

Sept. 15, 1931.

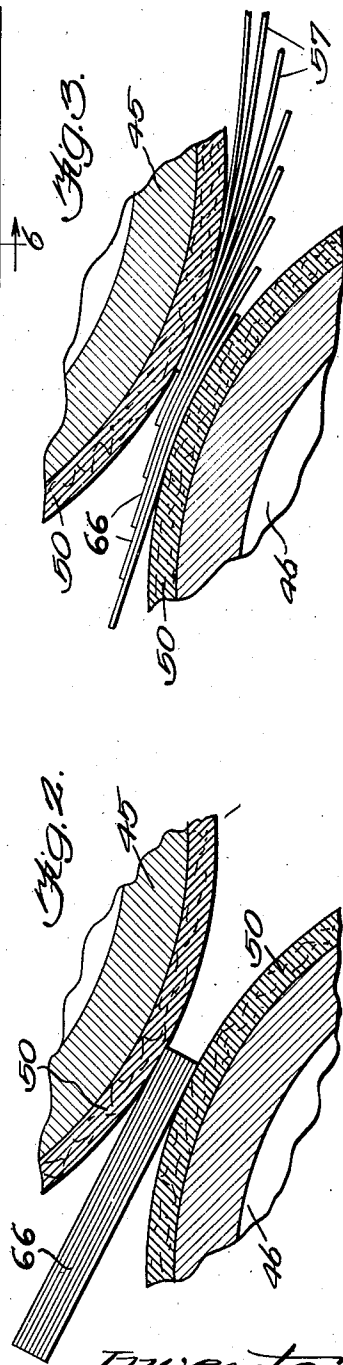
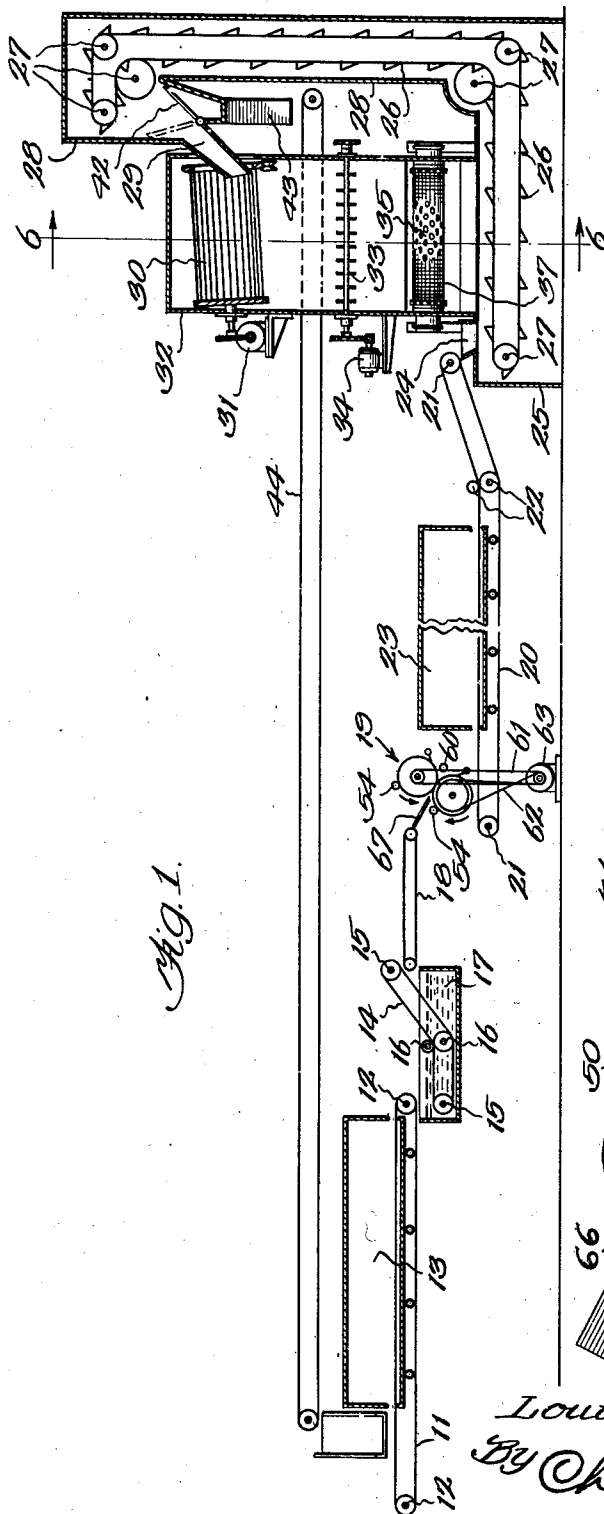
L. T. FREDERICK

1,823,136

MICA SPLITTER

Filed Sept. 24, 1928

2 Sheets-Sheet 1



Inventor
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By Cheever & Cox Attys.

