Dec. 5, 1950 W. H. MACKEY ET AL 2,532,318

BLOWING MACHINE

Filed Nov. 17, 1945 2 Sheets-Sheet 1

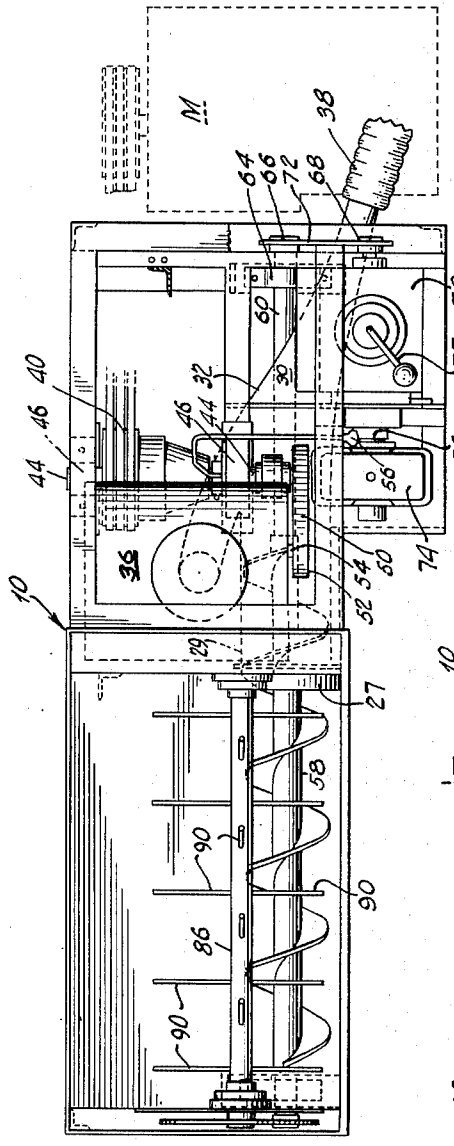


Fig. 1.

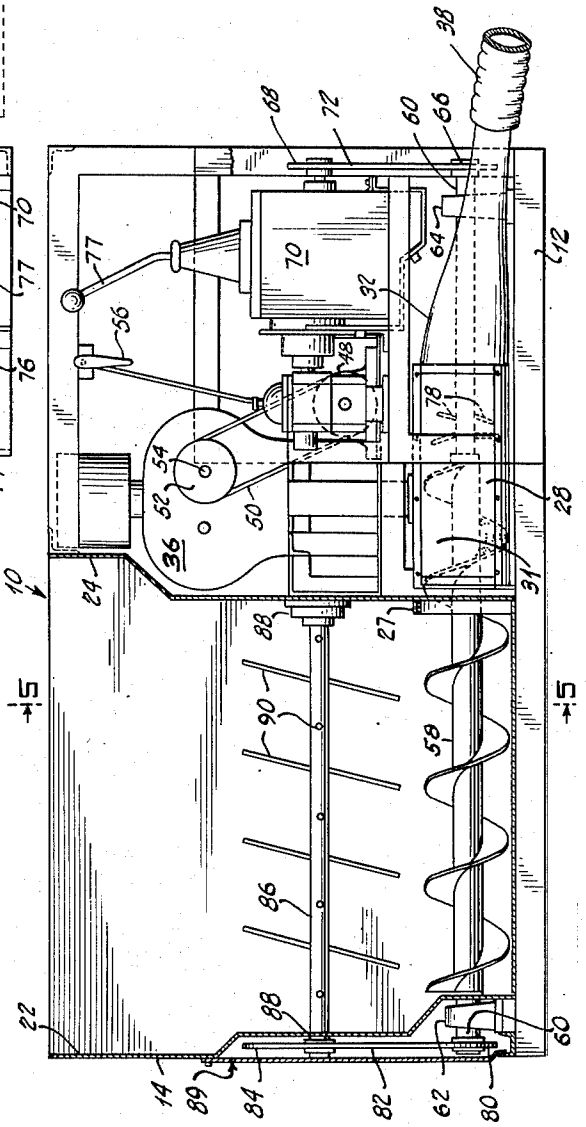


Fig. 2.

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Fig. 3.

