Dec. 15, 1953 I. J. NOVAK 2,662,639

REMOVAL OF MAGNETITE FROM ASBESTOS

Filed May 28, 1949

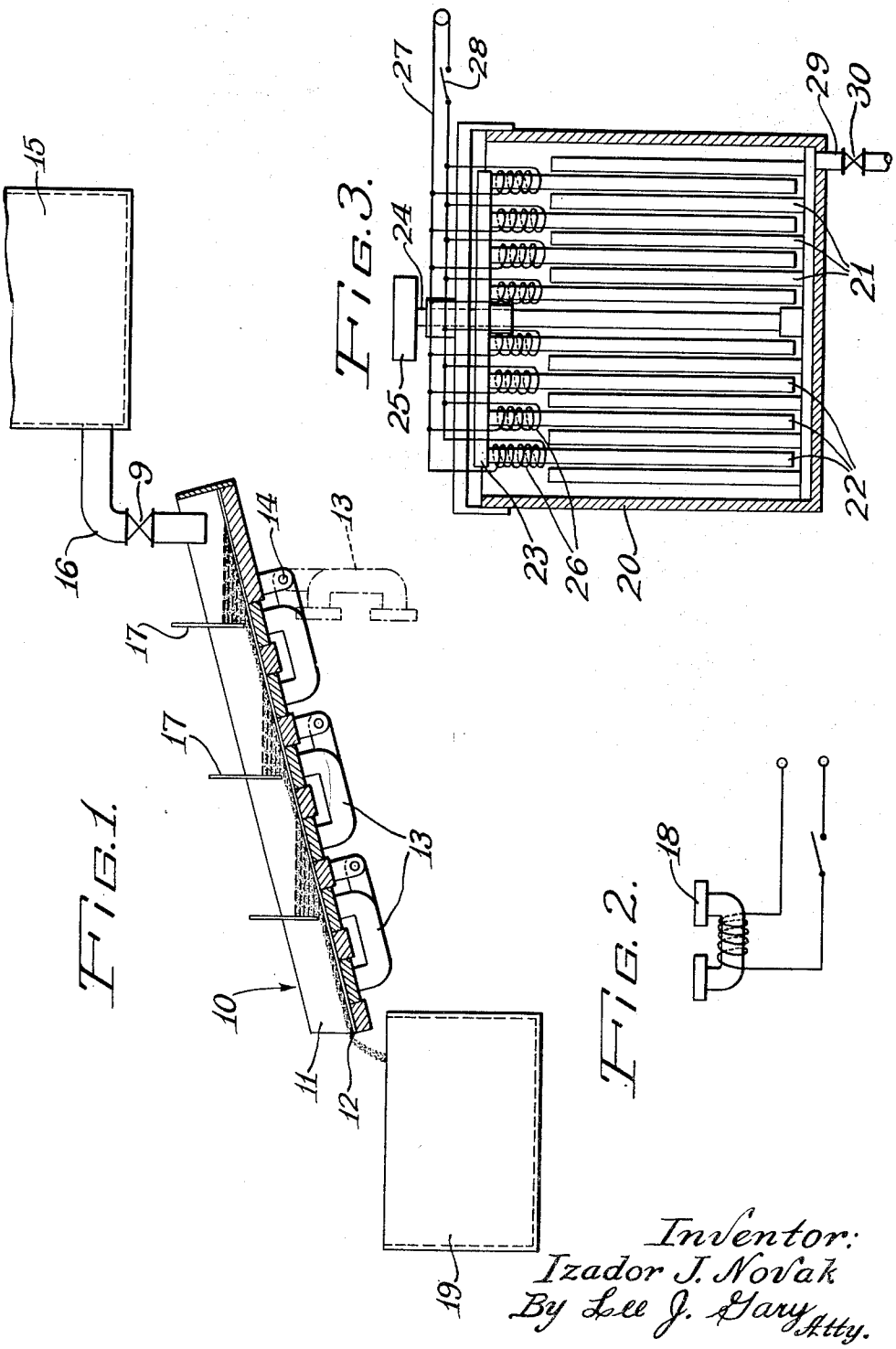


FIG. 1.

FIG. 3.

FIG. 2.

Inventor:
Izador J. Novak
By Lee J. Gary Atty.

Patented Dec. 15, 1953

2,662,639

UNITED STATES PATENT OFFICE

2,662,639

REMOVAL OF MAGNETITE FROM ASBESTOS

Izador J. Novak, Trumbull, Conn., assignor to Raybestos-Manhattan, Inc., Passaic, N. J., a corporation of New Jersey

Application May 28, 1949, Serial No. 96,061

2 Claims. (Cl. 209—2)

1

This invention relates to a novel method for removal of magnetic iron oxide, i. e. magnetite, from chrysotile asbestos without impairing the quality and fabricating properties of the asbestos fibers.

