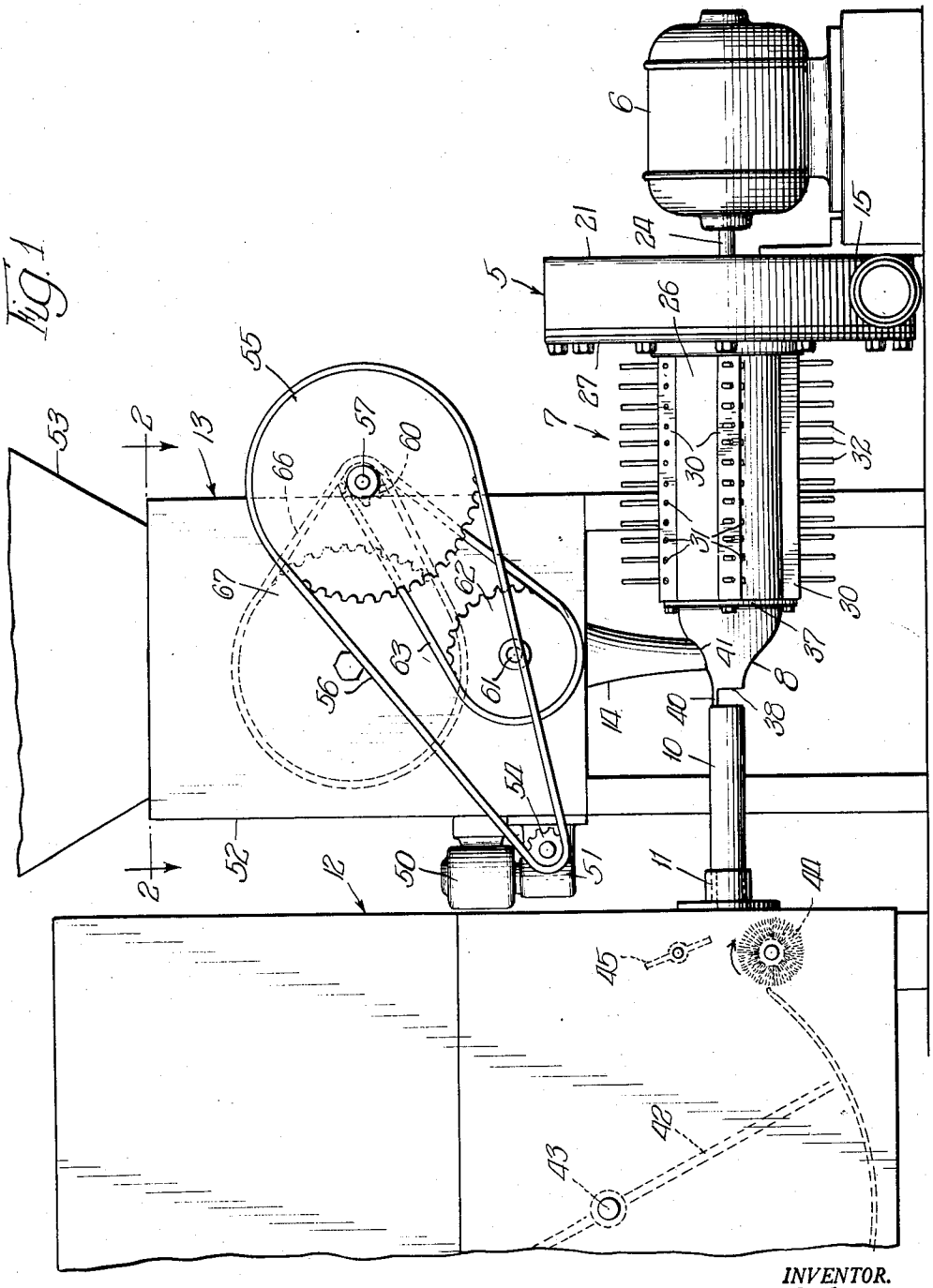
Oct. 27, 1959 E. J. FISHER 2,910,250

COMBINATION EXFOLIATOR AND BLOWER

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Fig. 1




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COMBINATION EXFOLIATOR AND BLOWER

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Fig. 1.

