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F. C. ATWOOD

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METHOD FOR PRODUCING MICA PRODUCTS

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Fig. 1.

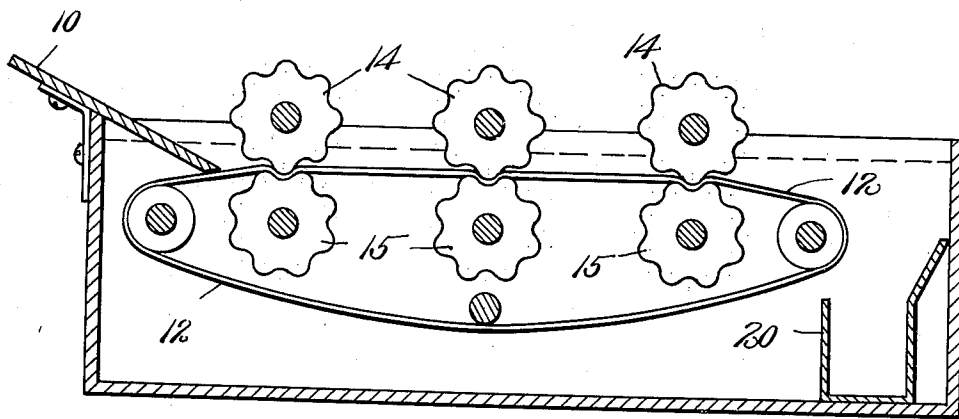


Fig. 2.

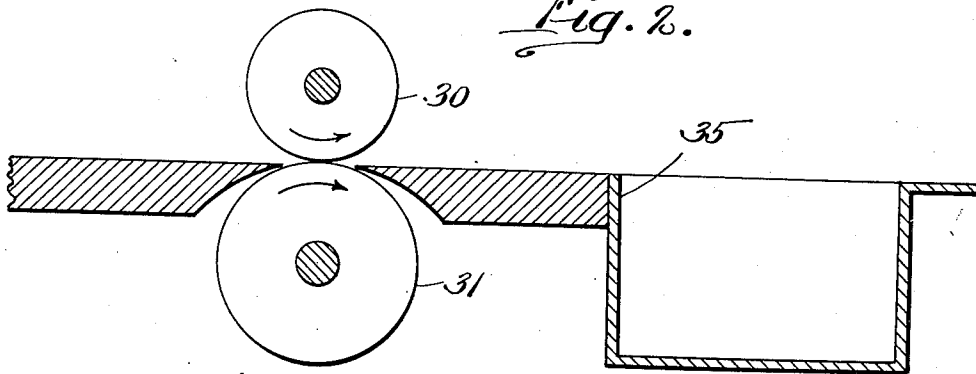
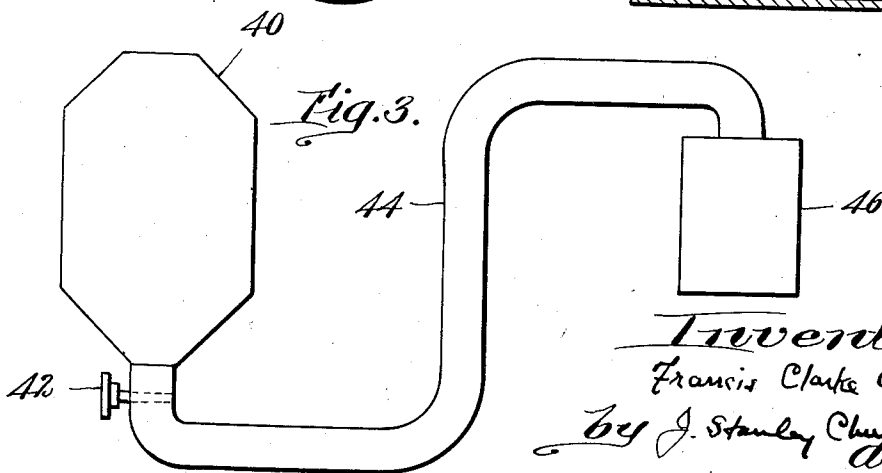


Fig. 3.



Inventor.
Francis Clarke Atwood
by J. Stanley Churchill
att'y.

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METHOD FOR PRODUCING MICA
PRODUCTS

Francis Clarke Atwood, Newton, Mass.

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3 Claims. (Cl. 154—2.6)

This invention relates to mica products and to methods and apparatus for producing the same.

In general the object of the invention is to produce various novel and highly useful mica products and to provide novel and efficient methods of and apparatus for the production of the same.

With this general object in view, and such others as may hereinafter appear, the invention consists in the products, methods and apparatus hereinafter described and particularly defined at the end of the specification.

In the drawing, Fig. 1 illustrates one form of apparatus suitable for use in flexing mica under water; Fig. 2 illustrates one form of apparatus suitable for separating the mica into thin laminations; and Fig. 3 is a diagrammatic view illustrating known apparatus which may be used in producing improved comminuted mica products.

