United States Patent

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[54] **METHOD FOR SPRAY-COATING A ROOF WITH A COMPOSITION CONTAINING LIQUID ASPHALT AND FLUFFED ASBESTOS FIBER**
10 Claims, 8 Drawing Figs.

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[50] **Field of Search** ..... 117/27, 32, 33, 168, 30, 92, 137, 126 D; 259/1; 106/282

[56] **References Cited**

UNITED STATES PATENTS

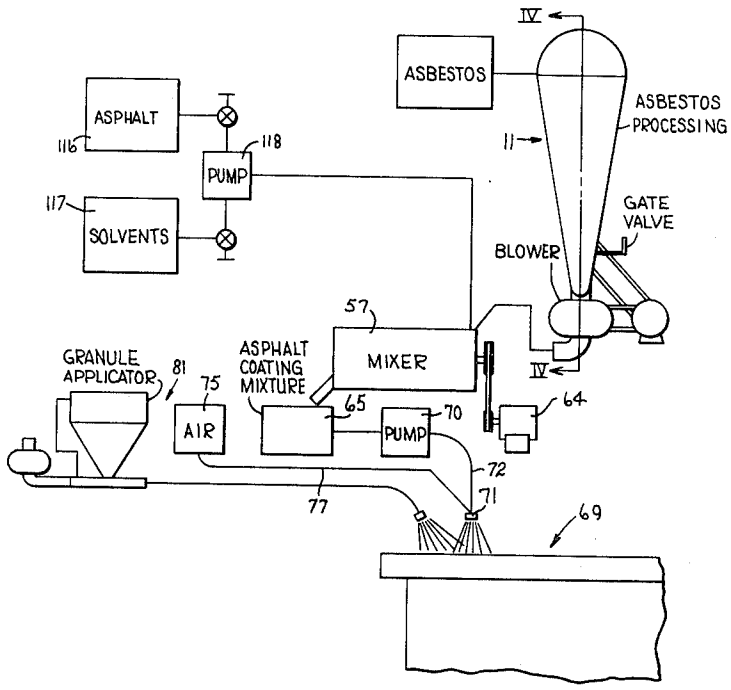
2,782,129	2/1957	Donegan	117/32 X
2,787,557	4/1957	Christensen et al.	117/32 X
2,893,889	7/1959	Schuetz et al.	117/30
3,105,771	10/1963	Simpson et al.	117/32
3,138,897	6/1964	McCorkle	117/32
3,180,783	4/1965	Walker et al.	117/27 X
3,255,031	6/1966	Lodge et al.	117/27
3,305,509	2/1967	Waterman et al.	117/32 X
3,365,322	1/1968	Hinds	117/27 X
3,431,128	3/1969	Jones	117/168 X
1,340,181	5/1920	Oliensis et al.	106/282
2,003,335	6/1935	Black	117/126 D
2,023,675	12/1935	Fisher	106/282
2,131,085	9/1938	Anderton	106/282
2,354,593	7/1944	Greider et al.	106/282
2,396,690	3/1946	Fair	106/282
2,472,100	6/1949	Fair	117/92
2,477,236	7/1949	Buchanan	106/282
2,604,416	7/1952	Dolbey	117/126 D
2,636,834	4/1953	Myers	117/168
2,793,138	5/1957	Wilkinson	117/168
2,847,318	8/1958	Dowlen et al.	117/30

FOREIGN PATENTS

522,694	3/1956	Canada	117/32

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ABSTRACT: A method of covering a surface such as a roof of a building with a coating including a liquid asphalt, diluents for controlling the hardening of the asphalt and granules which are applied to the asphalt while it is in the liquid state. The method is carried out by means of apparatus including a machine for fluffing fibrous material, a machine for mixing the fibrous material with the liquid asphalt and the diluents, and mechanism for moving the asphalt mixture to the surface and applying same evenly thereon. The apparatus also includes a device for moving the granules from a supply thereof to a point near the surface and then spreading said granules evenly over a coating of the liquid asphalt applied to the surface.