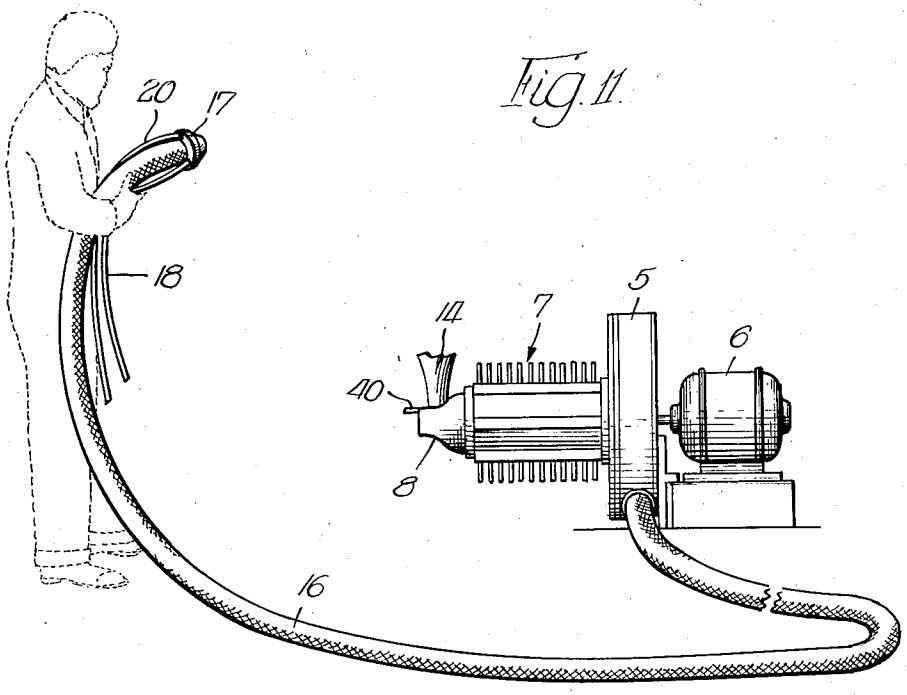
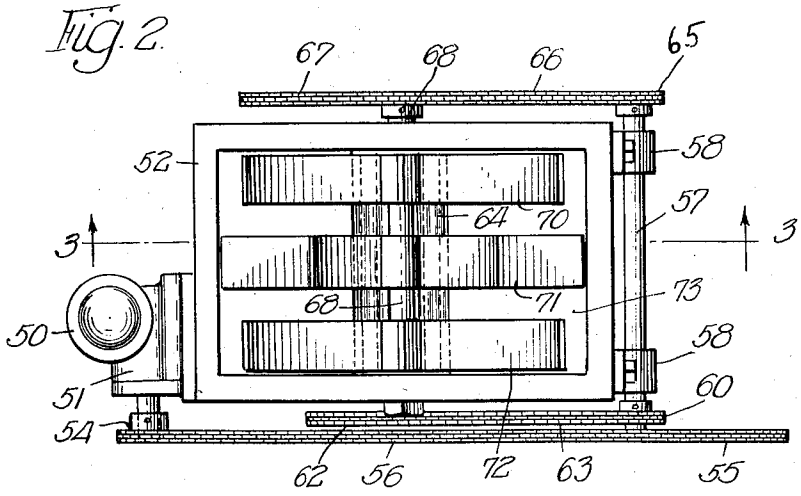



Fig. 2.




