Oct. 9, 1945. L. C. PHARO 2,386,715

ASBESTOS PROCESSING

Filed Oct. 12, 1943 2 Sheets-Sheet 1

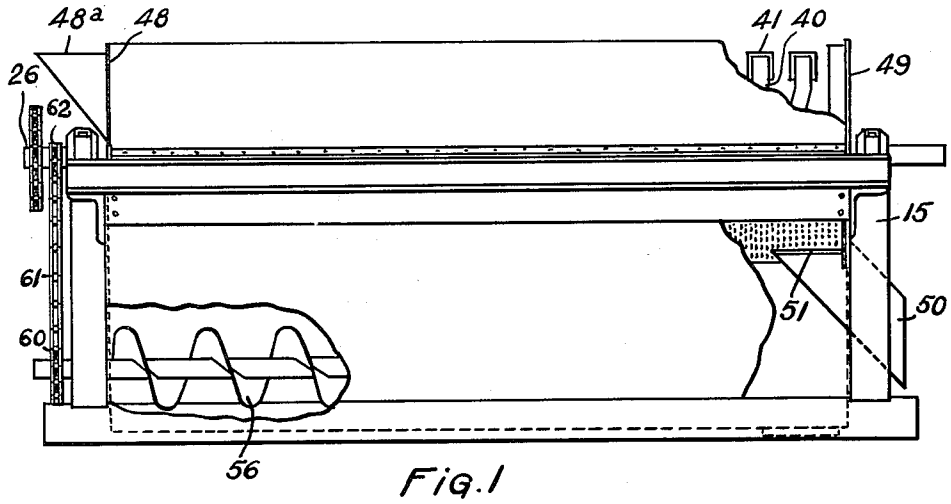


Fig. 1

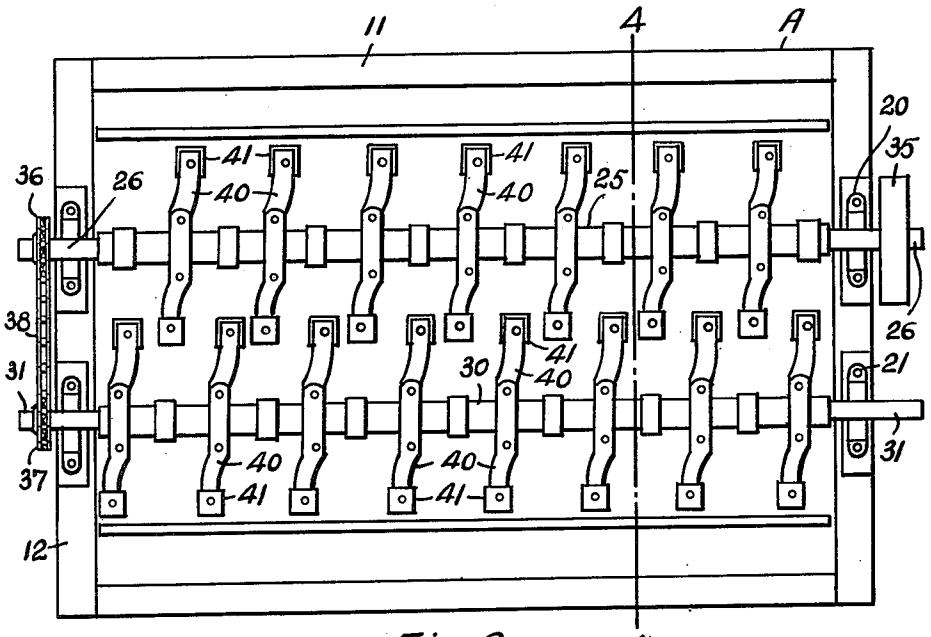


Fig. 2

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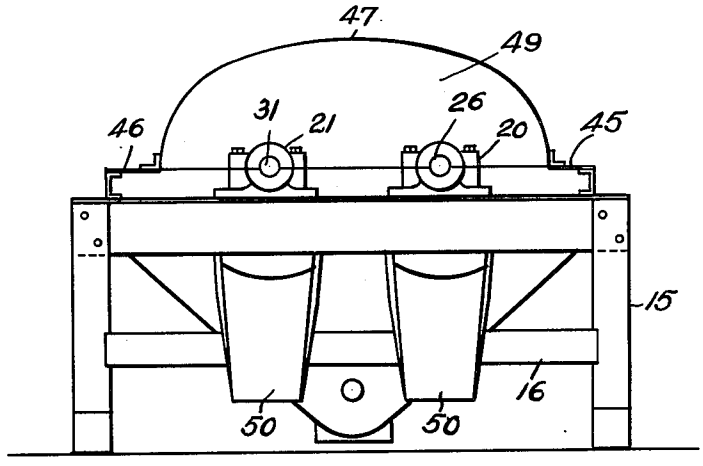


