Oct. 9, 1945. L. C. PHARO 2,386,714

ASBESTOS SEPARATING

Filed March 26, 1943

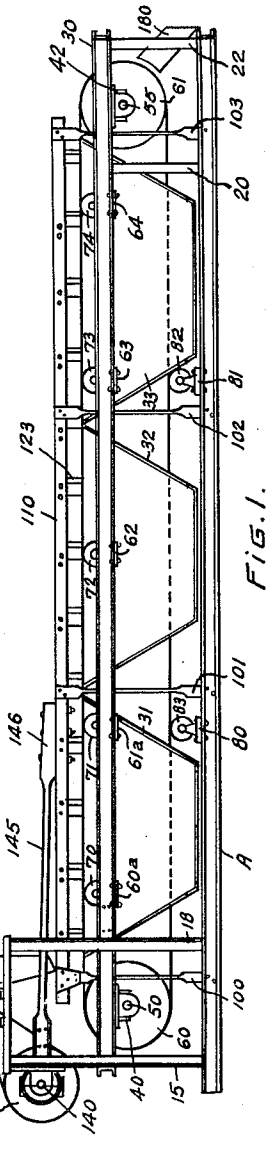


FIG. 1.

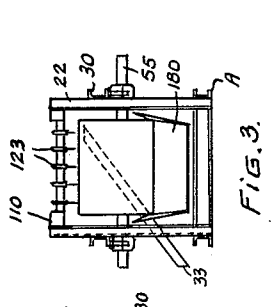


FIG. 3.

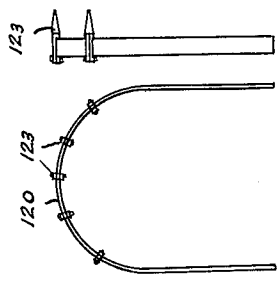


FIG. 4.

FIG. 5.

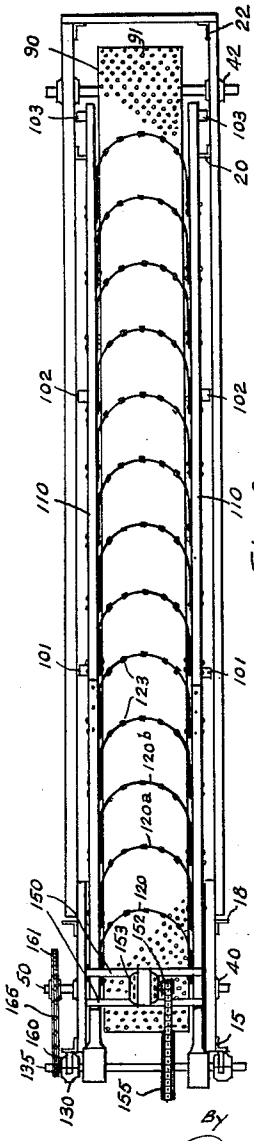


FIG. 2.

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Patented Oct. 9, 1945

2,386,714

UNITED STATES PATENT OFFICE

2,386,714

ASBESTOS SEPARATING

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Application March 26, 1943, Serial No. 480,700

10 Claims. (Cl. 209—2)

Introduction

This invention relates to the treatment of fibrous materials and more particularly to the removal of unfiberized spicules or lumps of foreign matter therefrom. It has special application to the treatment of asbestos.

When asbestos has been milled and fiberized it may still contain lumps or spicules of unfiberized or only partially fiberized material which have detrimental results when the fiber is employed for textile and other uses. Owing to the fibrous nature of asbestos, it is difficult to separate these lumps from masses of the fiberized product, especially if this is to be done without injury to the relatively brittle fiber. These remarks apply with greater or lesser degree to other fibrous materials.

Objects

Having regard to the foregoing, it is a principal object of the present invention to provide a method and means for removing lumps or coarse aggregates from partially or substantially completely fiberized fibrous materials, particularly asbestos. It is a further object to provide a method of this nature in which the lumps can be removed from the material without injury thereto. It is a still further object to provide an apparatus for performing these functions which is convenient to construct and to operate.

