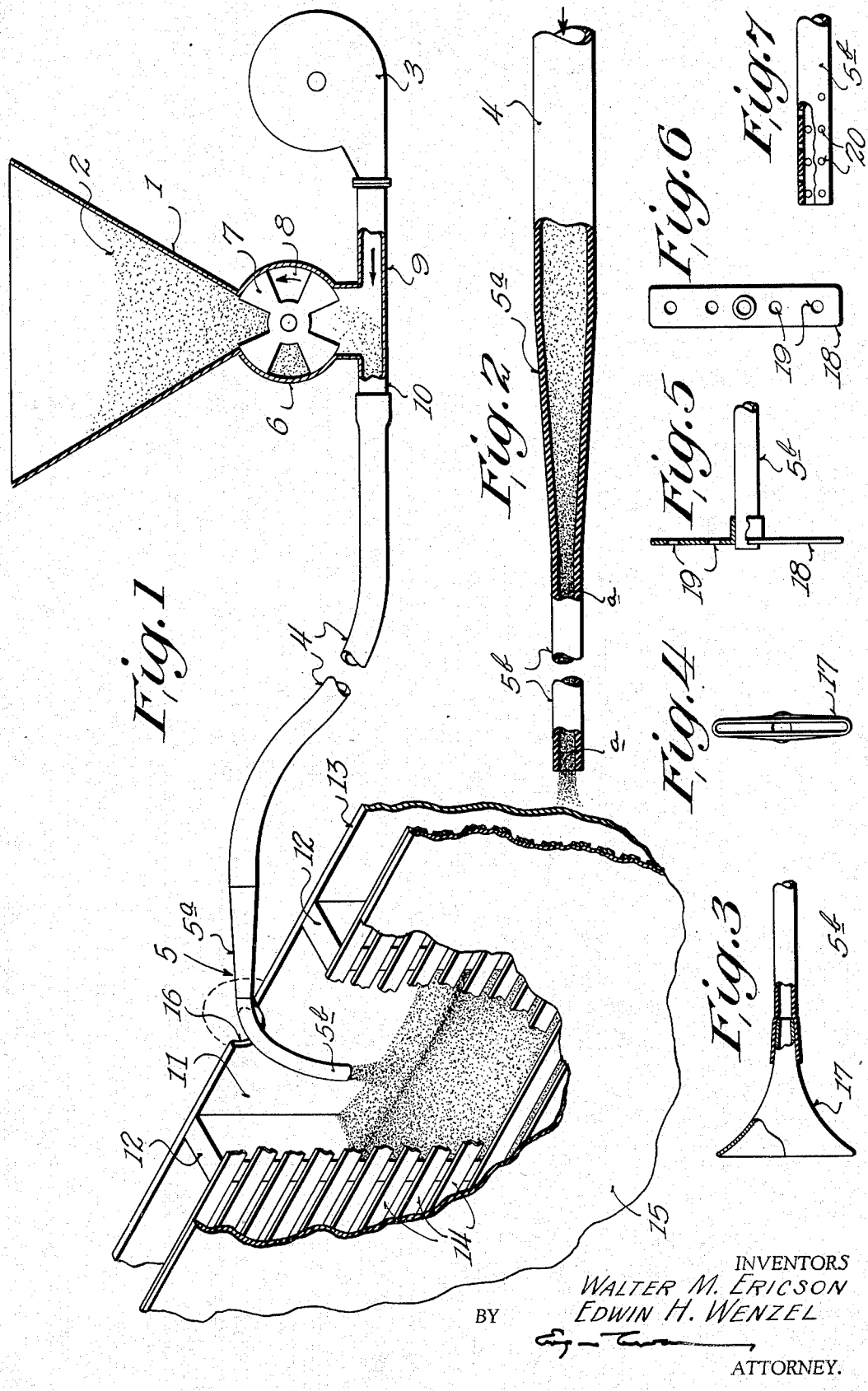
May 14, 1940. W. M. ERICSON ET AL 2,200,713

BUILDING INSULATION AND METHOD FOR PRODUCING SAME

Filed Dec. 24, 1937



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asbestosclaims.law/library/21961/1

Patented May 14, 1940 2,200,713

UNITED STATES PATENT OFFICE

2,200,713

BUILDING INSULATION AND METHOD FOR PRODUCING SAME

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Application December 24, 1937, Serial No. 181,718

1 Claim. (Cl. 72—16)

This invention relates to a method of and an apparatus for building an insulating blanket of insulation particles of mineral or other fibers or granules of the desired insulation material in hollow spaces of walls, ceilings and the like of buildings and other structures requiring thermal or acoustical insulation.