FIG. 3

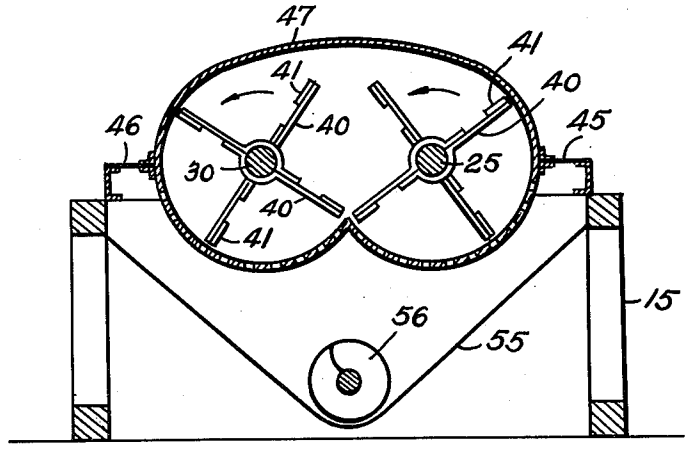


FIG. 4

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ASBESTOS PROCESSING

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Application October 12, 1943, Serial No. 506,000
In Canada September 4, 1943

1 Claim. (Cl. 19—90)

Introduction

This invention relates to the treatment of fibrous materials, particularly to material of the nature of asbestos, to remove therefrom short fibers.

The removal of such short fibers is a difficult problem owing to the fact that mechanical handling tends to injure the longer fibers and thus reduce its quality for textile and other uses.

Objects

Having regard to the foregoing, it is a principal object of the present invention to provide a method and means of removing short fibers from masses of fibrous materials in which they are entrained. It is a further object of the invention to provide such a method and means wherein the injury to the fibrous material is reduced substantially to a minimum. It is a still further object to provide an apparatus which is convenient to construct and to operate for performing such a method.

With these and other objects in view, a characteristic embodiment of the present invention is inherent in the operation of the following apparatus. This apparatus includes a pair of parallel shafts on each of which is mounted a number of beater arms each having blades inclined from the axes of the shafts.

The shafts are adapted to run in the same direction and the arms are such that they intermesh that is to say, pass between each other while moving in opposite directions. This agitating mechanism is closely surrounded by a housing forming a passage through which the material is caused to travel by the rotation of the arms and the pitch of the blades. The bottom of the housing is suitably perforated to provide for the escape of "shorts." The action of the revolving arms and blades is to disintegrate the fibers and particularly to hold the longer fibers in suspension while the shorts are caused to pass through the perforated cover, whence they are carried away by a suitable discharge mechanism. Rotation of the shafts and consequent operation of the arms at a relatively low speed has the desirable effect of agitating the fiber so as to separate the individual fibers in the longer spicules, eliminating the extremely short fibers from the masses, and leaving the spicules of the shortest fibers it is desirable to retain in a somewhat harsh or unopened state. The resulting masses of fiber are relatively uniform in staple length compared with the usual mass of asbestos. The longer fibers are fiberized and fluffed while the shorter fibers are in the form of fiberized bundles.

Detailed description

The invention will be understood more specifically by reference to the following detailed description illustrated by the accompanying drawings showing preferred equipment used in carrying out a specific embodiment of the invention, and in which:

Figure 1 is a side elevation partly in section of this preferred form of apparatus.

Figure 2 is a plan view of the apparatus shown in Figure 1 with the cover removed to reveal the agitating mechanism.

Figure 3 is an end elevation of the apparatus shown in Figures 1 and 2.

Figure 4 is a transverse vertical cross section of the apparatus shown in Figures 1 and 2 as along the line 4—4 of Figure 2.

Referring more particularly to the drawings, this apparatus includes a horizontal frame A having longitudinal beams 11 and cross beams 12 supported by legs 15 at the corners of the frame. Cross bars 16 between the legs 15 somewhat above floor level serve to stiffen the frame. The structural members are preferably of steel.

Carried on each cross bar 12 are spaced apart ball bearings 20 and 21. The bearings 20 receive the turned down ends 26 of a horizontal shaft 25. The ends 26 extend somewhat beyond the bearings 20. Similarly the bearings 21 receive the turned down ends 31 of a horizontal shaft 30 extending therebetween. Mounted on one end 26 of the shaft 25 is a drive pulley 35. Mounted on the other end 26 of the shaft 25 is a sprocket wheel 36. Mounted on the corresponding end 31 is a sprocket wheel 37. A sprocket chain 38 runs about the wheels 36 and 37 whereby they are driven in synchrony. The pulley 35 receives its drive from a suitable source of power.

To each of the shafts 25 and 30 are bolted intermediate their ends by clamps forming a part thereof, a series of agitating arms preferably drop steel forgings 40, provided with hardened, preferably manganese, tips 41. The tips are preferably given a pitch to assist the flow of the material from the input to the discharge end. A preferred pitch is about 10 degrees from the axis of the shaft. The position of the shafts and the length and position of the arms are such that they overlap and inter-mesh, that is to say, the arms of one shaft pass between those of the other shaft moving in the opposite direction.