With these and other objects in view, a characteristic embodiment of the invention is inherent in the following procedure. The fiber in a substantially dry state after having been milled and fiberized, is conveyed in masses forming a layer on a moving surface having perforations adapted to permit the escape therethrough of heavy lumps of material or foreign matter without allowing the escape of the fiber itself. While it is being advanced on this conveyor, the material is stirred and moved about locally in relation to the conveyor in such a manner as to cause gravitation of the heavy lumps to the bottom of the masses. The agitation also causes this material to gravitate through the openings in the conveyor. The net result of the treatment is in removing the greater portion of the lumps from the mass being treated without injury to this material.

Detailed description

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

Figure 1 is a side elevation of the preferred apparatus.

Figure 2 is a plan view of the apparatus shown in Figure 1.

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

Figure 4 is an enlarged plan view of one of the bows.

Figure 5 is an elevation of the bow shown in Figure 4.

Referring more particularly to the drawing, the apparatus includes an elongated frame A having a pair of parallel supporting beams **11** constituting a base. Long uprights **15**, **18** and shorter uprights **20** and **22**, extend upwards from each beam **11**. A pair of parallel horizontal beams **30** are supported by the uprights **15** etc. Several discharge hoppers **31**, **32**, and **33** are mounted in the frame lengthwise thereof. As indicated in the drawing, the top edges of these hoppers lie at one side of the belt and just underneath it. The hoppers slope to the other side of the machine adjacent the bottom thereof so that foreign substances gravitating from the belt are carried to the side of the machine as will be described. Pairs of bearing blocks **40** and **42** are mounted adjacent the extremities of the beams **30**. Journalled in these blocks are bearings carrying shafts **50** and **55** respectively. On the shaft **50** is mounted a conveyor drum **60** preferably of cast iron. On the shaft **55** is mounted a similar conveyor drum **61**. Intermediate the bearing blocks **40** and **42** on the beams **30** are mounted bearing blocks **60**, **61**, **62**, **63** and **64**, each carrying an idler **70**, **71**, **72**, **73** and **74** respectively, extending the width of the apparatus. Intermediate the ends thereof are also mounted the bearing blocks **80** and **81** carrying return idlers **82** and **83** respectively. An endless conveyor belt **90** extends about the drums **60** and **61** and is supported intermediate these drums by the idlers **70** etc. and **83** etc. For handling asbestos, this belt is preferably of rubber and is perforated to allow the escape therethrough of foreign substances or large lumps of fiber which it is a purpose of the present process to remove.

A series of springs **100**, **101**, **102** and **103**, four on each side of the machine are spaced apart and connected to each beam **11** and extend upwardly therefrom. These springs are preferably of wood, because of its longevity in such applications, and shaped as indicated. Carried by the springs and connected to the upper end thereof at

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each side of the machine are parallel wooden shaker arms 110 adapted by their mounting on the springs 100, etc. for limited reciprocal movement lengthwise of the apparatus in a plane determined by the length of the springs. Mounted between the arms 110 is a series of steel bows 120, 120a etc. The bows are preferably U-shaped and preferably made of flexible steel. The ends are parallel to and bolted to the arms 110 and the intermediate portions extend between the respective arms 110. The bows are parallel to one another and spaced apart along the entire length of the arms. On each bow is mounted several downwardly extending spaced apart fingers 123. These fingers extend to a position close to the conveyor belt leaving only a slight clearance.

Also mounted on the frame adjacent the upper ends of the uprights 15 and 18 are a pair of bearing blocks 130 one at each side of the machine. Journalled in bearings in these blocks is a drive shaft 135 extending the width of the machine. Mounted on the drive shaft, one at each side of the apparatus, are eccentrics 140. The eccentrics are mounted with the high sides 180° from each other. Connected to each eccentric is one end of an arm 145, the other end of which is connected as at 146 to one of the shaker arms 110.

On the top of the beams 15 and 18 are mounted a pair of beams 150. Between the beams 150 extend cross beams 151. On the beams 151 intermediate the beams 150 is mounted an electric motor 153. On the shaft 135 is mounted a sprocket gear 155. A sprocket drive chain extends from the motor sprocket to the sprocket 155. Sprockets 160 and 161 and the chain 165 extending between these sprockets constitute a driving connection between the shaft 135 and the conveyor shaft 50. In this way, the shafts 135 and 50 are driven from the electric motor. The speed is adjusted by the sizes of the respective drive pulleys or sprockets.