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UNITED STATES PATENT OFFICE

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MICA SPLITTER

Application filed September 24, 1928. Serial No. 308,043.

My invention relates in general to means and methods of treating mica, and has more particular reference to a method of and means for splitting mica into its constituent laminations.

Mica occurs in nature in solid, compact masses, and is delivered for manufacturing purposes in blocks or lumps, only partially separated into its constituent laminations or flakes. Before manufacturing the mica into various useful forms, it is necessary to reduce the blocks or lumps of crude mica to relatively thin flakes of substantially uniform thickness. Various means have been employed for delaminating the crude mica and separating it into flakes. The most common of these methods is that employed in localities where manual labor is inexpensive, and which consists in chipping off the mica flakes with a knife or scalpel. By this means a skilled operator may produce a uniform grade of relatively thin flakes. However, the physical limitations of the operator limit the quantity of flakes which may thus be produced, and for modern manufacturing needs, particularly in localities where labor is relatively expensive, the manual method of producing flakes can not be economically practiced. For this reason various mechanical devices have been suggested for splitting, separating and sorting crude mica into flakes. My copending application, Serial No. 157,804, filed December 29, 1926, illustrates and describes a device which has proved most successful and which employs the principle of bending the blocks of crude mica back and forth in order to separate the laminations along their planes of cleavage. In practice it has developed that the bending of the mica causes the individual flakes to crystallize and break into smaller flakes, with the result that a certain proportion of the mica is rendered unfit for use when split by a device employing the bending principle.

Another device for splitting mica is illustrated in my copending application, Serial No. 157,805, filed December 29, 1926, in which the principle is employed of separating mica by pulling it apart through suction applied to the opposite faces of a mica block by means

of suction rollers. This method is commercially unsatisfactory because the mica block is separated in two halves only along one plane of cleavage each time the mica is passed between the rollers, so that in order to get a relatively thin grade of mica flakes it is necessary to repeatedly pass the mica through the separator.

One object of my present invention is to provide a means for splitting mica in which the mica flakes are not subjected to repeated reverse bends, and in which the necessity of repeatedly passing the mica flakes through the splitter is reduced to a minimum.

Another important object of the invention is to provide a means for splitting mica by sliding the constituent laminations of a mica block along their individual planes.

Another important object of the invention is to provide a mica splitter of simplified construction having a minimum number of operating parts whereby mica may be separated to its constituent laminations with a minimum amount of mechanical distortion of the individual flakes.

Still another important object of the invention is to provide a mica splitter adapted to cooperate with auxiliary mica treating equipment in such a manner as to reduce the necessary operations in splitting, separating and sorting mica flakes.

Numerous other objects and advantages of the invention will be apparent as it is more fully understood from the following description which, taken in connection with the accompanying drawings, discloses a preferred embodiment of the invention.

Referring to the drawings:

Figure 1 is a vertical section taken through a mica treating apparatus including a mica splitter embodying my invention;

Figure 2 is an enlarged fragmentary view, partially in section, illustrating the operating portions of a mica splitter embodying my invention;

Figure 3 is a similar enlarged fragmentary view of a mica splitter embodying my invention;

Figure 4 is an enlarged view of the mica

splitting element of the mica treating apparatus illustrated in Figure 1;

Figure 5 is an enlarged view in vertical cross section illustrating the construction of the mica splitter element of the combination shown in Figure 1; and

Figure 6 is a vertical cross section taken substantially along the line 6—6 of Figure 1.

To illustrate my invention I have shown on the drawings a mica treating apparatus adapted to receive blocks of crude mica at one end, to delaminate the mica and to discharge the mica in the form of relatively thin flakes of approximately uniform thickness, at the other end. The apparatus includes a conveyor 11 which is mounted to travel around spaced rollers 12 and which is adapted to receive blocks of crude mica at one end, to carry the crude mica through a heating oven 13 and to discharge heated mica at its remote end, the heated mica being dropped upon a second conveyor 14. The conveyor 14 comprises a continuous screen carried around spaced rollers 15 and guide rollers 16 so arranged that the forward or receiving end of the conveyor is submerged in a quenching bath or soaking pit 17 into which the heated flakes are dropped by the conveyor 11. The conveyor 14 carries the heated and soaked mica from the soaking pit 17 and discharges it into a conveyor 18 which in turn carries the flakes to a mica splitter 19.

