Several types of machines used in the textile industry, especially pickers, air filters and condensers, include means for conveying cotton or other fiber in an air stream and a revolving screen through which the air stream flows and which serves to separate the fiber from said stream. When these machines are in operation the fiber so screened out of the air stream collects on the moving surface of the screen in the form of a mat or sheet, and the removal of this sheet is customarily effected by means of a pair of draw rolls or delivery rolls. Usually these are fluted steel rolls, accurately machined, and running substantially in contact with each other, except as that relation is modified by the fibrous mat or sheet fed between them. Usually, also, one at least of these rolls is mounted for yielding movement toward and from the companion roll in order to accommodate variations in the sheet and to maintain a firmer grip of the rolls on the sheet.

In these machines the mat delivered by it often is very irregular and lumpy. When a lump passes between the delivery rolls it opens a gap between them. There is always either a positive or a negative air pressure at one side or the other of this pair of rolls and when they are forced apart in the manner just described, a rush of air takes place between the rolls which interferes with the normal operation of the machine. That is, the effectiveness of machines of this type depends to a large extent on accurate control of air flow and such control obviously is impossible under the circumstances just described. It is partly for this reason that so many pains are taken in these machines to seal the spaces where leakage otherwise would occur. Especially troublesome is the tendency of the fiber to collect at any leaks around the ends of the rolls. Such a collection of fiber becomes tightly compacted partly by the action of the air, and more especially, by the motion of the rolls, and after a time it may build up sufficiently to form a hard bunch which wedges itself so tightly between the rolls and the screen, or between the rolls and adjacent frame parts, that the machine jams. These are referred to as "choke-up." A further objectionable effect which occurs when a bunch or lump passes between the rolls is that if there is a positive air pressure at the inner sides of the rolls, dust and fiber escape through the gap opened by the bunch and are discharged into the room in which the machine is operating. If this occurs at frequent intervals the working conditions in that room may become very unpleasant. Moreover, when the bunch passing between the rolls is sizeable, the separation of the rolls which it produces frequently is sufficient to permit the air pressure in the machine to blow out a substantial part of the mat from between the rolls. In addition to the foregoing, it not infrequently happens that some portion of the mat, instead of being fed between the rolls and discharged, winds up on one of the rolls, thus producing what is known as a "lap-up" or "roller lap" which may result simply in a jam or in the breakage of some part of the machine.

The present invention deals especially with the considerations above described, and it aims to improve machines of this type with a view to eliminating the objectionable features above described.

The nature of the invention will be readily understood from the following description when read in connection with the accompanying drawings and the novel features will be particularly described in the appended claim.

In the drawings:
Fig. 1 is a longitudinal, vertical, sectional view, somewhat diagrammatic in character, of a cotton picking machine in which the present invention is embodied;
Fig. 2 is a vertical, sectional view on a larger scale showing the invention applied to the filter unit of said machine;
Fig. 3 is a rear elevation, partly in section, of the upper delivery roll shown in Fig. 2;
Fig. 4 is a vertical, sectional view illustrating the invention as embodied in the condenser section of the machine shown in Fig. 1; and
Fig. 5 is a front elevation, partly in section, of the delivery rolls illustrated in Figs. 1 and 4.

The invention is here illustrated as embodied in the cotton picker shown in Patent No. 2,271,783, granted February 3, 1942, and assigned to the assignee of the present invention. For a detailed description of this machine reference should be made to the patent above designated, but for the purposes of this application it is sufficient to point out that the machine comprises a beater A to which cotton is fed in the conventional manner and from which it is carried, in a current of air, to the condenser cylinders B—B where it is collected on the screening surfaces; is taken off by the delivery rolls, and fed to the calendar section "C." The current of air just mentioned, and the suction essential for the operation of the condenser, is created by the customary blower 14 and the exhaust air from this blower is discharged through the duct 12 to the casing 18 in which the filtering cylinder 2 is mounted. As explained more in detail in said patent, the air discharged into the filter by the
blower carries with it some of the fiber and dirt which it has picked up on its way through the beater. This air flows through the screening surface of the drum, deposits its fiber on said surface, and discharges the filtered air where it is carried back into the main chamber from which it is re-circulated through the beater and the condensers.

The draw rolls or delivery rolls 3 and 4, Fig. 2, take the place of the rolls 24 and 25 provided for this purpose in the machine shown in said patent and are operated by the same and are placed in the same position in the machine as the rolls 24 and 25 were in the machine shown in the patent referred to above. Thus, the present invention resides in the construction of the delivery rolls 3 and 4 and in their arrangement and relations to the adjacent parts. As best shown in Fig. 3, the roll 3 comprises a shaft 3' and a thick layer of soft rubber mounted on said shaft. Preferably this layer consists of a series of annular sections a of substantially thickness positioned end to end. These sections or rings are preformed, are slipped on to the shaft, and are secured to it for rotation in unison therewith as, for example, by cementing them to the shaft or making them somewhat smaller in internal diameter than the shaft so that they will fit on it so tightly as to revolve with it. Each section is of hollow, cylindrical form. The other roll 4 is of the same construction.