It is known to remove portions of concomitant magnetite from asbestos by such methods as passing lumps of fiber in crude or rock form over magnetic belt separators; subjecting mechanically fiberized material to vibratory screening to screen out magnetite particles from the asbestos fibers; subjecting fiberized asbestos to agitation by means of air blasts whereby heavier particles of magnetite settle out by gravity, or doing the same with the aid of magnets; and the like. Flotation processes employing water or other liquids for settling out magnetite and other mineral impurities have also been suggested. It is recognized in the art, however, that considerable magnetite remains as particles adhering to the asbestos fibers and which cannot be removed by the foregoing methods. Chemical methods have also been suggested by these alter and damage the fiber.

It is an object of the present invention to substantially free asbestos of magnetite, and to largely remove same or residual particles thereof remaining in asbestos agglomerates, including mechanically fiberized or commercial mill fiber which may previously have been subjected to magnetic, gravity or the like processes for separation of magnetite, whereby fabrics of felted, woven or extruded asbestos of greatly improved dielectric strength may be produced.

Further objects relate to the improvement in physical character of asbestos products resulting from the removal of naturally concomitant magnetite and to the improvement in color character resulting from the removal of this dark-colored material.

In general, I accomplish the objects of the present invention by first making a stable, dilute (i. e. from about .1% to about 1%) aqueous dispersion of asbestos by means of an asbestos dispersing agent, as described in my co-pending application, Serial No. 66,552, filed December 21, 1948, now Patent 2,626,213, and then bringing the dispersion into contact with magnetic means, or subjecting it to the influence of a magnetic field which magnetically separates particles of magnetite from the asbestos.

The accompanying drawings diagrammatically illustrate means for magnetically removing magnetite from dilute asbestos dispersions.

Fig. 1 diagrammatically illustrates an elevation partly in section of an arrangement of apparatus provided with permanent magnets for continuously removing magnetite from a stream of dispersed asbestos.

2

Fig. 2 diagrammatically illustrates an electromagnet which may be employed in the apparatus of Fig. 1 in place of the permanent magnets.

Fig. 3 diagrammatically illustrates an elevation partly in section of a stirring vessel provided with magnetized stirring rods for accomplishing the objectives of the present invention.

As more fully described in my aforesaid co-pending application, microscopic bundles or agglomerates of asbestos (which terms are intended to include mechanically fiberized asbestos) are subjected to mild mechanical action, such as, for example, stirring or agitation by means of the apparatus illustrated in Fig. 3, while immersed in water containing an organic detergent surface-active material adsorbable on the asbestos and capable of forming an alkaline dispersion therewith, the amount of detergent being in excess of that adsorbed on the asbestos and sufficient to form and preserve or maintain the dispersion in a stable manner. Typical examples of such dispersing agents are Aerosol OT (dioctyl sodium sulfosuccinate), sodium oleate, and others more fully particularized in my said co-pending application. Treatment of the asbestos in this manner causes separation, individualization, dissemination and unclotting of the asbestos fibers, and converts them to single fibers or fascicular fiber bundles instead of the predominantly clotted and tangled multiple fiber groups known to prior wet or dry asbestos practice. The fibers in such dispersion are in a lubricated, slippery relatively slidable condition and composed predominantly of asbestos fibers of "unit size," or "fibro-colloidal diameter," that is, of a diameter of from about 200 to about 500 Ångstrom units.

The following is one example of a typical method for producing an asbestos dispersion in dilute condition suitable for subsequent magnetic removal of magnetite: To 1000 gallons of water were added 312 pounds of 25% Aerosol OT in water and dissolved. Then 212 pounds of Canadian 3R spinning grade chrysotile asbestos were added, which on stirring produced a smooth slurry of 2½% asbestos concentration. This was further diluted by adding water slowly in the volume proportion of 9 parts of the 2½% slurry to 47 parts water. This produced a ⅜% dispersion on mixing for four hours, of the character previously described.

Treatment of the asbestos in this manner not

only dispersed and individualized the asbestos fibers, but freed previously occluded and entangled non-fibrous associated impurities such as serpentine fragments and magnetite. The dispersion was thereafter subjected to screening in accordance with my co-pending application, Serial No. 96,062 filed May 28, 1949, for removal of such impurities and considerable magnetite was thus removed. However, fine particles of magnetite still passed through the screen, either in free condition or attached to small bits and fragments of the resulting fine fibers. A characteristic form is a grain of magnetite at the apex of a brush or fan of opened fiber.

The dispersion was then subjected to the influence of a magnetic field, as will be hereinafter described, although it will be understood that the aforesaid screening is not essential to the practice of the present invention, and if desired the screening may be resorted to after magnetic removal of magnetite for removal of remaining non-magnetic impurities, over-sized fiber clots, etc.

Thus, reference to Fig. 1 of the accompanying drawings illustrates an inclined sluice **10** composed of non-magnetic material, comprising a base **12** and side walls **11**. Against the underside of the base **12** of this sluice, there is mounted a plurality of permanent magnets **13**. These magnets are preferably pivotally mounted as at **14** so that they may be moved out of active position against the sluice, for the purpose of periodic cleaning as shown by the dotted position of the first magnet. In operative position, the poles of the magnets are held locked against the sluice by suitable means (not shown). The dilute asbestos dispersion is supplied to the sluice from the supply chest **15** through the conduit **16**, and the flow may be controlled by suitable valve means 9. Flow of the dispersion over the sluice **10** is further controlled by means of the slices **17** so that all of the material on the sluice will come within a small distance, say ¼ inch, or less, from the magnets and well within the magnetic field of these magnets. By means of these controls, all portions of the dispersion are held within the magnetic flux long enough so that the magnetite particles which have been separated from the non-magnetic fiber by the dispersing agent have time enough to fall towards the magnets and be retained within the field while the non-magnetic fibers pass on and away.