METHOD FOR SPRAY-COATING A ROOF WITH A COMPOSITION CONTAINING LIQUID ASPHALT AND FLUFFED ASBESTOS FIBER

BACKGROUND OF THE INVENTION

This invention relates in general to a method of applying a covering to a surface and to the apparatus for mixing certain ingredients of the covering together and thereafter applying the entire ingredients to the surface.

Heretofore, it has been standard practice to heat the asphalt which is combined with small stones to cover a surface, such as a roof. In most instances, the asphalt is heated in a large container and then carried in buckets or the like to the surface where it is spread thereon by some type of manually operated applicator. The asphalt is usually applied to sheet material such as tar paper, sometimes referred to as roof felt, which is placed over the roof boards or other sublayer of the roof structure.

A layer of relatively small stones is then applied to the hot layer of tar so that, when the tar cools and solidifies, the small stones are locked thereto. The small stones serve both to reflect the radiation from the sun and provide greater strength in the roof coating. However, it is well known that this type of roof surface tends to crack in time and thereby permit the seepage of water, resulting in a leaky roof. It is also known that this type of roof structure cannot be safely walked upon because the stones are forced downward through the relatively thin layer of tar so that they puncture the roofing belt and produce leaks. Nevertheless, it is almost impossible to avoid the necessity of walking on such roofs from time to time so that leaks inevitably develop. The obvious cure for such leaks is to recoat the roof, but this cannot always be done because of the excessive weight which is created by an additional coat of the covering. Thus, it is often necessary, in order to stop such leakage, to remove the previous roof covering and replace it with a new one including new roof felt, all of which is very costly.

It is also recognized that the handling of the buckets of hot tar, especially where the roof is relatively high, is dangerous and difficult. Moreover, the conditions under which the workmen must apply the heated tar are usually so uncomfortable that it is difficult to obtain workmen to handle this type of work and to keep them after they have been trained. This work requires a substantial amount of skill and know-how in order to apply the roof materials properly. For example, the tar must be warm enough to provide a good sound bond with the gravel, but not so soft as to permit the gravel to sink completely into the tar where it is in contact with the roof felt.

Generally speaking, roofers have believed that the cold application of an asphalt coating would not produce a satisfactory roof covering. In fact, where liquid asphalt has previously been used in a cold roofing process, the result has been largely unsatisfactory.

SUMMARY OF THE INVENTION

In order to overcome the problems indicated in the foregoing paragraph and produce a surface covering capable of relatively cold application, I first developed a mixture of asphalt, fibers and solvents which could be sprayed upon the surface and which would remain relatively soft and sticky for a predetermined period of time during which granular material could be applied. A number of different types of liquid asphalt, of solvents, both petroleum-base and otherwise, and fibrous materials were tried during years of experimenting. Several machines were developed and tested for handling and moving the various ingredients, including the mixture of asphalt and the materials combined therewith, before the present apparatus was completed.

It was found that the best combination of ingredients includes a steam-reduced, liquid-coating asphalt which is further reduced in viscosity by the use of diluents having a flash point of between 100° and 120° F. Asbestos fibers are fluffed and then mixed with the liquid asphalt. The amount of diluents and asbestos fibers is varied according to (1) the anticipated temperature during the coating operation and (2) the ease with which the coating can be applied. The ingredients also include granules of crushed quartz, crushed slate or the like of relatively small diameter which may have been treated to increase their affinity with liquid asphalt, and they are entrained in a gas stream so that they can be directed in a spray upon the surface after it has been coated with the asphalt and fiber mixture.

Apparatus is provided for mixing the various ingredients in the roof coating, for applying the mixture to the surface and for moving the granules from the supply to the coated surface.

Applicant believes that in his overall method the mixing of the specific quantities of ingredients is important because of the effect that temperature and timing have upon the success of the method. That is, the quantity and type of the ingredients for the asphalt coating are dependent upon individualized conditions which usually vary substantially from one job to the next.