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Fig. 3

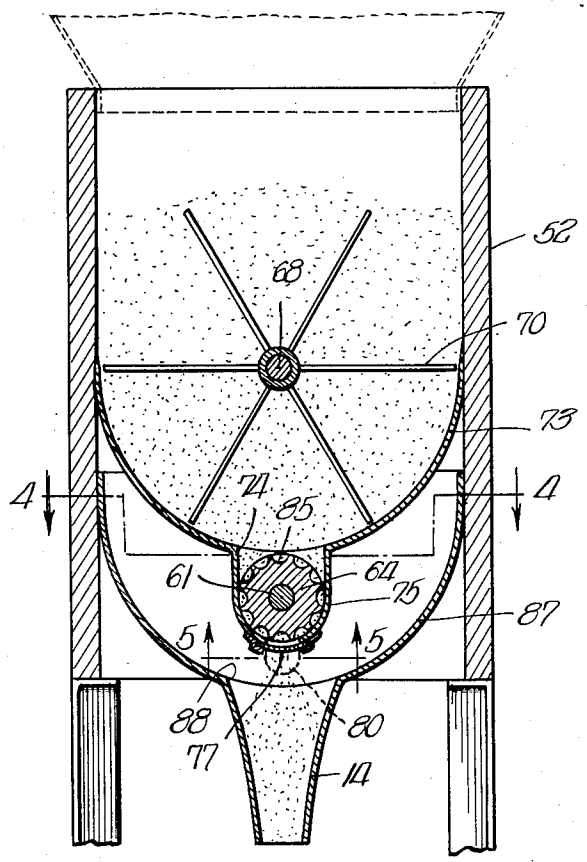



Fig. 4

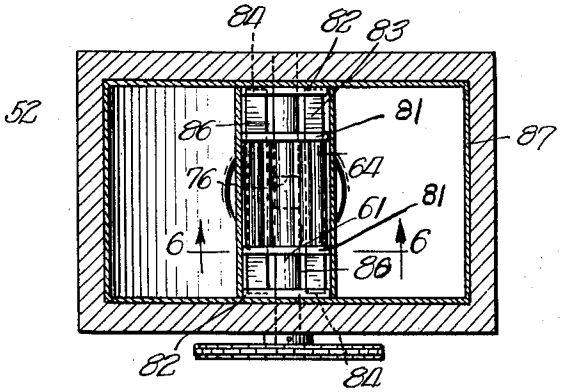



Fig. 5

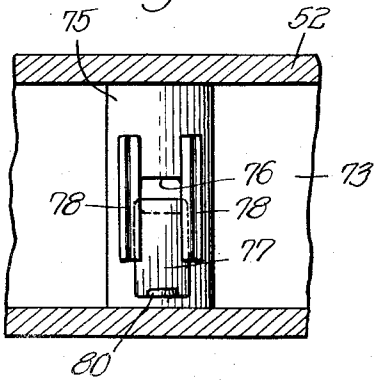
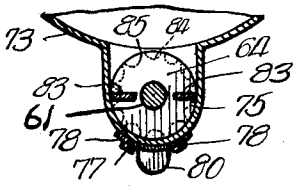