The splitter 19 comprises a device adapted to separate the heated and soaked mica into flakes by sliding the adjacent laminations of a block of mica relatively to each other in order to separate the laminations along their lines of cleavage. The heating operation puffs the mica and tends to separate the flakes along their lines of cleavage. The soaking operation allows a thin film of water to enter between adjacent laminations and by applying a force to the block, the constituent laminations thereof may be easily separated by sliding one upon the other without bending the individual flakes. After the mica has been so separated to its constituent laminations, the flakes are dropped upon a continuous conveyor 20 which is carried around spaced rollers 21 and guide rollers 22. This conveyor is arranged to carry the flakes through a drying oven 23 and to deposit the dried flakes through a hopper 24 into a housing 25. This housing encloses an elevator 26 into which the dried flakes are deposited. This elevator comprises an endless conveyor having a plurality of buckets therein, and is carried around spaced guide rollers 27. The conveyor 26 is arranged to raise the flakes through a tower or housing 28 extending upwardly of the housing 25 and to deposit the flakes into a bifurcated delivery chute 29, one mouth of which opens into a snowing machine of the type illustrated in my copending application, Serial No. 130,297, filed August

19, 1926, and which comprises a cylindrical tumbling drum 30 which is rotated by a motor 31 and which is mounted at the upper end of a snowing tower 32, the drum being journaled at one end in the sides of the tower and being supported at the other on rollers. The motor 31 is satisfactorily mounted upon a bracket secured to the end wall of the tower 32. The flakes are deposited into the tumbling drum which in the illustrated embodiment comprises a foraminated cylinder and which is adapted to snow the mica into the tower 32 in the form of a cloud of flakes which flutter downwardly through the tower under the influence of gravity. During their downward passage, the flakes are further agitated by means of kickers 33. These kickers comprise outwardly extending fingers carried on rods which are journaled for rotation in the end walls of the tower and which are rotated at a high rate of speed by means of a motor 34 and suitable interconnecting gears. The rotation of the rods and their extending fingers causes the fingers to come violently in contact with the majority of the flakes, which completes the separation of the constituent laminae where such separation has not been completely accomplished by the splitter 19. Below the kickers, the snowing tower 32 is provided with a lateral member 36 comprising a thin, flat sheet of material hinged at its upper end to a side wall of the tower and provided with means at its lower end to regulate its angularity with respect to the wall of the tower. The member 36 may be adjusted to direct the cloud of mica flakes toward the opposite side wall of the tower in which a suction roller 35 of a suction separator of the type illustrated and described in my copending application Serial No. 139,219, filed October 12, 1926, is arranged. In the illustrated embodiment the opposite wall of the conveyor is offset as at 40 to provide a bay 41, the vertical wall of which is apertured to receive the suction roller 35 which extends partially into the bay 41. The walls of the snowing tower 32 opposite the bay 41 are provided with a plurality of apertures 39 to facilitate the sorting action of the suction roller 35, these apertures allowing the ingress of currents of air whereby to agitate the cloud of flakes opposite the suction roller and to facilitate the removal of the lighter flakes. A continuous foraminated conveyor 37 is arranged to pass around the suction roller, being motivated by a prime mover 38. As the cloud of flakes flutters downwardly past the suction roller 35, the lighter flakes will be withdrawn laterally from the cloud and will adhere to the outer surface of the foraminated screen 37 and will be carried out of the tower by the movement of this screen, the heavier flakes falling downwardly into the housing 25 and onto the elevator 26 and being thereby redeposited through the delivery chute 29 into the

tumbling drum 30. In this manner the heavier flakes may be passed through the snowing device and suction separator several times in order that the thinnest flakes may be thoroughly sorted from the thicker flakes. After the mica has been thus repeatedly subjected to this sorting process, a shutter 42 in the bifurcated delivery chute 29 may be manually shifted to the dotted position shown in Figure 1 in order to deflect the mica through a dumping chute 43. This dumping chute discharges the mica directly onto a conveyor 44 which carries the mica to the forward or loading end of the mica treating apparatus and discharges the mica flakes upon the conveyor 11 whence they are carried through the heating oven 13, soaking pit 17, splitter 19, drying oven 23, and returned again to the sorting apparatus. In this way the heavier flakes may be again split until they are thin enough to be sorted out of the mica cloud by the suction roller 35.