The insulating qualities of mica as well as other characteristics of the same render it particularly useful for various industrial purposes, and in converting the natural mica into a form in which it may be suitable for the various industrial purposes, the following procedure is followed at the present time. The mica is mined and taken from the ground in relatively large sheets or lumps. During the mining operation difficulty is experienced in obtaining all of the mica in large sheets or lumps, and the mined material is next sorted to select from the cruder material the larger pieces and the clearer and more transparent pieces. The larger sheets of mica command the largest market price and the price of the remaining sizes range down to approximately twenty dollars a ton for the smaller scrap pieces. At the present time certain thicknesses and sizes of sheets are used as a raw material from which washers, bushings and other specially designed articles may be stamped. These articles are used largely for electrical insulating purposes. All of this work of sorting the mined mica is done by hand and in this country there is a limit to the amount of effort which may be economically put into the separation of the mica.

At the present time there is gradually coming more and more into use, fabricated mica composed of small pieces of mica welded or adhesively affixed together with quick drying varnishes, shellac, or similar binders. Such sheets are used for the manufacture of various articles including lamp shades and for other decorative purposes. A certain amount of this fabricated mica is used in the industries. In manufacturing the fabricated mica, small pieces of mica are manually adhesively affixed together, utilizing the

above-mentioned binders to gradually build up a sheet of mica of the desired thickness and area. In this country labor is too expensive to produce the small particles of mica necessary for this purpose, and such pieces are produced mostly in India where labor is only a few cents a day and the laborer can sit down with a knife and gradually laminate the piece of mica to produce the small thin pieces desired and to sort out pieces approximately the size of a half dollar or quarter. Pieces larger than this go into the manufacture of the more expensive materials for electrical work and for other industrial purposes.

In addition to the foregoing procedure, various machines have heretofore been proposed for splitting or laminating scrap mica. Some of these machines have been used to split mica into laminations of a thickness substantially that obtainable by hand methods, and which in practice approximate one thousandth of an inch and never below one half a thousandth of an inch. During the splitting operation, the individual laminations are broken down so that the area of the finished laminated pieces or flakes is for the most part relatively small.

I have discovered a novel and highly useful method by which mica may be laminated to produce extremely thin laminations and which at the same time enables the production of flakes, pieces or sheets of substantial area. This method and some of the steps thereof and the laminated product as well as the intermediate products, form a basis from which a number of novel mica compositions and products may be produced having considerable value and utility as will be pointed out.

I have discovered that mica may be successfully laminated by the following treatment. I start with a body of natural mica, and in practice I prefer to utilize the so-called scrap mica which at the present time cannot be worked economically by hand in this country and is used only for grinding down to fine meshes to be sold as ground mica. The body of mica is first subjected to treatment to introduce a lubricant between the laminations or natural crystals making up the body, and I have discovered that if a body of mica be flexed or worked in the presence of a fluid such as water, the water gradually works in between the flakes or laminations of the mica, and if this operation is continued for a sufficient period of time the water may be made to work in between the ultimate laminations of the mica. As the water works in between the laminations or crystals of the mica, it

will be found that the body of mica assumes great flexibility and that the water comprises a lubricant, destroying the adhesion of one crystal to another, and placing the mica in such a condition that the superposed crystals may be readily separated by hand or by suitable mechanical means. The extent to which the water is worked in between the crystals of the mica controls the extent to which the subsequent separation of the laminae may be accomplished, and by working the mica back and forth for a sufficient period of time, it is possible to obtain a separation of the mica laminae to produce flakes or pieces of substantial area and extreme thinness, a result which has never been heretofore attained as far as I am aware.

The body of mica with the fluid lubricant between the laminations or crystals thereof comprises a novel and extremely useful product which lends itself for use as a basis for the production of mica in different forms for various purposes. If such a body of mica with the fluid lubricant between the laminations thereof be subjected to high pressure and heat within a closed container in such a way that the body of the lubricant is heated up to a point where, when the pressure is suddenly released, the lubricant vaporizes with explosive violence, then the body of mica is transformed into particles of characteristic thinness and resembling small flakes. This method of producing comminuted mica is economical and operates to produce a product which is extremely useful in the production of plastic materials for wall surfacings, floors, and other uses where comminuted mica is employed, and its extreme thinness and flake-like shape serves to impart to such articles novel and characteristic qualities.

The mica product with the water between the laminations thereof may be treated to produce pieces or flakes of mica of extreme thinness and of substantial area. I have discovered that if scrap mica is flexed under water to work the water in between the laminations thereof, the product thus produced may, if desired, be separated into the ultimate laminations or crystals of the mica by relatively moving one lamination with relation to another. This can be accomplished by running the mica body through rolls, one of which is rotated at a greater speed than the other, or by other mechanical means for imparting a sliding motion to one lamination of the mica. As a result of this process it is possible to produce extremely thin pieces or flakes of mica of a substantial area, and these when dried find use for various purposes.