The conveyor has been described as extending horizontally because good results are thus achieved. A sloping conveyor might be used to achieve similar results without departing from the spirit of the invention.

Operation

The material to be treated is fed from the spout 160 on to the feed end of the belt 90 and is conveyed by this belt from left to right of the apparatus (as viewed in the figure). At the same time, the arms 110 are being reciprocated oppositely by the eccentric arrangement described above so that the flexible bows 120 are being moved back and forth across the belt causing the fingers to describe arcuate paths back and forth adjacent the surface of the belt closely resembling the action of the fingers of a human hand stirring up fibrous material on a flat surface. The fingers coming into contact with the material being moved forward by the belt have the effect of stirring up or raking the fibrous mass and causing any heavy particles, aggregates or lmps such as spicules of fiber or foreign matter to gravitate to the bottom of the mass and eventually to fall through the openings 91 in the belt. The fiberized material itself will not pass through the openings in the belt because of its fibrous nature but will nearly all remain on the surface of the belt, until it is discharged to a discharge spout 180.

Where asbestos is treated this has the effect of removing foreign matter such as sand or any other material which might have become entrained in the masses during their previous treatment. It also serves importantly to separate spicules of the fiber itself, which may not have been completely fiberized in the previous operations and which, if left in the mass, would cause trouble during the textile operations.

In the treatment of fiberized chrysotile asbestos, for instance, that coming from treatment in an apparatus such as that described in U. S. Patent No. 2,219,077, a preferred operating speed of the belt is about 200 feet per minute, although this speed is not generally critical. A preferred operating speed for the shaft 135 is about 200 R. P. M. where the belt is about 24 inches in width. This can also be varied within wide limits. The thickness of the layer of fiber on the belt is preferably in the neighborhood of about 3 inches to about 3½ inches. According to the conditions enumerated, in runs in which 20 short tons of asbestos were treated, about 900 pounds of lumps were removed, in other words in the neighborhood of 2¼%. A preferred type of conveyor belt is of rubber and includes perforations about ⅜'' positioned at about ¾'' centers. According to this preferred construction, the fingers are of wood or ebonite. These fingers may, of course, be of other materials, but if metal is used there is the possibility of broken pieces getting in the subsequent operations and causing damage to the machinery.

Advantages

An important advantage of this invention is that there may be removed from a fibrous material, in a more or less fiberized state, lumps either of the material itself or of foreign matter entrained therein without injury to the material. The treatment might be likened to that of the shaking imparted to a mass of asbestos by hand, using the fingers to agitate it. In this way, the material is continually spread over local areas of the surface in eccentric directions, and the mass is constantly stirred up and caused to take up different positions. This has the effect of causing the dust and any lumps present to gravitate to the bottom and also of pushing the lumps through the holes in the conveyor. By this method, therefore, there is produced a fiber which has superior characteristics especially for textile use wherein the presence of lumps would have a serious effect on the textile qualities of the fiber and would result in disruption of textile operations.

It will be understood that, without departing from the spirit of the invention or the scope of the claims, various modifications may be made in the specific expedients described. The latter are illustrative only and not offered in a restricting sense.

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

I claim:

1. An apparatus for treating fibrous materials containing lumps, comprising, a perforated conveyor adapted to advance the material through an extensive path, means for depositing a loose mass of the material on said conveyor, and stirring means in said path for stirring said material and moving it eccentrically in local areas of said conveyor as it is being advanced whereby lumps are caused to gravitate to the bottom of said masses and through the openings in said conveyor, said stirring means including a series of flexible members arranged over said conveyor

and substantially parallel to the surface thereof, said flexible members including fingers extending downwardly to points adjacent the surface of said conveyor, and means for flexing said flexible members whereby the fingers are caused to move locally in eccentric directions over said surface whereby the material is spread over said local areas.