The mica splitter 19 comprises a pair of spaced, substantially upright support members 47 between which rollers 45 and 46 are mounted. The rollers are carried on shafts, the opposite ends of which are journaled in bearings 48 formed in the uprights 47, and are arranged to roll one upon the other. The soaked mica is fed between these rollers and one roller is rotated more rapidly than the other with the result that the laminations of the mica blocks are fanned and in this manner separated. In the illustrated embodiment the uprights 47 are supported on a base or table 49 and the rollers 45 and 46 are formed with mica gripping peripheral surfaces 50. I prefer to surface the rollers 45 and 46 with rubberized canvas which is a most satisfactory mica gripping medium. Other suitable materials can of course be used.

The lower roller 46 is mounted permanently in position, the bearings 48 being fixed firmly in the support members. The support bearings for the upper roll are relatively movable so that the spacing between the rollers may be varied, and mounted in sliding members 51 carried on ways 50 formed in the support 47. Means for limiting the movement of the upper roller 45 away from the lower roller 46 and including a shaft 53 having threaded engagement with the upright 47 to allow for adjustment is provided and a spring 55 is interposed between the end of the threaded rod and the slide 51 so that the roller 45 is at all times resiliently urged to engage the lower roller 46, the screw shaft 53 allowing for the adjustment of the separation of the rollers, whereby mica blocks of varying thickness may be accommodated. A blowing nozzle 60 comprising an apertured pipe extending across the faces of the rollers 45 and 46 is supported by a bracket 59 formed in an upright 47 in po-

sition to direct a spray of fluid against the surfaces of the rollers in order to wash off any flakes of mica which may cling thereto.

The uprights 47 are also provided with integral brackets 56 adapted to support scrapers 57 in position against the surfaces of the rollers, the scrapers being for the purpose of scraping off the flakes and fluid deposited on the rollers by the nozzle 60. The uprights are also formed with projecting U-shaped brackets adapted to support stripping rolls 54 which are arranged to ride upon the rollers 45 and 46 and to remove moisture therefrom before the mica is fed to the rollers. The rollers 45 and 46 are driven by a prime mover 63 respectively by means of belts 61 and 62. The belt driving the roller 46 operates from a driving pulley of relatively small diameter to a driven pulley 64 of relatively large diameter where by the roller 46 is rotated at a relatively low peripheral velocity while the belt 61 driving the roller 45 operates between a driving pulley of relatively large diameter and a driven pulley 65 of relatively small diameter where by the upper roller 45 is driven at a relatively high peripheral velocity. The belts 61 and 62 are arranged to rotate the rollers in opposite directions, that is to say, viewing Figure 4, the lower pulley is normally driven in a clockwise direction while the upper pulley is driven in a counter-clockwise direction, as illustrated by the arrows.

The supporting base 49 on which the splitter is mounted, also carries the guide roller 21 for the receiving conveyors 20 on which the mica flakes are deposited after passing through the splitter. The conveyor 18 deposits mica flakes 66 (see Figure 5) into an inclined chute 67 which in turn deposits the mica directly between the rollers 45 and 46, the spacing of the rollers having been adjusted by means of the hand wheel and screw 53 so that the mica in passing between the rollers will be engaged at all times by the surfaces 50 thereof. The mica engaging surfaces 50 are formed of a suitable resilient material such as rubberized canvas or the like, so that a block of mica passing between the rollers will be subjected to a normal compressive force due to the resilient mounting of the roller 45 which is backed by the spring 55, to a tangential force exerted by the mica gripping surfaces 50 of the rollers because of the differing peripheral velocities at which the cooperating rollers are driven, it being understood that the lower roller 46 has a relatively low peripheral velocity while the upper roller is driven at relatively high speed. Figures 2 and 3 of the drawings illustrate respectively in cross section a block of mica entering the rollers and the same block of mica after having passed partially through the rollers. It will be apparent that the higher peripheral speed of the upper roll-

er coupled with the normal resilient compression will result in the flakes, comprising the laminations of the mica block, being moved relatively one over the other, that is to say, the mica will be separated along its planes of cleavage by the relative sliding movement of the adjacent flakes, the flakes of the block being consecutively stripped off by the action of the upper roller. It will also be apparent that such separation will be accomplished without materially bending the individual flakes and will be accomplished throughout the block, each lamination being displaced with respect to its adjacent laminations by an amount equal to the displacement of every other lamination of the block.

The preliminary heating and quenching operation whereby the mica blocks are thoroughly soaked so that a thin film of fluid may penetrate between the constituent laminations, is advantageous for the reason that the relative slipping between adjacent mica flakes is assisted materially by the presence of such a film of fluid.

