May 21, 1968 J. C. HINTERMAIER 3,383,839

DEVICES FOR COLLECTING FIBROUS MATERIALS

Filed March 23, 1965 2 Sheets-Sheet 1

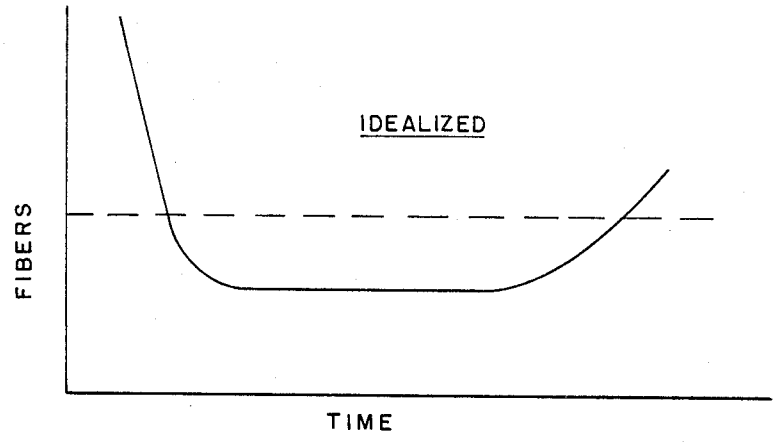



FIG. 1

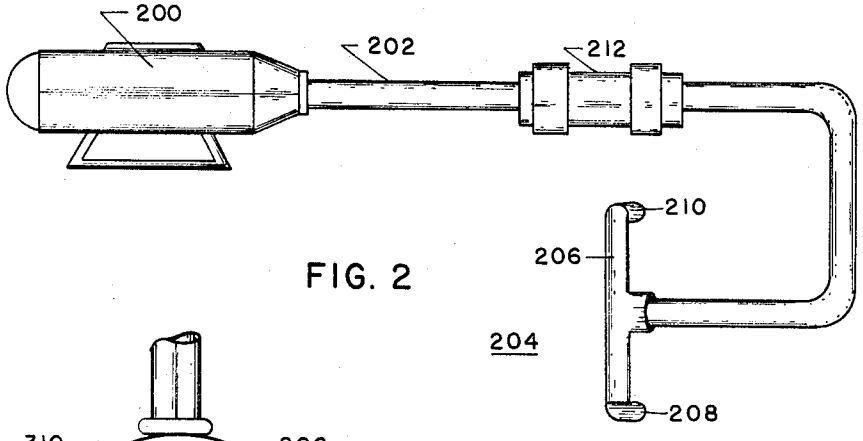



FIG. 2

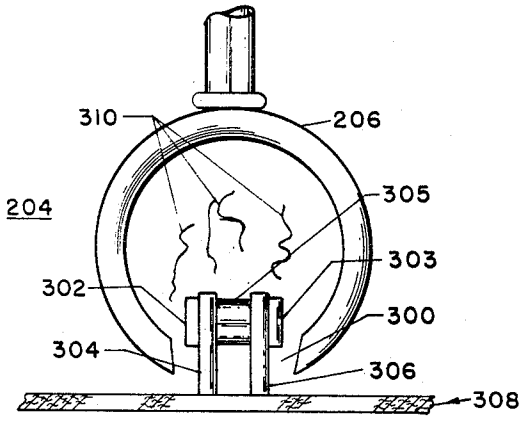



FIG. 3

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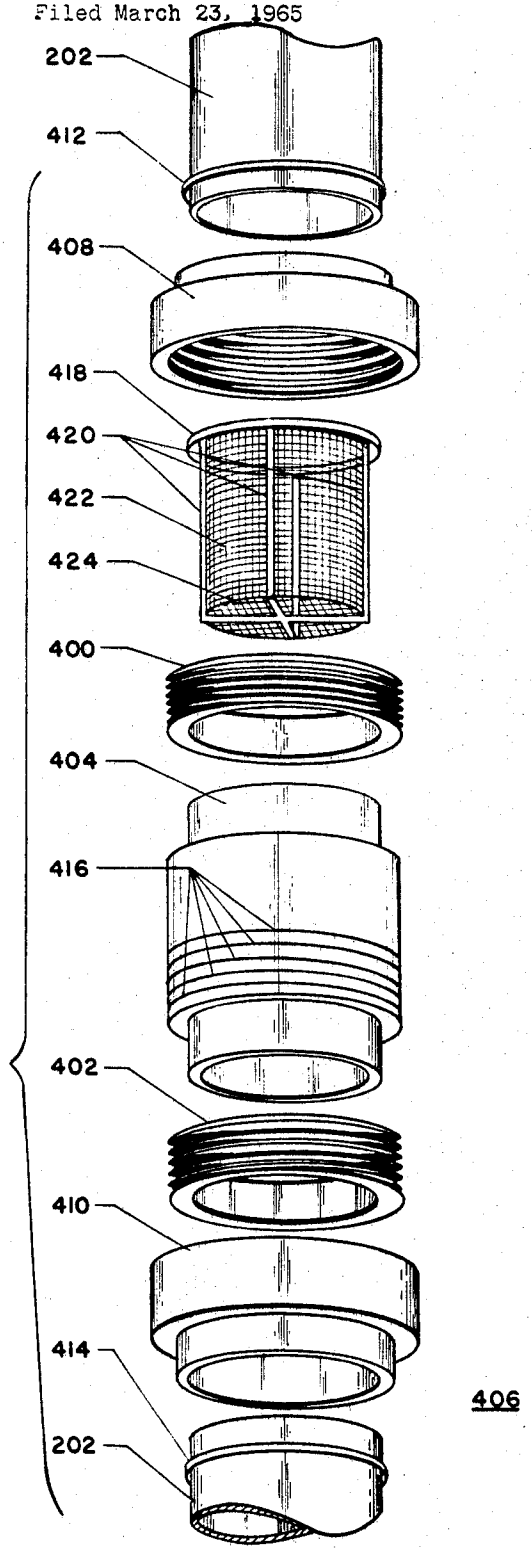



FIG. 4

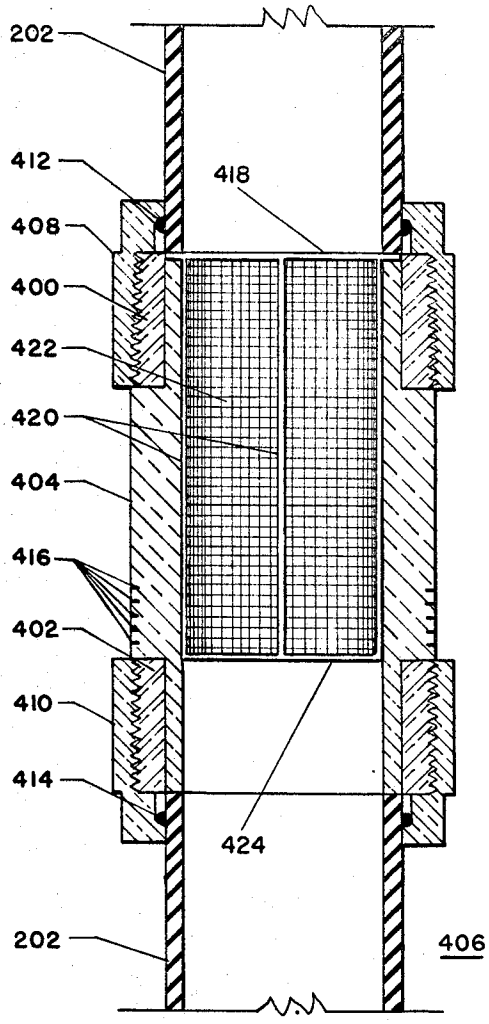



FIG. 5

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3,383,839

# DEVICES FOR COLLECTING FIBROUS MATERIALS

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1 Claim. (Cl. 55—270)

This invention relates to improvements in devices for collecting fibrous materials. In order to demonstrate how this invention solves certain problems heretofore experienced in the collecting of fibers, the example of a web of paper as it is being manufactured will be discussed here, but it is to be understood that this choice of context is merely by way of illustration, and not of limitation.

Techniques of papermaking now in widespread use utilize papermaker's fabrics for transporting a formed web of paper through the papermaking machinery, and for assisting in effecting certain objects of so processing the paper, such as removing water from it. Thus, for example, fabrics are used to transport the formed web of paper through the nip of press rolls which, by a wringer-like action, remove the water in which the wood or other fibers have been suspended to facilitate the forming of the web. Another example of the use of a fabric in papermaking is in the dryer section of a papermaking machine, where the fabric serves to hold the web of paper against the surface of heated rolls whereby moisture removed is facilitated.

Usually these fabrics are very large, endless belts made by weaving and/or needling natural fibrous materials such as wool, or synthetic fibrous materials such as nylon, or combinations of natural and synthetic fibers, according to well-known techniques. However, some of the constituent fibers of such fabrics are not securely affixed to the main body of the fabric and tend to become attached to the web of paper upon contact with it, causing hair-like deposits to appear in the surface of the paper. These deposits are objectionable because they discolor the paper, foul printing ink platens, cause "skips" or streaks in surface coatings applied to the paper, and cause other objectionable effects to occur.