Employment may be made of either electromagnets or permanent magnets, the latter being preferable because of their space-saving and easier maintenance qualities. Fig. 2 diagrammatically illustrates an electromagnet **18** which may be employed in place of the permanent magnets **13** of Fig. 1. The magnetite particles are removed at intervals or continuously by known means so as to maintain the effectiveness of the collecting surface.

The purified slurry may be collected in the vessel **19** substantially free of magnetite, and the separated magnetite particles may be periodically cleaned from the sluice in any suitable manner. It will be found that although many of these magnetite particles are free, a portion have attached to them fine fibrous asbestos.

Fig. 3 illustrates a mixing tank **20** which may be the one employed for making the final ⅜% slurry indicated in the foregoing illustrative example. This tank is provided with a plurality of stationary baffle bars **21** secured adjacent the bottom of the tank, and a plurality of stirrer rods **22** secured to the agitator cross arm **23** and rotatable therewith through the shaft **24** and drive pulley **25**. The upper end portions of the stirrer rods **22** are provided with magnetic coils **26** connected in parallel to the line **27** controlled by the switch **28**. In this manner, particles of magnetite may be segregated from the slurry while the dispersion is being made by energizing the magnetic coils **26** and causing the stirrer rods **22** to become magnetized. The asbestos dispersion may then be discharged through outlet **29** and valve **30** and the collected particles of magnetite cleaned from the stirrer rods **22** in any suitable manner. As an aid in such removal, the current may be temporarily shut off in the line **27**.

By this means, chrysotile having an (Fe, Al) content of 7% has been reduced to an (Fe, Al) content of 3%, the difference being Fe removed as black magnetic iron oxide. In so doing, the color of the asbestos changed from the characteristic gray of Canadian chrysotile to the amber of African chrysotile which is known to have very little magnetite. The iron content remaining is not magnetic iron, but a constituent of the asbestos molecule itself.

This asbestos dispersion, which is now free or substantially free of magnetite is eminently suitable for fabrication into products useful for electrical insulation, and may be sheeted out on a paper-making machine and converted into electrical insulation tapes; thin webs thereof may be converted into yarn in accordance with the co-pending application of Novak and Palm, Serial No. 90,238, filed April 28, 1948, now Patent 2,578,941, and the yarn employed for braided or woven electrical insulation; or the dilute refined slurry may be concentrated and employed for electrical insulation by extruding about wires in accordance with my co-pending application, Serial No. 85,187, filed April 2, 1949.

Although I have shown and described several devices or arrangements of apparatus of magnetically removing magnetite from a stable asbestos dispersion, it will be understood that other related and modified arrangements of apparatus may be employed within the scope of my invention.

I claim as my invention:

1. The method of treating chrysotile fibrous asbestos agglomerates to segregate therefrom normally occluded and entangled associated magnetite particle content which comprises, mixing said asbestos with an aqueous solution of organic chrysotile asbestos colloidizing agent effective to (*a*) subdivide them into fibrils of colloidal size and to saturate the fibril surfaces with and to deposit thereon an adsorbed layer of said agent (*b*) and to colloidally disperse said saturated fibrils, and then subjecting said dispersion at a concentration of from about 0.1% to about 1.0% by weight of asbestos to magnetic separation to withdraw the magnetite particles therefrom.

2. The method of segregating normally occluded and entangled associated magnetite particles in fibrous chrysotile asbestos which comprises opening chrysotile asbestos agglomerates and colloidally dispersing the resultant fibers, by combing said agglomerates with an aqueous liquid containing organic chrysotile asbestos colloidizing agent adsorbable on the asbestos and capable of forming an alkaline dispersion therewith, the amount of agent being in excess of that adsorbable on the asbestos and providing an added colloidal dispersion forming and maintaining in-

crement, and mixing said components to bring them into intimate contact until the fiber surfaces become saturated with an adsorbed film of said agent whereby the agglomerates are subdivided into colloidally fine fibers and a colloidal dispersion of said fine fibers is formed, and intimately contacting said dispersion at a concentration of from about 0.1% to about 1.0% by weight of said asbestos, with a surface maintained within a magnetic field to segregate particles of magnetite from said dispersion and to collect them on said surface.

IZADOR J. NOVAK.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
393,348	Atkins	Nov. 27, 1888
461,579	Johns	Oct. 20, 1891
1,214,817	Osgood	Feb. 6, 1917
1,907,616	Tucker	May 9, 1933
2,072,907	Rowland	Mar. 9, 1937
2,423,314	Herkenhoff	July 1, 1947
2,500,154	Crockett	Mar. 14, 1950