Fig. 6




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Fig. 7

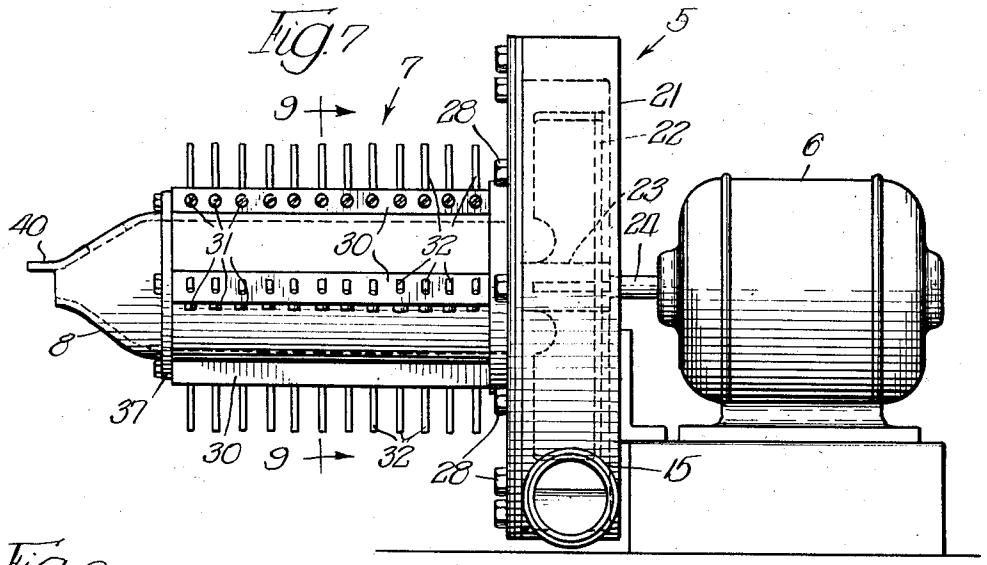



Fig. 8

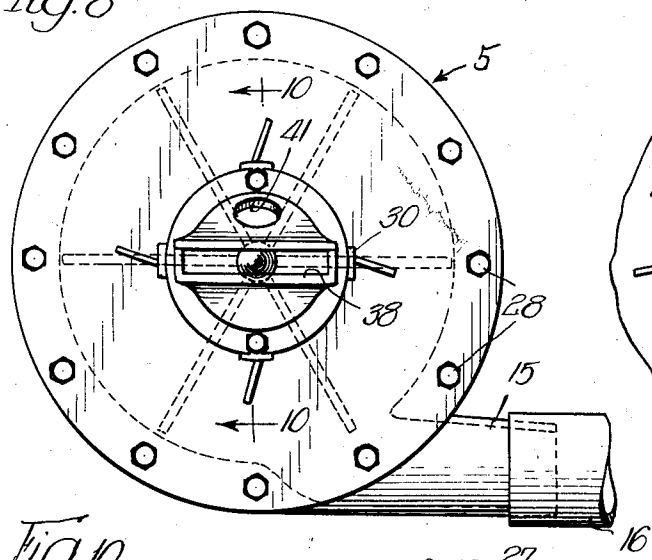



Fig. 9

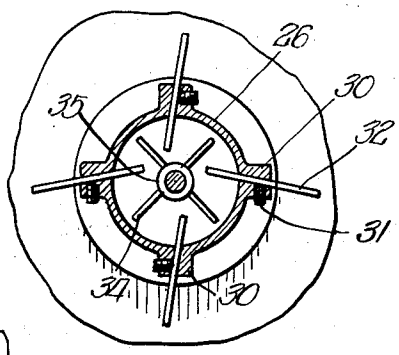
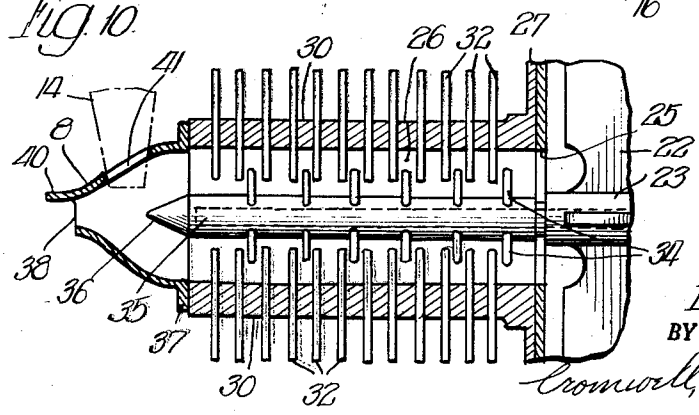



Fig. 10




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2,910,250

# COMBINATION EXFOLIATOR AND BLOWER

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Application January 4, 1955, Serial No. 479,781

7 Claims. (Cl. 241—101)

This invention relates, generally, to apparatus or machinery for simultaneously feeding pieces of a fibrous material such as asbestos, and a powdered material such as cement, into a blower from which a blended mixture of the exfoliated fibrous material and the powdered material is discharged. The invention relates more particularly to innovations and improvements in a draft-proof feeder device for accurately feeding a powdered material such as cement out of a hopper through a discharge spout and to innovations and improvements in a device for exfoliating or shredding a fibrous material such as asbestos into its individual fibers.

The invention has particular utility in connection with a ctntrifugal blower used to deliver dry insulating material in fibrous, shredded or other subdivided form to a spray gun by which it may be applied by means of adhesive onto walls, roofs, floors, or other surfaces to be provided with thermal and/or acoustical insulation. This general method or technique of applying and building up mats or coatings of insulation on surfaces is disclosed, for example, in Patents Nos. 1,718,507, 1,888,841 and 2,179,679 to Wenzel, et al., Patent No.2,837,422, to Fix, and Patent No. 1,978,125 to Bennett.

Asbestos provides one of the best insulating materials for forming mats of sprayed-on insulation. It occurs naturally in various deposits and is mined in large pieces which are crushed or otherwise subdivided. The individual pieces of asbestos are composed of densely compacted fibres. Both from the standpoint of economy of material used and the quality of the insulation obtained, it is desirable that the individual clumps of asbestos be exfoliated or opened up as much as possible into the individual fibres prior to being blown onto a wall or other surface so as to become part of a layer or mat of insulation.

An important object of the present invention is the provision of a feeding attachment adapted to be secured to the side of a blower housing and over the central inlet opening therein so as to serve as an exfoliator for exfoliating and shredding pieces of asbestos as they are sucked into the blower. The asbestos may be fed alone or it may be fed along with other fibrous material such as shredded paper, corn husks and like materials.

In certain applications of sprayed-on insulation of the general character disclosed and described in the aforementioned patents, it is desired to incorporate a powdered material such as cement. For example, when such sprayed-on insulation is being applied under winter conditions in unheated buildings, or in buildings where there is excessive dampness such as in mushroom cellars, it is advantageous to incorporate a material such as cement in the sprayed-on insulation so as to properly set up the mat or layer of insulation on the walls or ceilings, even though the drying conditions for the adhesive binder may be extremely slow.

One of the objects of the invention is the improvement in the process of spraying on insulation onto walls or other surfaces wherein a powdered material such as cement is incorporated or blended into the sprayed-on insulation so as to bring about rapid and uniform setting-up of the layers and mats of insulation.



Another object of the invention is the provision of a device which will accurately feed a powdered material such as cement into the suction inlet of a blower.