The number of such free fibers which a given fabric will so discharge usually varies in a more or less predictable pattern throughout the life of the fabric. It is relatively great during the first few cycles of use, due to an abundance of such free fibers which are introduced during the manufacture of the fabric and are not subsequently removed therefrom prior to installation of the fabric on the papermaking machine. These fibers are released from the fabric to the web of paper during the first few times the web and the fabric come into contact with each other. Thereafter, and for the major portion of the life of the fabric, the free fibers discharge at a relatively low and tolerable rate. But during the final stages in the life of the fabric, when it is beginning to deteriorate structurally from the continued abuse to which it is subjected in normal use, the rate of discharge of free fibers increases until it exceeds a tolerable level.

This pattern of free fiber discharge throughout the life of a fabric is illustrated in idealized representation in FIG. 1 of the attached drawings.

A certain number of free fibers on the paper web are tolerable, and standards of acceptable tolerance have been established. In order to make sure that the unwanted fiber content of the surface of paper in the process of manufacture is not exceeding the acceptable level, test devices have been perfected which are suitable for gathering up the loose fibers from the surface of the web of paper. Some of the devices rely on a vacuum removal



technique for gathering the fibers while the web of paper is running in production on the paper machine. By relating the width of the strip so vacuumed to the time during which the vacuuming is done, knowing the speed at which the web is running, and counting the number of fibers so gathered, a determination of the number of unwanted fibers per square foot of paper produced may be made. Certification may then be made that the number of unwanted fibers present on the paper is within the acceptable level of tolerance or, if it is not, appropriate adjustments, such as changing a fabric may be made to bring the content of unwanted fibers within acceptable limits.

Until now, however, the element of the test device in which the free fibers were actually accumulated has been very crude, bulky, and difficult to use under the testing conditions encountered in the paper mill. A consideration which made such accumulators particularly unsuitable for the use described above was the inability of the operator of the test device to tell, at any instant in time, what quantity of free fibers had been accumulated.

It is an object of this invention to provide an improved fiber filtering means.

It is a further object of this invention to provide such an improved fiber filtering means which is particularly suited for use in devices of the type heretofore described.

Still another object of this invention is to provide a means whereby the amount of fibers, and therefore the rate of fiber filtration, may be readily ascertained.

Yet, another object of this invention is to provide a means whereby the amount and rate of fiber filtration may be continuously monitored.

Another object of this invention is to provide a fiber filtration means having the features heretofore mentioned which is structurally simple and from which the accumulated fibers may be readily removed for examination.

These and many other objects which will be readily apparent to those ordinarily skilled in the art are achieved through practice of the principles of this invention, as hereinafter taught and described. This invention will be readily understood from the following discussion and the attached drawings in which:

FIG. 1 is an idealized representation of the phenomenon of unwanted fiber occurrence,

FIG. 2 is an illustration of a typical free fiber collecting apparatus,

FIG. 3 is a cross-sectional drawing of the collecting head of the device illustrated in FIG. 2,

FIG. 4 is an expanded isometric view of one embodiment of this invention, and

FIG. 5 is a cross-sectional view of the embodiment of this invention which is illustrated in FIG. 4.

FIG. 1, an idealized graphic representation, has already been referred to in the preamble of this specification in connection with a description of the particular problem of the shedding of fibers from a papermaker's fabric.

FIG. 2 illustrates a device of the type heretofore referred to in which the principles of this invention might be utilized. This device comprises a vacuum generating unit **200**, having a hose **202** or other suitable air duct connected thereto, the other end of which is connected to a collector head **204**. The collector head **204** comprises an elongated tubular member **206** having handles **208**, **210** affixed to the ends thereof.

A cross-sectional representation of the collector head **204** is shown in FIG. 3. In this figure it will be seen that the bottom side of the collector head **204** has a slot **300** down the length of which are positioned support bars **302**, **303** having spacer **305** separating them from each other so that air and fibers may pass between them. The outer surfaces of the bars **302**, **303** have affixed to them scraper blades **304**, **306** which extend beyond the circumference described by the outside of the collector head to an ex-

tent sufficient to permit the outmost edges of the blades **304, 306** to freely contact the surface of the paper web **308** being monitored. The effect of these blades is to cause fibers **310** which have been liberated from the papermaker's fabric (not shown) and are loosely adhering to the surface of the web of paper **308** to be loosened to an extent sufficient for the vacuum generated by the unit **200** and directed into the collector head **204** by means of the hose **202**, to suck the fibers into the collector head and through the tube toward the unit **200**.