Accordingly, a primary object of the invention has been the provision of a method for applying a covering to a surface wherein said covering includes a cold mixture of liquid asphalt and other materials which is applied to said surface followed by the application of small granules to the coated surface in a thin, even layer.

A further object of this invention has been the provision of an apparatus for carrying out the aforesaid method whereby the ingredients of the asphalt coating are mixed to produce a manageable material capable of being applied in a spray under conditions of widely varying temperatures and wherein the granules can be moved by gas entrainment in a stream from a supply to a point spaced a very substantial distance from such supply.

Other objects of the invention will become apparent upon reading the following descriptive material and examining the accompanying drawings, in which:

FIG. 1 is a schematic illustration of the complete apparatus utilized in carrying out the method of the invention.

FIG. 2 is a side elevational view of a device for applying the granules to a coated surface, a fragment of which is included.

FIG. 3 is a sectional view taken along the line III—III in FIG. 2.

FIG. 4 is a sectional view taken along the line IV—IV in FIG. 1.

FIG. 5 is sectional view taken along the line V—V in FIG. 4.

FIG. 6 is a central sectional view of a nozzle.

FIG. 7 is a cross-sectional view of a modified nozzle.

FIG. 8 is a central sectional view of the mixer appearing in FIG. 1.

For convenience in description, the terms "upper," "lower" and words of similar import will have reference to the apparatus as appearing in FIG. 1. The terms "inner," "outer" and derivatives thereof will have reference to the geometric center of the various devices which form a part of said apparatus.

DETAILED DESCRIPTION

Apparatus Of The Invention

The apparatus for applying a cold, waterproofed covering or coating to a surface such as the roof of a building includes (FIG. 1) supply containers for the liquid asphalt, the diluents and the asbestos. The apparatus also includes a device for the processing of asbestos, a device for the mixing of various ingredients and devices for applying the asphalt coating and granules to the surface. The structure of the apparatus for carrying out the present invention will be described first.

The shredding machine or device 11 (FIGS. 5 and 6) for processing or fluffing asbestos includes a hopper 12 having a pair of V-shaped end walls 13 and 14, a pair of rectangularly shaped and downwardly converging sidewalls 16 and 17 and a top door 18 which is pivotally connected by hinge 19 to the

upper end of wall 17. Hopper 12 may be constructed of any suitable material, such as sheet metal.

Device 11 also includes a plurality (here three) of beaters or rotors 23, 24 and 26. Beater 23 has a shaft 27 rotatably mounted upon end wall 14 by the bearing 28. A disk 29 is disposed in locked engagement upon the leftward end of shaft 27 and has a bar 31 secured to its periphery and is parallel with shaft 27. The beaters 24 and 26 are substantially identical to rotor 23 with the exception that their respective disks 32 and 33 are of progressively lesser diameter. Pulleys 34, 36 and 37 are mounted in driving engagement upon the rightward ends of the respective shafts 27, 38 and 39.

A gate valve 42 (FIG. 4), which controls the discharge of material through the lower end of the device 11, is disposed beneath rotor 26 and is comprised of a pair or guides 43 and 44 and a slideable plate 46 mounted therein. A positive displacement pump or blower 47 has its inlet arranged in communication with the zone 48 beneath the valve 42. The pump 47 is driven through the belt 52 (FIG. 5) and a double-grooved pulley 49 by electric motor 51. Pulley 49 is also drivingly connected to pulley 37 by belt 53. Pulley 37A on shaft 39 drives pulley 36 by belt 54, and pulley 36A on shaft 38 in turn drives pulley 34 by belt 56. Pulleys 34, 36 and 37 are so selected that rotor 23 turns at a relatively slow rate, such as 60 r.p.m., rotor 24 turns at an intermediate rate, such as 100 r.p.m., and rotor 26 turns at a rapid rate, such as 200 r.p.m. However, other rotational speeds may be found advantageous. The pump 47 draws the fluffed asbestos from the zone 48 and delivers same to the mixer 57.