For practical purposes the wall space is filled with these particles from a flexible hose or conduit through which the particles are conveyed in freely suspended or floating relation in an air stream. It has been found that a hose or conduit from 2½ to 3 inches in diameter is best suited for a more rapid filling of the wall space, but small conduits could be used. These, however, are not desirable because the filling operation would be too slow at the air pressure employed, namely, about two pounds at the exit end of the conduit. Any pressure in excess of this would likely damage the plaster layer or other of the confining members of the wall space, and obviously an increase of air pressure would not be recommended or desirable. A two pound pressure does not, however, afford enough forceful delivery of the particles to produce a dense, compacted blanket such as we have found necessary to give increased insulating efficiency and prevent subsequent settling and voids in and about the blanket from vibrations or otherwise. We have also found that a denser blanket prevents air and moisture infiltration to a larger degree than does a blanket formed in a wall space by the old method as above described.

In accordance with our invention, we constrict the hose or conduit at or adjacent its discharge end to amass the particles and increase the velocity of the air stream so that the particles are discharged or shot out of the conduit with a greater landing force to produce a denser blanket without increasing the air pressure on the larger portion of the conduit or adding any appreciable volume to the air to destroy or damage the plaster layer on the other structural elements of the confined space.

We have retained the practical manner of conveying the particles suspended freely in the air stream to or near the point of delivery of the conduit and from there on we have constricted the exit end of the conduit to increase the velocity of the air stream at said exit end. A higher air velocity results in a higher air pressure which forcibly discharges the particles out of the conduit at a greater force and momentum than is possible with the old method wherein the velocity of the air flow is not increased in the conduit and the latter continues at its uniform diameter up to the very exit end of the conduit. In constricting the conduit, we propose a reduction on a ratio of about 2 to 1 so that the customary normal air pressure may be employed in the larger portion of the conduit. This increased velocity and momentum results in a more forceful delivery of the particles and causes them to unite more closely and interlock and interlace at their tendrils to such an extent that the blanket has a greater resistance to touch and a springiness than the blanket produced under the old method. This density may be maintained throughout the entire blanket by keeping the exit end of the delivery hose in substantially the same spaced relation to the point of deposition of the particles throughout the building of the blanket. In this way a substantially uniform mass may be produced and of sufficient carrying capacity to hold the load and weight of the blanket above its lower portion to prevent subsequent settling.

It is obvious that the materials carried through the larger conveying means or conduit will find it necessary to travel through the smaller exit opening which may be in relation of approximately 2 to 1 and which thereby may lose some of its freely suspended attributes and bulk in some degree in the smaller section of the carrying conduit. The pressure back of said massed portion will result in a forceful expelling or shooting like action as differentiated from the delivery of freely suspended particles to find their own place of lodgement as in the old method. The degree of amassing or bulking in the smaller conduit is in direct relation to the amount of material delivered to the air stream at the point of introduction of the same, that is, by reducing the amount of material at the point of introduction the massing in the smaller area will be substantially lighter in density than when larger quantities are introduced. In this way any desired results may be obtained, although for practical purposes there is very little distinction between them because it is the increased velocity of the air in the smaller conduit which produces the results desired in either case, namely, a denser blanket.

The invention also relates to the blanket and consists further in the features hereinafter described and claimed.

In the accompanying drawing illustrating a form of apparatus for practicing the method of our invention—

Fig. 1 is a perspective view with parts broken

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away and in section, respectively, of said apparatus and the wall space being filled;

Fig. 2 is a longitudinal sectional view with parts in elevation of the constricted portion at the discharge of the conduit; and

Figs. 3 to 7 inclusive illustrate modified forms of construction for use with the discharge end of the conduit, said forms to be hereinafter more fully described.

In Fig. 1, 1 indicates the hopper which carries a supply of insulation material 2 which may be rock-wool fibers, glass-wool fibers or other fibers or granules or particles of the desired insulation material. 3 indicates a positive air blower 3 preferably the centrifugal type and 4 indicates a flexible conduit in the form of a hose for conveying the insulation particles from the hopper to the wall space. 5 indicates the discharge nozzle at the delivery end of the conduit for introducing the insulation particles into the wall space. The nozzle 5 contains the constricted portion in accordance with our invention.

The hopper 1 connects at its lower discharge end with a housing 6 containing a rotary valve 7 which regulates the supply of insulation particles to the conduit 4. The valve 7 is preferably power driven and has a number of peripherial pockets or cavities 8 to carry the insulation material from the hopper to the air stream which is forced through the housing 6 beneath the valve 7 by the blower 3. For this purpose the housing 6 has pipe extensions 9, 10 for connection with the blower 3 and the conduit 4, respectively, as shown in Fig. 1. The arrow in Fig. 1 shows the direction of flow of the air stream through the housing 6 and into the conduit 4. The cylindric wall of the valve member 7 fits within the housing 6 to seal the hopper from the blower. The blower and the valve are motor driven, the entire assembly depicted being preferably mounted on a truck for portability.