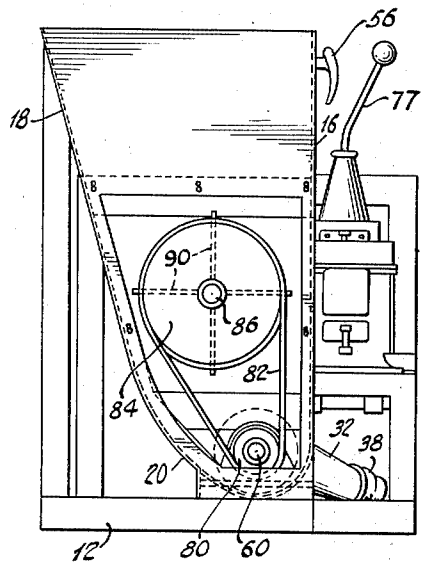


Fig. 4.

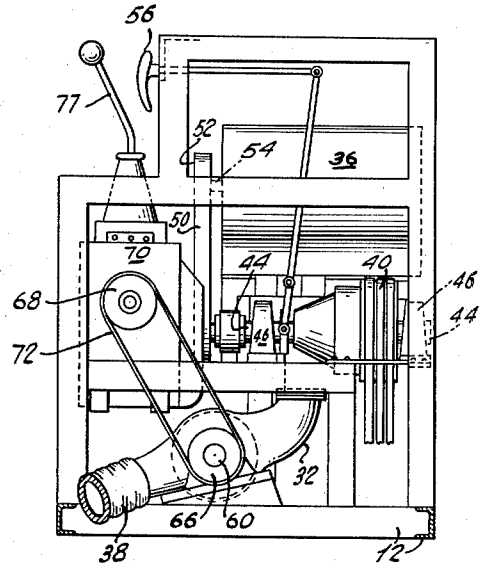


Fig. 5.

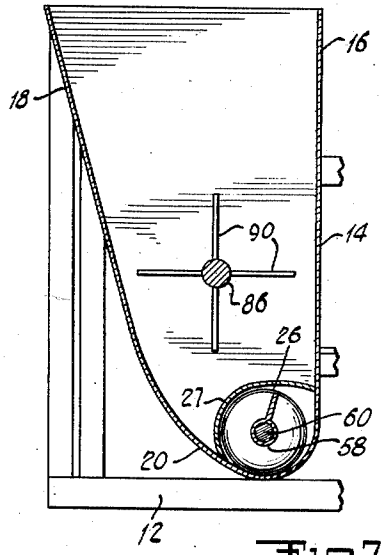


Fig. 6.

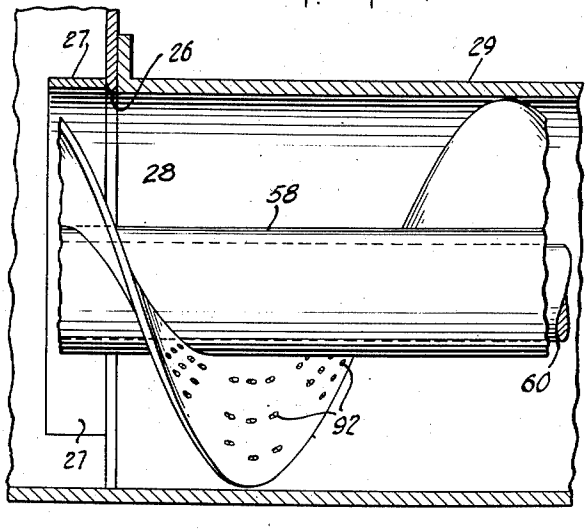
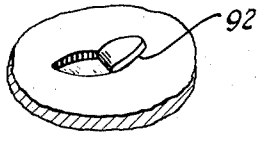


Fig. 7.



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Patented Dec. 5, 1950 2,532,318

UNITED STATES PATENT OFFICE

2,532,318

BLOWING MACHINE

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Application November 17, 1945, Serial No. 629,268

6 Claims. (Cl. 302—50)

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The instant invention relates to improved machines of the type employed for pneumatically conveying insulating materials and the like.

At the present time a well known and efficient method of insulating wall spaces, such as the wall spaces defined by the studding, inner lathing and outer sheathing of frame buildings, resides in filling such spaces with insulating material conveyed in an air stream. A preferred material for this purpose comprises mineral wool in the form of relatively small aggregates, known commercially as modulated or granulated mineral wool. It will be understood that the term "mineral wool" is used herein in a generic sense to include fibers or fibrous material formed of rock, slag, glass, mixtures thereof and other similar raw materials. The filling of the wall spaces is accomplished with a machine comprising a blower, a discharge line from the blower and into which the bulk insulating material is fed from a suitable hopper, and a hose extending from the discharge line and having a nozzle to be inserted in openings formed in the building wall leading into the stud spaces.