It is thought that the invention and numerous of its attendant advantages will be understood from the foregoing description, and it will be apparent that numerous changes may be made in the form, construction and arrangement of the various parts without departing from the spirit and scope of the invention or sacrificing any of its material advantages, the form hereinbefore described being merely of a preferred embodiment.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In a mica splitter, a pair of spaced apart cooperating rollers adapted to frictionally engage the opposed faces of a mica block, means for rotating one of the rollers at a higher peripheral speed than the other, means for soaking mica in a suitable lubricant, means for feeding the soaked mica between said rollers, means for adjusting the spacing of said rollers and means to remove mica from the surface of a roller.

2. In a mica splitter, a pair of spaced cooperating rollers having mica gripping surfaces adapted to frictionally engage the opposed faces of a mica block, means for feeding mica between the rollers, and means for removing the mica from the surfaces of the rollers.

3. In a mica splitter, a frame, spaced rollers having mica gripping surfaces carried by said frame in position to frictionally engage the opposed faces of a mica block fed therebetween, means for rotating said rollers so that one has a higher peripheral speed than the other, means for feeding mica between said rollers, and means comprising a nozzle mounted in said frame for directing

an air blast upon said rollers to remove mica therefrom.

4. In a mica splitter, a frame, spaced rollers having mica gripping surfaces carried by said frame in position to frictionally engage the opposed faces of a mica block fed therebetween, means for rotating said rollers so that one has a higher peripheral speed than the other, means for feeding mica between said rollers, and means comprising scrapers carried by said frame for removing mica from said rollers.

5. In a mica splitter, a pair of spaced apart cooperating rollers adapted to frictionally engage the opposed faces of a mica block, means for rotating said rollers at unequal speeds, means for feeding mica between the rollers, means for adjusting the spacing of the rollers, and means for removing mica from the surfaces of the rollers.

6. In a mica splitter, a pair of spaced apart cooperating rollers adapted to frictionally engage the opposed faces of a block of mica, means for rotating one of the rollers at a higher peripheral speed than the other, means for moistening mica, means for feeding the moistened mica between said rollers whereby to separate the laminations by relative sliding and means to remove mica from the surface of a said roller.

7. In a mica splitter, a pair of spaced cooperating rollers having mica gripping surfaces adapted to frictionally engage the opposed faces of a mica block, means for soaking mica, means for feeding the soaked mica between the rollers, whereby to separate the laminations thereof by relative sliding and means for removing mica from the surface of a feed roller.

8. In a mica splitter, a pair of spaced apart co-operating rollers adapted to frictionally engage the opposed faces of a mica block, means for rotating one of the rollers at a higher peripheral speed than the other, means for soaking mica, means for feeding the soaked mica between the rollers, and means for resiliently pressing the rollers on the mica whereby the constituent laminations of the soaked mica blocks may be separated by relative sliding induced therein by the difference in the peripheral speeds of the co-operating friction rollers and means for removing soaked mica flakes from the surface of a said roller.

9. In a mica splitter, a pair of spaced apart co-operating rollers adapted to frictionally engage the opposed faces of a mica block, means for rotating one of the rollers at a higher peripheral speed than the other, means for soaking mica, means for feeding the soaked mica between the rollers, and means for resiliently pressing the rollers on the mica whereby the constituent laminations of the soaked mica blocks may be separated by relative sliding induced therein by the difference

in the peripheral speeds of the co-operating friction rollers, and scraper means for removing soaked mica laminations from the surfaces of the rollers.

5 10. In a mica splitter, a pair of spaced apart co-operating rollers in vertical offset relationship and adapted to frictionally engage the opposed faces of a mica block, means for rotating one of the rollers at a higher
10 peripheral speed than the other, means for feeding mica between said rollers and means for resiliently pressing the rollers toward each other, said rollers being in vertically offset relationship to facilitate the feeding of
15 the mica there-between.

11. In a mica splitter, a pair of spaced apart co-operating rollers having surfaces adapted to frictionally engage the opposed faces of a mica block, means for rotating one
20 of the rollers at a higher peripheral speed than the other, means for feeding mica flakes between said rollers and spring means for normally urging said rollers together, the axes of said rollers lying in a non-vertical
25 plane whereby to facilitate the delivery of mica between the rollers.

12. In a mica splitter, a pair of spaced apart co-operating rollers adapted to frictionally engage the opposed faces of a mica
30 block, means to rotate one of the rollers at a higher peripheral speed than the other, a moistening station, means for sequentially feeding mica through said moistening station and then between said rollers, the axes of
35 said rollers being vertically offset and extending in a common non-vertical plane whereby to facilitate the delivery of mica between the rollers and means for resiliently pressing the rollers toward each other whereby the laminations of mica may be separated by resiliently sliding therebetween.
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In witness whereof, I have hereunto subscribed my name.

45 LOUIS T. FREDERICK.

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