2. An apparatus as claimed in claim 1 wherein said flexible members are a series of substantially U-shaped bows arranged over said conveyor.

3. An apparatus for treating fibrous materials containing lumps, comprising, a perforated conveyor adapted to support masses of the material and to convey it through an elongated path, means for depositing masses of material on said conveyor, a pair of shaker arms lying substantially parallel to the surface of the conveyor and at each side thereof, substantially U-shaped members each having an end connected to one of said shaker arms, fingers extending downwardly from said U-shaped flexible members to points adjacent the surface of said conveyor, means for reciprocating said arms oppositely whereby said U-shaped flexible members are flexed to cause the fingers to move eccentrically adjacent the conveyor to stir the masses supported thereby.

4. An apparatus as claimed in claim 3 including means beneath said conveyor for removal of lumps gravitated through said conveyor and means adjacent the discharge end of said conveyor for receiving said masses after removal of the lumps therefrom.

5. An apparatus for treating fibrous materials containing lumps, comprising, a conveyor adapted to support masses of the material and to convey it through an elongated path, the surface of said conveyor having openings therein adapted for the escape therethrough of extraneous lumps but to exclude the fibrous material proper, means for depositing masses of material on said conveyor surface, a pair of shaker arms lying substantially parallel to the surface of the conveyor and at each side thereof, flexible members extending between said shaker arms and connected thereto, fingers extending downwardly from said members to points adjacent the surface of said conveyor, means for reciprocating said arms oppositely in a plane substantially parallel to said conveyor surface whereby said members are flexed to cause the fingers to move eccentrically close to the conveyor surface to spread the masses thereover in eccentric directions.

6. An apparatus for treating fibrous materials containing lumps, comprising, a perforated conveyor adapted to support masses of the material and to convey it through an elongated path, means for depositing masses of material on said conveyor, a pair of shaker arms lying substantially parallel to the surface of the conveyor and at each side thereof, flexible members extending between said shaker arms and connected thereto, fingers extending downwardly from said flexible members to points adjacent the surface of said conveyor, means for reciprocating said arms oppositely whereby said flexible members are flexed to cause the fingers to move eccentrically adjacent the conveyor surface to spread the masses thereover.

7. An apparatus for treating fibrous materials containing lumps, comprising, a frame, a perforated conveyor mounted on said frame and adapted to convey them through an elongated path, means for depositing masses of material on said conveyor, a set of upstanding flexible supports mounted on the frame at each side of the conveyor, a shaker arm at each side of said conveyor and mounted on one of said sets of supports, a plurality of flexible members extending between said shaker arms and connected thereto, members extending downwardly from said flexible members to points adjacent the surface of said conveyor, means for reciprocating said shaker arms oppositely whereby said flexible members are flexed to cause the downwardly extending members to move eccentrically adjacent the conveyor to stir the masses supported thereby.

8. An apparatus, as claimed in claim 7, including a drive shaft, a pair of cranks on said shaft, a connecting member extending between each crank and one of said shaker arms whereby the rotation of said shaft causes reciprocating motion of said shaker arms.

9. Apparatus for screening fibrous materials containing lumps, comprising a frame, an endless perforated conveyor mounted on the frame, the perforations in the conveyor being constructed and arranged to permit lump material to pass therethrough and retain fibrous material on the screen, means to drive the conveyor, means for depositing masses of said material on the conveyor near one end thereof, supporting bows arranged transversely of the conveyor at intervals along its length, agitating fingers on the bows at spaced intervals along their length, means for supporting and for oppositely oscillating the opposite ends of said bows in directions longitudinally of the conveyor.

10. A method of treating fiberized asbestos containing lumps comprising continuously screening a mass of the asbestos while passing the same in a thin layer through a substantially horizontal and longitudinal path, and agitating said travelling mass to cause the lumps to gravitate to the bottom of the mass and be screened therefrom by continuously subjecting the mass to a reciprocating stirring action which comprises raking the continuously travelling layer of asbestos at the same level and substantially adjacent the screening surface both laterally and longitudinally with respect to its path of travel simultaneously at spaced points substantially throughout its screening path, and recovering the fibrous portion of the mass substantially free of said separated screened lumps.

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