The instant invention is concerned with, and has for its principal object, the provision of an improved blowing machine for use in operations of the kind referred to above. More particularly, an object of the invention is the provision of a blowing machine which achieves, as compared to prior practice, an improved automatic feed of the insulating material and more accurate control of the coverage obtained, i. e., the density of the deposited wool.

Another object of the invention is the provision of a blowing machine having a screw conveyor for carrying insulating material from a hopper to a blower discharge line, the conveyor including means for controlling the movement of the insulating material and preventing its backward travel under the pressure of the air blast set up by the blower.

A further object of the invention is the provision of a blowing machine having an insulation-receiving hopper and means for feeding the insulation from the hopper to the air conduit, both of improved design.

Our invention will be more fully understood and further objects and advantages thereof will become apparent when reference is made to the more detailed description of a preferred embodiment of the invention which is to follow and to the accompanying drawings in which:

Fig. 1 is a plan view of a machine embodying the instant invention;

Fig. 2 is a side elevational view partially in section of the machine of Fig. 1;

Fig. 3 is an elevational view of the left hand end of the machine as shown in Figs. 1 and 2;

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Fig. 4 is an elevational view of the right hand end of the machine as shown in Figs. 1 and 2;

Fig. 5 is a sectional view taken on the line 5—5 of Fig. 2;

Fig. 6 is an enlarged detail view of a portion of the apparatus; and,

Fig. 7 is a further enlarged detail view of one feature of the apparatus shown in Fig. 6.

Referring now to the drawings, there is shown a blowing machine, indicated generally at 10, adapted particularly for use in the installation of insulating filling in building walls and other confined spaces. The preferred insulating material is modulated mineral wool and the like, although it will be understood that the use of the machine is not limited to any particular type of filling.

Machine 10 comprises a frame 12 suitably made up of channel members, as shown, joined together to provide a platform or base for the support of the several elements of the apparatus. Supported on the frame is a hopper 14 adapted to receive the material to be blown. Hopper 14 (see particularly Figs. 1, 2 and 5) has a substantially vertical side wall 16 and an inclined side wall 18, the two being connected by a curved bottom wall 20. Walls 16, 18 and 20 may be separate metal sheets joined together by welding or the like, or a single, integral sheet bent into the desired shape may be used. The hopper has end walls 22 and 24 welded or otherwise secured to the other walls.

End wall 24 is provided with an opening 26 (see Fig. 5) adjacent bottom wall 20 and side wall 16, opening 26 forming the mouth of a tubular passageway 28 defined by a hollow tube 29. A baffle 27 forms what is, in effect, a funnel leading to passageway 28. Tube 29 may be provided with a clean out and inspection door 31. The end of the cylinder opposite the hopper makes a Y-connection 30 with a conduit 32 leading from the discharge port of a blower 36. The stem of the Y is coupled to a delivery hose 38. Blower 36 is of any suitable type such, for example, as that known in the trade as a "Root-Victor-Acme" blower and conventionally used in blowing machines of the type under consideration. Delivery hose 38 is of substantial length so that it may extend from the blowing machine placed in a suitable position, for example, on the bed of a truck, to the house or other building to be insulated. The outer end of delivery hose 38 may be provided with a nozzle or other fitting (not shown) for insertion in the openings leading into the insulation-receiving spaces of the building.

The blower is driven by any suitable prime mover which may be a gasoline motor M indicated in dotted lines in Fig. 1 and separately

mounted on the truck bed or other foundation, or which may be the truck motor itself. The drive includes a pulley 40 forming part of a clutch element mounted on a shaft 44 supported in bearings 46. A pulley and belt connection 48, 50, 52, is provided between the shaft 44 and the driven shaft 54 of the blower. The clutch, which may be of any conventional or other type, is manipulated by lever 56 to engage or disengage shaft 44 from driven relationship with pulley 40 whereby the blower may be started or stopped as desired.

Mounted for rotation in the bottom of the hopper and projecting into the tubular passageway through mouth 26 is a screw conveyor 58. The screw conveyor includes a spiral flight which fits tube 29 with small clearance and extends to, or substantially to, the Y-connection between tube 29 and conduit 32 (see Figs. 1 and 2). The conveyor is carried on and fixed to a shaft 60 to rotate therewith, the shaft being supported in bearings 62 and 64 at opposite ends of the machine. The shaft projects beyond bearing 64, the projecting end carrying a pulley 66 connected with a pulley 68 keyed to the output shaft of a change-speed gear box 70 by belt 72. The change-speed gears in box 70 are driven from shaft 44 through the medium of bevel reduction gears in gear box 74 directly connected to shaft 44 and connected to the change-speed device through jack shaft 76. Shifting of the gears in the change-speed device is effected by gear shift lever 77.