In operation the rolls cooperate to remove the fibrous sheet from the screen 2 in the same manner as in the machine shown in the patent above referred to, but it has been found in actual practice that these rolls are much more efficient in that they produce a more constant and tighter seal with each other, with the cylinder, and with the fibrous sheet which they are discharging, than can be produced with metallic rolls. Especially important is their action on a lump or bunch when it comes through in the mat. Both blow out and immediately cut such a bunch. Instead of forcing the rolls bodily apart, those portions of the rubber layers in contact with the bunch conform to its contour. This action in marked contrast to that which occurs with steel rolls which, as above explained, are forced apart bodily, opening a gap through which the mat may blow out. With the rubber rolls, however, the action is simply one of temporary deformity of those portions only of the rubber layers which bear on the bunch, such deformity being limited to a degree determined by the shape and dimensions of the bunch. At other points of contact the normal relationship of the rolls to the mat remains undisturbed. Consequently, there is no danger of a blow-out; control of the air flow in the machine is not disturbed; and any appreciable discharge of dust or fiber into the room is prevented.

These rolls may be mounted in the machine in the usual way, although it is not necessary to support them for yielding movement, one relatively to the other, unless the thickness of the mat to be discharged is exceptionally large. The ends of the rubber sections of the rolls themselves provide a good seal with the portions of the casing through which the shafts extend, as will be evident from an inspection of Fig. 3 where the casing walls are shown at 23—23.

The rubber of which the sections a are made may be either natural or synthetic, but it should be sufficiently stiff so as to be resilient if properly treated. In the manner above described. A firm grade of sponge rubber made up in sections about two inches long has been found to operate very satisfactorily. My experiments indicate that the hardness of the rubber sections should be between approximately 32 and 38, as measured on a Shore durometer. The compounding of the rubber should be such as to give good resiliency or spring-back, and while this characteristic may vary widely, a resiliency of 38 to 40, as measured on a Bashore instrument, has given excellent results. Also, the radial thickness of wall of the rubber rings should be ample, a minimum of a half inch being desirable, although with some compositions a thinner ring would work. It is preferable, however, to use a considerably greater thickness, say an inch or an inch and a half.

Figs. 4 and 5 show on a larger scale the condenser delivery rolls illustrated in Fig. 1. The two condenser cylinders or screens B have upper and lower delivery rolls 28 and 21 associated with them in the usual way. These rolls include steel shafts 29' and 21', respectively, which may be mounted in the machine in the usual manner. As here shown each is supported near its opposite ends in bearings 24—24 and 25—25. Each roll is made up of rubber sections c, which are like those above described and illustrated at a in Fig. 3. And the same advantages are derived from the use of these rolls in delivering the condensed sheet of fiber from the cylinders B that is realized in using the rolls 3 and 4 in Figs. 2 and 3. A negative pressure is maintained in the machine casing around the condenser cylinders and a lump or bunch of fiber passing between the steel delivery rolls 20 and 21' is carried by the condenser delivery rolls which sets up violent eddy currents inside the casing and interferes seriously with the formation of the sheet on the screen drums. Disturbances of this type are prevented by the use of the soft rubber rolls. Lap-ups also are eliminated.

A further advantage attending the use of this invention is the economy effected in the manufacture of the machine. The steel rolls used in both the filter section and the condenser section of the picker must necessarily be machined very accurately in order to produce the desired results, and such machining is expensive. With the rubber rolls this expense is eliminated.

While some of the advantages of this invention could be obtained by using a soft rubber roll with a steel roll, for most purposes it is far more preferable to use two rubber rolls working together. At other points of contact the normal relationship of the rolls to the mat remains undisturbed. Consequently, there is no danger of a blow-out; control of the air flow in the machine is not disturbed; and any appreciable discharge of dust or fiber into the room is prevented.

These rolls may be mounted in the machine 75
While I have herein shown and described preferred embodiments of my invention, it will be evident that the invention is susceptible of embodiment in other forms without departing from the spirit or scope thereof.

Having thus described my invention, what I desire to claim as new is:

In a fiber filtering machine of the type having a casing controlling an air-stream and within said casing a rotatable screen through which a stream of air laden with fiber is conducted when the machine is in operation so that a fibrous mat built on the screen, a delivery mechanism for removing said mat from said screen and discharging it from said casing comprising a pair of rolls running in peripheral contact with each other and between which the mat is drawn from the screen, one at least of said rolls comprising a rigid shaft and a covering consisting of a series of annular rings of soft rubber positioned end to end on said shaft independently of each other, said rings being capable of conforming to and accommodating local irregularities independent of each other to prevent substantial flow of air between said delivery rolls.

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