The nozzle 5 comprises two connected or joined sections 5*a* and 5*b* which sections continue the flow path of the conduit to its discharge or exit end. The section 5*a* which is directly connected to the hose 4 has an appreciable length and is tapered gradually from the diameter of the hose to its smaller end which is at the point of connection with the section 5*b*. The latter continues to the discharge end of the conduit at approximately the smaller diameter of tapered section.

The tapered section 5*a* substantially increases the velocity of the air stream at the discharge end of the conduit and also amasses the particles coming in from the hose so that the air stream will forcibly discharge the particles from the conduit at an increased velocity and force without necessitating an increase of pressure in the hose or an increase of air volume in the wall space. While the particles are brought into a more compacted or bulked relation in the nozzle section, the amassment is not such as to choke or clog the conduit because the bulked particles are still under the moving force or pressure of the air stream as applied at the source. Hence, the flow through the conduit is not hindered and a dense blanket can be produced because of the increased landing force given to the particles by increasing the velocity of the air stream at the discharge end only of the conduit.

The nozzle may be a part of the conduit in the sense of being integrally formed with the hose or it may be made as an independent unit in which case the nozzle could be suitably secured to adjacent end of the hose. The section 5*b* confines the bulked particles in their compacted relation to the very discharge end of the conduit and thus assures all of the amassed particles partaking of the increase velocity given to the air stream by the constriction.

The increased acceleration given to the particles causes them to impact or impinge with sufficient force on landing to interlock and interlace their tendrils in a manner to produce a dense and compact blanket resistant to the touch and requiring less lateral support by the enclosing elements of the confined space. The density of the blanket may be made substantially uniform from the bottom to the top by keeping the discharge end of the conduit at the desired distance from the point of deposition of the particles in the forming of the blanket. Forcibly projecting the particles from the conduit in amassed relation, also enables spotting with respect to the place of deposition and thus corners and other crevices in the wall space may be effectively filled.

The 2 to 1 ratio referred to may be accomplished by a reduction of 2 to 1¾ inches for the constriction from a hose diameter of from 2½ to 3 inches. The factor of density is employed not only to provide a blanket which will support the load and thus prevent subsequent settling and voids but to materially increase the insulating efficiency of the blanket as compared to the relatively loosely compacted blanket as produced by the old method.

The wall space is indicated in Fig. 1 at 11. Said space is made up of the structural members of a building wall, said members comprising the studs 12, 12, outer wall formation 13 and the inner wall formation which is composed of lath 14 and an overlapping plaster layer or wall board 15. The conduit is inserted into the wall space 11 at its upper end, an opening 16 being shown in the outer wall member 13 for this purpose. A washer member shown in dotted lines may be used about conduit to close the opening 16 to prevent back pressure and the escape of the insulation material as the blanket is being produced.

As to the modifications shown in Figs. 3 to 7, we may point out that these modifications have to do with the discharge end of the conduit. In Figs. 3 and 4, the nozzle section 5*b* is provided with a nozzle member 17 of a flared or narrow type for use when introducing the insulation material into a brick wall on removing one of the bricks in an upper course. The type of nozzle end shown in Figs. 1 and 2 might be too large in diameter to enter such opening.

Figs. 5 and 6 show a baffle 18 which may be applied to the discharge end of the conduit. The purpose of this baffle is to reduce an excessive upward swirling action which is likely to occur as the compacted mass of particles are projected downwardly into a wall space in the formation of the blanket. An excess of this action is likely to free the impinged fibers at the point of deposition. The baffle 18 comprises an elongated member which extends laterally from the conduit on opposite sides thereof and which member may be provided with holes 19 for free upward passage of the air therethrough. The member 18 may be made of rubber or other desired flexible material to yield on contact with the wall or other objects.

The same result may be accomplished by the structure shown in Fig. 7. Here, the discharge end of the nozzle is provided with a number of perforations 20, 20 disposed in and about the

nozzle, to vent the same of air pressure to reduce excessive eddy currents. The amassing of the particles in the nozzle **5** is indicated at *a*, *a* in Fig. 2. In addition to mineral fibers, the insulation material employed may be ground cork, commuted paper or fragments of other organic substances usable for insulation purposes. The forcible delivery of the particles tends to compress the previously deposited material so as to increase the cohesive and adhesive qualities as well as the density, and may be regulated. Manifestly, more material is used by our process.

The details of construction and arrangement of parts shown and described may be variously changed and modified without departing from the spirit and scope of our invention, except as pointed out in the annexed claim.

We claim as our invention:

The method of building an insulating blanket of dry particles of insulation material within the hollow space of a building wall, ceiling or the like which consists in conveying the particles to the wall space from a source of supply in freely suspended relation in an air stream in a conduit and through a constricted portion of such conduit substantially adjacent its discharge end without disturbing conveyance of the particles therethrough in suspended relation in the air stream and to amass the particles in denser form and increase the velocity of the air flow for the discharge of the particles from the conduit at a force to produce a blanket of sufficient density to substantially reduce subsequent settling and voids.

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