Shaft 60 carries a number of breaker fingers 78 extending angularly and either in line or in staggered relationship from the shaft. The fingers are located adjacent the end of the flight of the conveyor and partially in the Y-connection 30.

An end of shaft 60 opposite pulley 66 projects beyond bearing 62 and carries a pulley 80 operatively connected by a belt 82 with a pulley 84 keyed to a breaker bar 86 carried in bearings 88 in the end walls of the hopper. The hopper end wall is inwardly recessed to receive bearing 62 and the drive elements for shaft 86. The recess may be closed by cover plate 89 (omitted in Fig. 3). Shaft 86 carries a plurality of breaker arms 90, alternate arms lying in common planes at substantially right angles to the common plane of the intermediate arms. Alternate arms preferably extend at an acute angle to the shaft 86 which lies above, but laterally offset with respect to, screw conveyor 58, as illustrated in Figs. 1 and 3.

Screw conveyor 58 is provided with suitable means such as indicated at 92 for engaging the material carried by the conveyor (see Figs. 6 and 7). The primary function of means 92 is to retard movement of the insulating material over the surface of the conveyor flight and may be of any suitable form for this purpose. In the preferred embodiment, forwardly projecting, hook-like elements or barbs are used, as shown more clearly in Fig. 7. The barbs may be made in different ways but preferably by striking up material from the conveyor flight. The barbs are located on the conveyor within tube 29 but preferably adjacent opening 26, and are provided in suitable number and arrangement to control the movement of the material on the conveyor, as will be hereinafter more fully pointed out.

In the operation of the apparatus described above, the insulating material, such as nodulated mineral wool, is discharged into hopper 14 suitably to substantially fill the same. Motor M, or the truck motor as the case may be, is operated and the clutch is engaged by manipulation of lever 56 to cause rotation of shaft 44 and, hence, operation of the blower. Gear shift lever 77 is shifted to obtain the gear ratio required to cause rotation of shaft 60 and, hence, rotation of the screw conveyor at the selected R. P. M. Due to the drive connection between shaft 60 and breaker bar 86, the latter is rotated in the same direction as the screw conveyor. Rotation of shaft 86 causes breaker arms 90 to break up large clumps or agglomerations of the insulating material whereby the material is deposited in relatively loose, open, fibrous form at the bottom of the hopper onto and adjacent conveyor 58. The material is deposited by a combination of gravitational force and the action of the breaker bars into the screw conveyor through the relatively open space to the left of the conveyor, as viewed in Fig. 5. The conveyor feeds the material forwardly through the funnel mouth formed by baffle 27 and into the tubular passageway. The funnel mouth overcomes the tendency of the insulating material to move out of the conveyor as it reaches the entrance to the passageway. The material is deposited by the screw conveyor at the Y-connection in the path of the airstream created by the operation of the blower. The material is picked up by the airstream and carried thereby through hose 38 to the place of discharge.

Barbs 92 provide a location of greatly increased frictional engagement between the flight and the insulating material and, hence, retard movement of the material in either direction along the flight to serve important functions. The material carried by the screw conveyor is of relatively low density as it enters the tubular passageway inasmuch as it has been loosened and opened by breaker arms 90 and fed mainly by gravity into the conveyor. However for efficient operation of the blowing machine, the insulating material must be of relatively high density as it is fed into the airstream at the Y-connection. The prongs or other means 92 achieve this result. The insulating material travels forwardly on the screw sliding over the surface of the flight at a substantially constant speed until it reaches means 92. These frictionally engage the surface of the entangled mass of material in the conveyor and retard or slow down the forward movement while the material behind it continues to move forward at a higher velocity, with the result that the material becomes packed into the tubular passageway to an extent determined by the degree of frictional engagement of means 92 with the material. The insulating material thus packed to a much higher density than it originally had is deposited in the airstream from the blower with consequent greater quantity of wool conveyed for the air used. Means 92 also serves to prevent blow-backs through the conveyor. That is, if flow of air through the delivery hose is retarded, or for other reasons the air pressure at the Y-connection is substantially increased, the tendency is for the increased air pressure to force the material back through the screw conveyor and into the hopper. The barbs biting into the material in combination with the increased density or packing of the material in the tubular passageway prevent such rearward movement even under relatively high air pressure.