In the drawing I have illustrated one form of apparatus which may be used in practicing the present method, and referring to the drawing the mica scrap or other sheet mica comprising the source from which the present products are to be formed may be fed down the inclined feed chute 10 onto a rubber conveyor 12 by which the successive mica sheets are successively conveyed between a plurality of flexing rolls 14, 15, and by which each mica sheet is flexed. The rolls 14, 15 are located within a tank 16 which is filled with liquid, preferably water, to the level indicated, so that the mica sheets are flexed under water thus, as above described, causing the water to work in between the laminations. The mica sheets may be delivered by the conveyor 12 into a suitable receptacle conventionally shown at 20 in Fig. 1.

After the mica sheets have been subjected to the described treatment to work in the water be-

tween the laminations of the same, the sheets may be passed between a pair of separating rolls 30, 31, the upper of which is preferably rotated at slightly increased speed so as to gradually comb off the uppermost laminations from the sheet. It has been found experimentally that this treatment results in the movement of the laminations with respect to one another rendered possible by the interposed fluid between the laminations so that when the sheet is subjected to submersion in a tank of water as at 35, the sheet may be separated by hand into extremely thin laminations.

In producing a novel comminuted mica product as above described, the sheet of mica in the condition in which it is received within the receptacle 20 in Fig. 1 may be loaded into the usual form of apparatus now used for exploding materials such as fiber and the like, and which is diagrammatically illustrated in Fig. 3. Such apparatus comprises a pressure chamber 40 within which the mica sheets with the water between the laminations are subjected to heat and pressure as by steam pressure, and then the outlet valve 42 is suddenly opened, releasing the pressure and enabling the mica sheet to be exploded by the steam formed within the laminations, producing a comminuted flake product which may be passed through the outlet pipe 44 and collected in the usual form of collector 46 now used in the manufacture of these exploded materials.

It has heretofore been impossible by any of the known practical methods of which I am aware to produce flakes or pieces of mica of a thinness below one half thousandth of an inch, and at the same time to preserve any substantial area to the mica flake or piece, but the present process enables mica flakes or sheets of extreme thinness to be produced, and I have found that it is possible to produce flakes of mica having an area of at least one square inch, and of a thickness below one-half thousandth of an inch. In fact any degree of thinness seems to be obtainable in the mica flakes by the operation of the present process, and for some purposes it may be desirable to carry the separation of the mica laminations to produce extremely thin mica flakes, and for other purposes to terminate the separating process with the flakes of material thickness.

In addition to the above described process of involving the exploding of the body of mica containing the lubricant, I have discovered that a process involving the separation as above described of the scrap mica into thin laminations may be utilized with advantage in the production of comminuted mica flakes by either grinding the thin mica flakes or subjecting them to the action of cutting knives in a suitable machine.

For some industrial purposes it is desirable to produce a fabricated mica sheet, and in accordance with the present invention such a sheet may be advantageously produced by incorporating in the water used as a lubricant in the above described laminating process, a sufficient binder, such as casein, so that as the thin laminations are produced they may be rolled or pulled out into sheet form and subjected to pressure with the flakes or crystals in partial overlapping relation, thus producing a fabricated sheet when the binder has become set. This process is simple, economical, and lends itself to the production of inexpensive fabricated mica sheets. As a wall covering, fabricated sheets produced in this manner may be used to be adhesively affixed to the wall to provide the same with a moisture-proof surface and one having an attractive decor-

ative appearance. Instead of the preliminary production of the fabricated sheets, it is possible to utilize small flakes produced by comminuting the thin laminations of mica as a paint. The thin flakes of mica in overlapping relation upon the surface to be painted produce a moisture-proof film which is unaffected by the paint vehicle and which can be used for painting all sorts of surfaces where moisture-proofing is the desirable factor. In addition to its use as a paint, the thin mica flakes may be used when incorporated with a suitable binder such as nitro-cellulose, casein, asphalt or any other similar material to produce a very smooth, tough, resilient and elastic surface. This can be used as a floor covering or a roofing and for other purposes.

The subject matter of this application has been disclosed in my Patent No. 1,829,031, granted October 27, 1931 on application Ser. No. 293,024, filed July 16, 1928.

Having thus described the invention, what is claimed is:—

1. The method of making a fabricated sheet of mica which consists in flexing a body of mica in

a bath of water containing an adhesive, whereby the water and adhesive is caused to work in between the laminations of the mica, then separating the laminations of the mica to form thin sheets of mica, and thereafter spreading the sheets thus formed in partial overlapping relation to form the fabricated sheet.

2. The method of producing a fabricated mica sheet which consists in flexing a body of mica in the presence of a fluid lubricant containing an adhesive, separating the crystals of the mica, and assembling the separated crystals in overlapping relation to form the mica sheet, and thereafter permitting the adhesive to harden.

3. A method of making a fabricated mica sheet which consists in flexing mica in the presence of an adhesive fluid to cause the fluid to work in between laminations thereof, relatively moving one lamination with relation to another to spread the laminations into sheet form, and thereafter permitting the fluid to become set to affix the laminations together.

FRANCIS CLARKE ATWOOD.