Still another object of the invention is a combined apparatus whereby a material such as asbestos and a powdered material such as cement may be intimately blended and the asbestos exfoliated or shredded as the mixture is drawn into the inlet opening of a centrifugal blower, with the blending action being completed in the blower housing prior to the discharge of the blend through the tangential opening in the periphery of the blower housing.

Certain other objects of the invention will, in part, be obvious and will, in part, appear hereinafter.

For a more complete understanding of the nature and scope of the invention, reference may now be had to the following detailed description thereof, taken in conjunction with the accompanying drawings, wherein:

Fig. 1 is a side elevational view of an apparatus forming a preferred embodiment of the invention and comprising a centrifugal blower having an exfoliator device attached over the inlet opening in one side thereof and adapted to receive articles of asbestos or other insulating material from a supply receptacle, and a feeding attachment for metering a powdered material such as cement into the exfoliator device along with the articles of asbestos or similar material;

Fig. 2 is a view taken on line 2—2 of Fig. 1 looking down into the hopper of the device for metering the cement or other powdered material into the apparatus;

Fig. 3 is a vertical sectional view taken on line 3—3 of Fig. 2;

Fig. 4 is a horizontal sectional view taken on line 4—4 of Fig. 3;

Fig. 5 is a detail view taken on line 5—5 of Fig. 3;

Fig. 6 is a detail view taken on line 6—6 of Fig. 4;

Fig. 7 is an enlarged side elevational view of the blower and exfoliator attachment thereon;

Fig. 8 is a left end elevational view of the exfoliator-blower combination shown in Fig. 7;

Fig. 9 is a detail sectional view taken on line 9—9 of Fig. 7;

Fig. 10 is a lonigtudinal sectional view of the exfoliator taken on line 10—10 of Fig. 8; and

Fig. 11 is a composite view showing a spray gun of the type used for applying sprayed-on insulation mounted on the outer end of a flexible hose conduit, the opposite end of which is attached to the tangential discharge opening of the blower shown in Fig. 1.

Referring now to Fig. 1 of the drawings, the reference numeral 5 designates generally a centrifugal blower of known type which is driven by means of an electric motor 6. An exfoliator feed device which is indicated generally at 7 is attached to the inlet side of the blower housing. The exfoliator 7 is provided with a feed nozzle 8, into which asbestos or other insulating material is fed through a length of conduit 10, attached to the discharge opening 11 of an insulation supply hopper indicated generally at 12. Cement or other powdered material is metered or fed at a predetermined rate into the upper side of the nozzle 8 from a no-draft feeding device indicated generally at 13, which is provided with a discharge spout 14.

A uniform blend of dry insulating material such as exfoliated asbestos fibres and cement powder is discharged from the blower 5 through the discharge opening 15 (Fig. 8) in the periphery of the blower housing and is delivered through the flexible conduit or hose 16 to a spray-gun 17 (Fig. 11) fastened on the opposite end thereof. The spray gun 17 may, for example, be of the type disclosed and described in my Patent 2,578,412, dated December 11, 1951. Such a spray gun is provided or

served with compressed air, through a flexible air line indicated at 18 for atomizing adhesive and adhesive under pressure is supplied through the hose line 20. The spray gun 17 is used to apply layers or mats of insulation to ceilings, walls and like surfaces in accordance with the manner of operation described in my Patent 2,578,412.

Referring now particularly to Fig. 7, the blower 5 may be of known type having a blower housing 21 which houses a blower fan or blower wheel 22, mounted for rotation on a hub or shaft 23. The blower wheel is driven by means of the electric motor 6, with the hub or shaft 23 of the blower being connected directly to the drive shaft 24 of the motor, as shown. The discharge outlet opening of the blower housing comes off tangentially from the bottom of the housing, as indicated at 15 in Fig. 8. The inlet opening 25 (Fig. 10) into the blower housing 21 is in the center of the side opposite the motor 6. The exfoliator attachment 7 is mounted over the inlet opening 25 as shown.

The exfoliator 7 comprises a sleeve member 26, which is provided with a flange 27 on the end adjacent the blower 5 whereby the sleeve 26 may be secured over the inlet opening 25 by means of a plurality of bolts 28—28. On the exterior, the sleeve 26 is provided with four longitudinal ribs 30—30 (Fig. 9) through each of which a row of regularly spaced holes are drilled, with each hole being provided with a set screw 31 (Fig. 9). Each of these holes is fitted with a stationary spike or rod 32, and these spikes are made long enough so that they project outwardly a sufficient distance whereby they may be easily manipulated for adjustment. The inner ends of the four longitudinal rows of spikes 32—32 project interiorly of the sleeve member 26, as shown, for example, in Figs. 9 and 10. Preferably, each of the rows of spikes 32 is given a corresponding pitch, as shown in Fig. 9, although they could be aligned in a true radial direction if desired.