The number, character and arrangement of

prongs 92 may be varied to secure the desired density conditions of the insulating material. For example, for higher densities, a greater number and in a wider pattern are employed with increased resistance to movement of the material along the conveyor flight. As illustrated in Fig. 6, preferably the prongs or protuberances are concentrated at one portion of the flight and are of relatively small number to avoid packing of the material to an undesirable extent. However, as substantial packing is required, breaker fingers 78 are provided to open up the material and separate it into relatively loose form as it enters the airstream whereby it may be distributed in the wall or other place to be insulated.

The particular construction and design of the hopper, cooperating screw conveyor, and breaker bar, including the positioning of the screw conveyor at one side of the hopper to leave an open space, and the positioning of the breaker bar to force insulating material into the screw conveyor through such open space, prevents bridging of the material and insures that the conveyor will continuously pick up a full load. The Y-connection between the tubular passageway and the air conduit permits the insulating material to be picked up by the airstream in substantial continuation of the forward movement imparted to it by the screw conveyor and, hence, promotes free flow of the same into and with the airstream. The breaker fingers at the end of the conveyor loosen up the material packed by the conveying operation and return it to an open state. All of the features discussed above cooperate to provide continuous and uniform flow of the insulating material at a predetermined rate without the danger of "blow backs." The operation is entirely automatic, requiring merely the dumping of the insulating material into the hopper. The insulating material does not have to be pushed into the feeder by hand as is customary in many machines. The speed of rotation of the conveyor relatively to the rate of air delivery by the blower may be controlled through change-speed gear box 70.

Having thus described our invention in rather full detail it will be understood that these details need not be strictly adhered to but that various changes and modifications may suggest themselves to one skilled in the art, all falling within the scope of the invention as defined by the subjoined claims.

What we claim is:

1. A blowing machine for insulation and like fibrous material comprising a hopper for receiving said material, a blower, a discharge conduit leading from the blower, a passageway leading from said hopper and connecting into said conduit, a screw conveyor extending from said hopper into said passageway for conveying said material to said conduit, and material engaging means on a flight of said screw conveyor within said passageway to retard movement of the material carried thereby.

2. A blowing machine for insulation and like fibrous material comprising a hopper for receiving said material, a blower, a discharge conduit leading from the blower, a passageway leading from said hopper and connecting into said conduit, a screw conveyor extending from said hopper into said passageway for conveying said material from the hopper to the conduit, and projections on a flight of said screw conveyor within said passageway to retard movement of the material therealong.

3. A blowing machine for insulation and like fibrous material comprising a hopper for receiving said material, a blower, a discharge conduit leading from the blower, a passageway leading from said hopper and connecting into said conduit, a screw conveyor extending from said hopper into said passageway for conveying said material from the hopper to the conduit, and integral projections struck up from the material of a flight of said conveyor within said passageway to retard movement of the material along said flight.

4. A blowing machine for insulation and like fibrous material comprising a hopper for receiving said material, a blower, a discharge conduit leading from the blower, a passageway leading from said hopper and forming a Y-connection with said conduit, a screw conveyor extending from said hopper and through said passageway to a point adjacent said Y-connection for conveying said material from said hopper to said conduit, breaker means in said passageway adjacent the end of said conveyor, and material engaging means on a flight of said conveyor within said passageway to retard movement of said material conveyed thereby.

5. A blowing machine for insulation and like fibrous material comprising a hopper for receiving the material, a blower, a discharge conduit leading from the blower, a passageway leading from said hopper and forming a Y-connection with the conduit, a screw conveyor extending from said hopper into said passageway to a point adjacent said Y-connection to convey insulating material from said hopper to said conduit, breaker means in said passageway adjacent said conveyor, and means projecting from a flight of said conveyor within said passageway to retard movement of the material therealong.

6. A blowing machine for insulation and like fibrous material comprising a hopper having relatively converging side walls, said hopper receiving said material, a blower, a discharge conduit leading from the blower, a passageway leading from said hopper and forming a Y-connection with said conduit, a screw conveyor extending substantially the length of said hopper along a bottom wall thereof and closely adjacent one side wall thereof to leave a space between it and the opposite wall, said conveyor serving to convey the material from the hopper to said conduit, and material engaging means on a flight of said screw conveyor within said passageway to retard the movement of the material conveyed thereby.

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Certificate of Correction

Patent No. 2,532,318 December 5, 1950

WILLIAM H. MACKEY ET AL.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows:

Column 1, line 12, and column 2, line 14, for the word "modulated" read *nodulated*;

and that the said Letters Patent should be read as corrected above, so that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 23rd day of January, A. D. 1951.

[SEAL]

THOMAS F. MURPHY,
Assistant Commissioner of Patents.