This mixer 57 (FIG. 8) has a cylinder or drum 58 in which a shaft 59 is concentrically and rotatably mounted, as by bearings 61 and 62. A plurality of rods or arms 63 radiate from shaft 59, said shaft being rotatably driven at a relatively slow rate, such as 200 r.p.m., by an electric motor 64. The mixer is provided with appropriate inlets 66 and 67 for receiving asphalt and asbestos, respectively, and an outlet 68 for discharging the mixture.

Apparatus for applying the mixture from mixer 57 (FIG. 1) includes a storage drum 65 and a pump 70 for moving the coating material from said drum to the work area 69. The coating is applied by a nozzle 71, such as illustrated in FIG. 6, which is connected to said drum by a conduit 72. The nozzle 71 includes a barrel 74 into one end of which a second conduit 77 extends from a source 75 of compressed air. A plug 73 is disposed in the end of conduit 72 adjacent barrel 74 and is provided with at least one diagonal and eccentric opening 76. The compressed air moves into chamber 78 with a cyclone action where it entrains the incoming coating material and reduces it to small droplets which also travel in a cyclonelike movement. A nipple 79 may be secured in the other end of barrel 74 to control the dispersion of the droplets during their application.

The granule applicator 81 (FIGS. 2 and 3) has a hopper 82 which may be mounted on a trailer bed 83 by a frame 84 which has a ring 86 supported by a plurality of legs 87. Hopper 82 includes a lower conical wall 88, a cylindrical central wall 89 and an upper frustoconical wall 91 having an upwardly opening, cylindrical rim 92. A cover 93 is pivotally mounted on hopper 82, as by hinge 94, adjacent the upper edge of wall 89. Said hopper 82 may in the preferred embodiment be from 3 to 5 feet high and from 3 to 5 feet in diameter.

A metering device 96 is connected to the lower end of the conical wall 82, and it has a body portion 97 with a vertical passageway 98 which communicates with opening 99 in the lower end of the conical wall 88. Body portion 97 has a horizontal slot 101 in which gate 102 is slideably received to control the central passageway 98. A guide and locking member 104 holds the gate 102 in a selected position to control the rate of material flow through passageway 98, which feeds through an opening 106 into a rigid pipe 107. In the preferred embodiment, said pipe 107 is about 2 inches in diameter.

Applicator 81 is connected to a positive pressure blower 108 capable of providing pressure in excess of 1 pound per square inch. The blower 108 feeds air under pressure through a conduit 109 into a vertical conduit 111 which communicates with the upper portion of hopper 82 through the wall 89. The conduit 109 also feeds into horizontal conduit 112 which leads into the rigid pipe 107 thereby providing selected balancing of pressure between the upper end of the hopper 82 and the conduit 107 which eliminates clogging and bridging of the granular material. A length of plastic tubing 113 extends from pipe 107 to the work area 69. Said tubing 113 is preferably 1½ inches in diameter and it is fabricated from a self-lubricating type of plastic. A short section of flexible rubber hose 114 may be provided adjacent the end of tubing 113 to act as a directional control.

Method Of The Invention

The method of the present invention concerns the preparation and application of a surface-coating material including asphalt and an aggregate. The coating material is comprised of a liquid asphalt, diluents or solvents and fluffed asbestos fibers. The liquid asphalt may be of a type which is steam-reduced and in which the viscosity is further reduced by naphtha, or some other petroleum diluents having a flash point of between 100° and 120° F., such as kerosene and oleum spirits, for example.

The asbestos fibers may be prepared by processing an asbestos material, such as Johns Manville 7M asbestos shorts, in the aforedescribed device 11 where the asbestos fibers are whipped and fluffed by beaters 23, 24 and 26.