The stationary spikes 32 cooperate with rotating spikes 34—34 (Figs. 9 and 10) which project radially from a shaft 35, which extends coaxially through the sleeve 26 and which may be mounted as an extension on the end of the hub or blower wheel shaft 23. The rotating spikes 34—34 are so mounted that they rotate in between the stationary spike 32—32 without striking. The outer end of the shaft 35 is pointed, as indicated at 36, so as to divert and break up clumps of asbestos or other insulating material as it is fed into the exfoliator 7 through the feed nozzle 8.

The feed nozzle 8 is provided on one side with a circumferential flange 37 by which it is attached to the outer end of the sleeve 26. The nozzle 8 is provided with an inlet mouth opening 38, which is rectangular in configuration, as shown in Figs. 8 and 10, and which is provided with an overhanging spacer lip 40. The outer end of the feed conduit 10 fits against the lip 40 in alignment with the inlet mouth opening 38 so that air may be easily sucked in through the mouth 38 thereby preventing the application of excess suction through either the conduit 10 or the spout 14.

The nozzle 8 is provided in the upper side with an inlet opening 41 (Figs. 8 and 10) into which fits the bottom end of the discharge spout 14 leading from the device 13 for feeding cement or other powdered material.

Particles of asbestos or other fibrous insulating material are continually agitated in the bottom of the supply hopper 12 by means of a paddle wheel 42, which is mounted on a shaft 43 and driven by suitable known means which are not shown. The particles of asbestos are continually fed out from the discharge opening 11 adjacent the bottom of the hopper 12 at the desired rate by means of a rotating wire brush 44, which cooperates with a small paddle wheel 45.

The brush 44 serves to flick the particles of asbestos out through the opening 11 into the conduit 10 at the uniform rate. It will be understood that other feeding means may be provided for feeding the particles of asbestos into the feed conduit 10.

The cement feeder 13 is driven by means of a motor 50 and an attached speed reducer unit 51 mounted as a single unit on one side of a vertical hopper 52, which may be provided at the upper end with a feed hopper 53. A power take-off sprocket 54 serves to drive a large sprocket wheel 55 by means of a chain 56 running over these two sprocket wheels. The sprocket 55 is mounted on a shaft 57 the ends of which are suitably journaled in bearings 58—58 on the side of the hopper 52 opposite the motor 50. Juxtaposed to the large sprocket wheel 55 the shaft 57 carries a smaller sprocket wheel 60, which serves to drive a shaft 61 (Fig. 1) provided with a sprocket wheel 62 over which runs a drive chain 63. A fluted feeder wheel 64 (Figs. 3 and 4) is supported on the shaft 61 on the interior of the hopper 52.

The shaft 57 is also provided with a small sprocket 65 on the opposite end from the sprockets 55 and 60, over which runs a drive chain 66 for driving a sprocket 67, mounted on a drive shaft 68, suitably journaled in opposite sides of the hopper 52 and carrying a set of three paddle wheels 70, 71 and 72 (Fig. 2). The ends of the paddle wheels 70, 71 and 72 cooperate with the semi-cylindrical bottom 73 (Fig. 3) disposed in the hopper 52 and formed of a material such as galvanized steel plate.

A rectangular opening 74 is centrally located in the semi-cylindrical bottom 73 so as to extend across the bottom thereof and open into a housing 75 for the fluted metering wheel 64. A rectangular opening 76 is provided in the bottom of the housing 75 which serves as a discharge opening for cement or other powdered material which is fed from the main hopper 52. Preferably, a gate valve member 77 is provided for regulating the size of the opening 76. The gate valve member 77 is curved to conform to the contour of the bottom of the housing 75 and is longitudinally slidable in the welded-on guide members 78—78. The gate valve 77 is provided with a handle 80 to facilitate the adjustment of the width of the opening.

The feeder wheel 64 is held in place on the shaft 61 by means of a pair of disk plates 81—81 on opposite sides thereof. A second pair of disk plates 82—82 are mounted on opposite ends of the shaft 61 each of which cooperates with the adjacent disk plate 81 to support and retain a pair of strips 83—83. A pair of retaining recesses or slots 84—84 are milled into the opposing faces of each of the plates 82 and 83 for receiving the opposite ends of the strips 83. It will be seen that the strips 83—83 and the wheel 64 rotate as a unit in the pocket 75. Metered quantities of the cement are collected by the wheel 64 in the longitudinal flutes or furrows 85—85 as the wheel rotates. The pairs of strips 83—83 which are spaced somewhat from the shaft 61 as indicated at 86—86 (Fig. 4) serve to prevent the cement from compacting or bridging in the pocket 75.