As is illustrated in FIG. 2, an improved fiber collector device **212** which utilizes the principles of this invention is incorporated into the device as part of the hose **202**. This embodiment of this invention is further illustrated in FIGS. 4 and 5.

Referring first to FIG. 4, an expanded isometric view of this embodiment, it will be seen that it comprises the following components appropriately interconnected with each other and adjacent segments of the vacuum hose **202** as illustrated; nipples **400, 402**; a central filter container **404**; and a filter member **406**. The hose segments **202** each have suitable terminal members **408, 410** which are affixed thereto by means of compression rings **412, 414**, and are internally threaded so as to receive the nipples **400, 402**.

The central filter container **404** may be made from any transparent material, but preferably is made from plastic for ease of formation and shaping and for resistance to breaking. Circumferential lines **416** or other suitable markings are integral with the container **404** so that the amount of fiber accumulated by the filtering device can be readily discerned. One suitable configuration for these markings, particularly adapted for use in the embodiment being discussed, is in the form of circumferential grooves .002" in depth and spaced .100" apart, starting .100" from the lower shoulder of the container **404**.

The nipples **400, 402** are rigidly affixed to the reduced diameter end portions of the container **404**, by pressure fit, adhesives, heat bound, or other appropriate means so as to become bound thereto, thereby forming a means for connecting the container **406** to the terminal members **408, 410** by a removable, threaded connection.

The filter member **406** comprises a pervious member **422** which is made by weaving, knitting, perforating, or other well-known techniques using metal, plastic, paper, cloth, or other suitable material in sheet, wire or other form appropirate to the technique by which it is produced, in such a fashion that the contents thereof may be observed from the outside of said member. One material which has been found to be particularly suited to the embodiment being discussed is a woven wire screen of 150 mesh. It may be suitably reinforced for strength by rigid structural members formed from wire or other suitable material. Such a support frame is illustrated in FIG. 4 as comprising circular end portions **418, 424** and side portions **420**. The upper end portion **418** may be made so as to bear on the upper end of the container **404**, thereby holding the filter member **406** in place when in use, since migration might otherwise be induced due to the pressure gradient across the filter at its lower end. The filter member **406** is illustrated as having been made basket shaped with the ingress end open so that it will readily contain fibrous material filtered from the stream of air passing therethrough. Of course, a wide variety of shapes and cross-sectional configurations might be advantageously used without departing from the spirit or scope of this invention. In order to strengthen the closed end of the filter member, appropriate reinforcement, such as a coarse mesh wire screen or straight reinforcing members, may also be positioned within and affixed to the lower circular end portion **424** of the support frame.

FIG. 5 illustrates the assembled embodiment which has been discussed in connection with FIG. 4. It will be noted that any and all of the constituent parts of the assembly may be removed or replaced at will. Thus, in the operation of the embodiment discussed in connection with the problem in papermaking which has been outline, the operator of the test unit starts the vacuum generating unit and holds the collector head against the fabric side of the running web of paper. The scraper blades in the collector head finally dissociate loosely adhering fibers from the surface of the paper web and they are sucked into the hose **202**, through which they travel until they are caught by the filter element **406**. The operator may readily observe the amount of fibrous material which has been collected up to any instant in time through the transparent side wall of the container **404** and, when an adequate amount has been accumulated as measured by reference to the markings on the side of the container, the operator may stop the test by removing the collector head from contact with the web. The upper hose terminal member **408** may then by unscrewed from the container **404**, the filter member **406** removed therefrom, and the contents of the filter spread out on the surface of a dark sheet of paper for examination under a microcope, according to well-known techniques.

It will be understood that the description which has been set forth herein is by way of illustration and not of limitation, and that other embodiments utilizing the teaching and principles of this invention will be readily apparent to and may be practiced by persons skilled in the art without departing materially from the spirit and scope of this invention.

I claim:

**1.** In a device for gathering up loose fibrous materials from the surface of a fibrous web by vacuuming, a filtering device comprising

a cylindrical clear plastic member which is open at both ends and constitutes a part of the air conduit to a vacuum device, said plastic member having markings along its length at .100" intervals beginning near the air egress side thereof, and a cylindrical 150 mesh woven wire filter member which is open at one end and has an outer diameter substantially equal to the inner diameter of said plastic member, said filter member having rigid circular support frame members at each end thereof rigid support frame members interconnecting said circular support frame members and extending therebetween parallel to the axis of said filter member, and rigid support frame members positioned across the circular support frame member at the closed end of said filter member,

said filter member being positioned within said plastic member with its closed end located at the air egress end of said plastic member.

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