Mounted on the frame by means of brackets 45 and 46 is a housing 47 preferably of sheet

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iron substantially of the conformation indicated, of which the bottom part is perforated and positioned fairly close to the agitating arms. The bottom or lower perforated portion of the casing always presents a curved surface which closely receives the tips of the arms, e. g. the lower portion has a substantially central inwardly extending portion and the perforated portions on either side of the inwardly extending portion are substantially arcuate whereby they closely receive the tips 41. The housing or casing is also free of obstructions such as would prevent maintaining the longer fibers in suspension and liberating them. As explained the longer fibers are maintained in suspension and liberated while the shorts fall from the suspension and escape through the perforated lower portion. The housing is provided with ends 48 and 49 through suitable openings in which the shafts 25 and 30 extend. The end 48 is provided with a feed hopper 48a, while the discharge spout 50 extends from beneath the discharge end of the cover and is bolted thereto as at 51.

Also mounted on the frame A and beneath the cover 47 and agitating mechanism is a substantially V-shaped hopper 55 the top of which is connected to the side beams 11 and the bottom of which is adjacent the floor. This hopper extends the length of the frame. Running in the trough of the hopper is a spiral conveyor 56 which extends from the input to the discharge end.

The conveyor shaft is held in suitable bearings in the frame and has an end projecting beyond the frame adjacent the feed end. On the projecting end is mounted a sprocket wheel 60. This sprocket wheel is driven by a sprocket chain 61 driven from a sprocket gear 62 mounted on the end 26 of the shaft 25.

Operation

The operation of the apparatus is as follows. The shafts 25 and 30 are rotated at the desired speed and the fibrous material continuously fed in through the hopper 48a. Rotation of the shafts causes agitation of the fiber inside the housing 47 by the arms 40 and its advance by the pitch of the tips 41 towards the discharge end. The arms and blades of one shaft passing between the arms and blades of the other shaft in the opposite direction causes the lumps or bunches of fibers to be pulled apart. The longer fibers are fluffed, the short fibers are not fluffed or opened. While excellent results can be obtained while operating the apparatus at a low speed, in screening out the short fibers and any sand or other foreign material, this low speed is effective in reducing the injury to the fiber substantially to a minimum. The turbo or blowing action of the usual type of grader is avoided since the fan action is neutralized by the extra beater turning in the opposite direction. The material is thus advanced towards the discharge end while being separated to a desirable extent before finding its way out through the discharge spout 50. Fines are forced through the perforations in the housing 47 and fall into the hopper 55 in which they are carried away by the conveyor 56 to a suitable collection point.

The size of the apparatus may be varied as may the speed of operation. In an apparatus in which the dimensions are approximately 1 foot from the center line of the shaft to the end of the beater blade, and the remainder of the apparatus dimensioned substantially proportionately according to the drawings, the preferred range of speed is between about 200 R. P. M. and about 250 R. P. M. Often it may be found advantageous to subject the masses of fiber to more than one passage through the apparatus.

Advantages

Among the advantages of the invention are the fact that short fibers and any remaining rock or other foreign material may be removed from masses of fibrous material with injury to the mass being reduced substantially to a miniumum. Effective means is thus provided for improving the quality of fibrous materials, particularly the spinning qualities of asbestos. A particularly useful application is in the sizing of asbestos coming from the milling operations so as to provide a fiber of relatively uniform staple length, without injury to the longer fibers.

It will be understood that, without departing from the spirit of the invention or the scope of the claim, various modifications may be made in the specific expedients described. The latter are illustrative only and not offered in a restricting sense, it being desired that only such limitations shall be placed thereon as may be required by the state of the prior art.

The sub-titles used throughout the specification are merely to simplify reference thereto and should otherwise be disregarded.

I claim:

The method of treating asbestos masses to separate the individual fibers in the longer spicules and eliminate extremely short fibers from the masses without removing the short fibers it is desirable to retain in an unopened state, which comprises feeding the asbestos masses into one end of a closed unobstructed substantially horizontal passage having a perforated area to allow the escape of said extremely short fibers by gravitation, moving said masses through the passage by subjecting them to the action of a succession of intermeshing rotating beating arms extending throughout the passage and inclined with respect to the longitudinal axis thereof in a direction to advance the masses continuously through the passage, passing the beating arms closely adjacent to one another while rotating them in intermeshing relation for agitating and advancing the mass thereby to cause the fibers from the long spicules to be liberated and the extremely short fibers to escape by gravitation, the beating arms being moved at a speed equivalent to the speed at which arms about one foot long would intermesh with each other between about 200 to about 250 times per minute, said speed being effective to maintain the long fibers in suspension and cause the undesirable short fibers to gravitate and to reduce injury to the long fibers substantially to a minimum.

L. C. PHARO.