A second semi-cylindrical hopper bottom 87 is provided underneath the hopper bottom 73. The bottom 87 is provided with a central opening 88 into which the upper end of the spout 14 is fastened.

The operation of the apparatus is as follows:

The hopper 52 is filled with cement or other powdered material by emptying bags of cement through the filling hopper 53. The suply hopper 12 is loaded with asbestos or other fibrous material, or mixtures thereof. When the operator handling the spray gun 17 is ready, the motor 6 is energized so as to drive the blower 5 and then the motors are energized for operating the moving parts of the asbestos hopper 12 and the cement feeder 13. Particles of asbestos are discharged through the outlet opening 11 into the conduit 10 and are sucked through the mouth 38 of the nozzle 8 into the exfoliator 7. As the metering wheel 64 rotates each of the pockets or grooves 84 as it reaches the bottom of the housing pocket 75 discharges all or a portion of its contents of cement which

falls through the opening 76. If this opening is partially closed the full contents of the pockets 84 cannot be discharged and the undischarged deposits are continually carried around with the wheel. Each increment of cement falls through the opening 76 and into the spout 14, from which it discharges into the nozzle 8.

As the particles of asbestos and the cement enter the nozzle 8 they are caught in the inflow of air which is drawn into the blower housing and are thereby pulled through the exfoliator device 7. The rapidly rotating spikes 34 in cooperation with the stationary spikes 33 serve to exfoliate or shred the particles of asbestos so as to break down the bundles of fibres into individual fibres or small groups of fibres. By the time the asbestos reaches the blower housing 5 and is ready to pass in through the inlet opening 25 in the side thereof the exfoliation or shredding action is complete. The cement powder is also well blended or mixed with the asbestos fibres at this point. The mixture of asbestos fibres and cement comes into the center of the blower wheel 23 and is thrown by centrifugal force outwardly to the outer tips of the blades thereof which are moving at very high velocities. Some additional defibering and blending takes place in the periphery of the blower housing so that when the asbestos-cement mixture is discharged through the tangential outlet opening 15 of the blower into the hose 16 the blend is completely uniform and the fibres are in a highly shredded and fluffed condition.

As the blend of asbestos fibres and cement discharges from the central opening of the spray gun 17 on the outer end of the conduit 16 the particles receive a spray of liquid adhesive which serves to bind them together to a wall or other surface to be insulated.

The rate of feed of the cement into the exfoliator device 7 may be regulated by adjusting the width of the opening 76. The rate of feed of the asbestos or other fibrous material from the feeder 12 may be regulated by adjusting the speed of the wire brush 44. The operation of the apparatus is continuous as long as the hoppers 12 and 13 are supplied with asbestos and cement, respectively.

It has been found that the pointed end 36 on the shaft 35 serves a very useful purpose in deflecting and breaking up the particles of asbestos or other insulation as they enter the nozzle 8 and prevents the end of the exfoliator sleeve 26 from becoming clogged.

In certain instances it is unnecessary to feed cement or other powdered material in with the insulation and in these cases the cement feeder 13 may be shut down and if desired it may even be removed. It will also be understood that the cement feeder 14 may be used for feeding cement or other substances where it is desired to have cement or other powdered material fed in accurate amounts and in a positive manner. The cement feeder 13 is such that it is not affected by suction or back pressures applied to the discharge spout 14.

Since certain changes may be made in the apparatus described above and shown in the accompanying drawings without departing from the spirit and scope of the invention, all matter described above or shown in the drawings is intended to be interpreted as illustrative and not in a limiting sense. What is claimed as new is:

1. Apparatus for feeding, blending and blowing a mixture of asbestos or like fibrous material and cement or like powdered material, comprising in combination: a centrifugal blower which comprises a blower housing having a central inlet opening in one side thereof and a tangential discharge opening in the peripheral portion thereof, and a blower wheel supported on a shaft approximately coaxially aligned with said inlet opening; an exfoliator and blender which comprises a sleeve member one end of which is connected to said blower housing so as to fit said inlet opening and project from the side of said blower housing in approximately coaxial alignment with said blower wheel shaft, an extension of said shaft extending centrally through said sleeve member with the outer end of said shaft carrying a point, a plurality of spikes projecting radially from said shaft extension along the length thereof and therearound, a plurality of stationary spikes projecting within said sleeve member and positioned so as to clear said spikes projecting from said shaft extension during rotation, and a feed nozzle secured over the outer end of said sleeve member having an inlet mouth of substantially reduced cross-section compared to said sleeve member for asbestos or the like opposite the point end of said shaft extension and having an inlet opening substantially smaller than the cross-section of said sleeve member for cement or the like in the side of the nozzle; and, a feeder for cement or like powdered material equipped with a rotary feeder wheel of the star wheel type for closing and feeding the powdered material through a bottom opening and having a gravity discharge spout the bottom end of which discharges into said inlet opening in the upper side of said feed nozzle, said feeder wheel serving to prevent suction within said nozzle from reaching the contents of said feeder so as to affect the feeding rate.

2. Apparatus for feeding, shredding, and blowing a fibrous material such as asbestos comprising in combination: a centrifugal blower which comprises a blower housing having a central inlet opening in one side thereof and a tangential discharge opening in the peripheral portion thereof, and a blower wheel supported on a shaft approximately coaxially aligned with said inlet opening; and an exfoliator and blender which comprises a sleeve member having a length substantially greater than the width of said blower housing one end of which is connected to said blower housing so as to fit said inlet opening and project from the side of said blower housing in approximately coaxial alignment with said blower wheel shaft, an extension of said shaft extending through said sleeve member to the inlet end thereof with the outer end of said shaft carrying a point, a plurality of spikes projecting radially from said shaft extension along the length thereof, and therearound, a plurality of stationary spikes projecting within the interior of said sleeve member and positioned so as to clear said spikes projecting from said shaft extension during rotation, and a feed nozzle secured over the outer end of said sleeve member through which a material to be shredded and exfoliated may be introduced, said nozzle having an inlet opening for fibrous material substantially restricted in size relative to the cross-sectional area of said sleeve member the center of said opening being substantially aligned with said point.

3. In combination with a centrifugal blower comprising a blower housing with a central inlet opening in one side thereof and a tangential discharge opening in the peripheral portion thereof, and a blower wheel supported on a shaft approximately co-axially aligned with said inlet opening, an exfoliator and blender which comprises a cylindrical sleeve member having a length substantially greater than the width of said blower housing one end of which is connected in substantially air-tight relationship to said central inlet opening with said sleeve projecting at approximately right angles to the side of the blower housing, an extension shaft extending co-axially through said sleeve member to the inlet end thereof and connected at its inner end to the adjacent end of said blower wheel shaft so as to rotate therewith, the outer end of said extension shaft being pointed so as to break up and deflect entering particles of material to be exfoliated and shredded, a plurality of pins projecting from said extension shaft at regular intervals along the length thereof and from different angles therearound, a plurality of stationary pins projecting inwardly through the side wall of said sleeve member arranged to cooperate with said pins carried on said shaft extension, and an inlet nozzle on the outer end of said sleeve member, said nozzle having an inlet opening for fibrous material substantially

restricted in size relative to the cross-sectional area of said sleeve member the center of said opening being substantially aligned with said point.

4. The combination called for in claim 3 wherein there are at least two rows of spikes extending along said shaft and at least two rows of stationary spikes extending along the interior of said sleeve member.

5. The combination called for in claim 3 wherein said sleeve member has a plurality of uniformly spaced longitudinal ridges extending along the exterior thereof, and said stationary pins project through radially directed holes in said ridges.

6. The combination called for in claim 3 wherein said inlet nozzle opening is relatively long and narrow.

7. A feeder for a dry powdery material such as cement comprising, an upper hopper having a curved bottom with an elongated pocket extending there across, said pocket having a semi-cylindrical bottom with a discharge opening therein, a paddle wheel disposed for rotation within said upper hopper, a feeder wheel disposed for rotation within said pocket in close proximity to the semi-cylindrical bottom thereof and overlying said opening, a supporting shaft for said feeder wheel extending through opposite ends of said pocket, said feeder wheel having a fluted surface with a radius of curvature approximately equal to that of said semi-cylindrical bottom, the opposite ends of said feeder wheel being spaced inwardly from the



adjacent ends of said pocket so as to leave spaces therebetween for collection of the dry powdery material, and agitators carried on said shaft for operation in said spaces to agitate the dry powdery material therein, said material being collected in said flutes as they pass through the upper portion of the orbit and being discharged therefrom as each flute passes over said discharge opening, and a lower hopper having a discharge outlet in the bottom thereof aligned with said discharge opening in said elongated pocket, said flutes being open at their ends so as to receive agitated dry powder material from said end spaces.

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