Liquid asphalt and diluent are pumped from suitable storage tanks 116 and 117, respectively (FIG. 1), by pump 118 to the mixer 57 where they are combined with the fluffed asbestos which is supplied in proper proportions from the machine 11. The amount of fluffed asbestos fibers in the mixture is dependent upon the ambient temperature in the area where the roof coating is to be applied. For example, at a temperature of 45° F., it was discovered that 0.6 pounds of asbestos fibers per gallon of liquid asphalt was satisfactory, whereas at 90° F., the preferable ratio is 1.6 pounds of fibers to a gallon of liquid asphalt. The liquid asphalt and the asbestos fibers may be premixed and stored in drums until needed for application. In order to control the drying rate and consistency of the coating, a suitable quantity of diluent or solvent is included in the mixture, naphtha, oleum spirits or kerosene being satisfactory. The amount of diluent required is also dependent upon the ambient temperature and a setting time of about 20 minutes has been found desirable. If the ambient temperature is approximately 50° F., 1 percent of kerosene is sufficient whereas if the ambient temperature is approximately 90°, 15 percent of the mixture should be kerosene. The kerosene solvent can be added just prior to application of the roofing mixture, or graded mixtures suitable for various condition may be premixed and stored in airtight containers.

At the time of application, the asphalt coating mixture, suitably diluted, is forced by a positive pressure pump through a high-pressure neoprene hose from which it may be applied to the roofing area by use of the aforedescribed nozzle. A layer of said mixture is first applied to the surface to be roofed, such as in a strip 6 feet wide and at a rate of about 6 square feet in 3 to 6 seconds, after which quartz granules are blown from the applicator 81, thus forming a layer which both insulates and protects the covered surface. It has been found that about 3 gallons of the asphalt mixture per 100 square feet provides a good coating. The aggregate may be a crushed quartz which has been immersed in a water-soluble dye, drained and baked at a minimum of 700° F. This treatment will increase the adherence of the granules to the asphalt. The granules are desirably of random sizes and shapes in the range of from about one-eighth inch in diameter down to a particulate size of several thousandths of an inch. This random sizing of the

granules permits the formation of a granular layer which effectively forms a shield for the underlying asphalt. A layer of about 0.4 pounds of such granules per square foot has been found desirable. However, a range of from 0.3 pounds to 0.5 pounds per square foot may be satisfactory if properly applied. The asphalt coating material serves both as a sealant to prevent leakage of the roof and as a bonding agent to retain the quartz granules.

Although a particular preferred embodiment of the invention has been disclosed above for illustrative purposes, it will be understood that variations or modifications thereof which lie within the scope of the appended claims are fully contemplated.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A method of forming a weatherproof coating on the roof surface of a building by applying a liquid coating composition directly to said roof surface, comprising the steps of:

providing a fluent roofing asphalt comprising a mixture of asphalt and diluent, said diluent consisting of a petroleum distillate having a flash point of at least approximately 100° F., the amount of said diluent being sufficient to permit the asphalt-diluent mixture when applied to the roof surface to remain soft and sticky for a determined time;

beating asbestos fibers into a fluffy condition so as to cause separation of the fibers; then

moving the fluffed and separated fibers into contact with the asphalt-diluent mixture while simultaneously mixing the fluffed asbestos fibers with the asphalt-diluent mixture to form a homogeneous flowable roof-coating composition, the amount of asbestos fibers added being in the range of from approximately 0.6 pound per gallon to approximately 1.6 pounds per gallon of the asphalt-diluent mixture;

spraying the flowable homogeneous roof-coating composition directly onto the roof surface of a building to form thereon a thin layer of said coating composition of substantially uniform thickness, the coating composition when applied on the roof surface being substantially at the ambient temperature in the region of the roof surface;

providing a supply of roofing granules having an average maximum size not materially in excess of one-eighth inch in diameter; and

while the layer of coating composition is still soft and sticky, applying said roofing granules evenly upon the layer of coating composition at a rate of from approximately 0.3 to 1.0 pound of granules per 1 square foot of the roof surface treated whereby the granules become embedded in, bonded to, and completely cover the layer of coating composition to form a granular layer which both insulates and protects the layer of coating composition.

2. A method according to claim 1, wherein the amount of asbestos fibers varies directly with the ambient temperature from approximately 0.6 pound per gallon at an ambient temperature of approximately 45° F. to approximately 1.6 pounds per gallon at an ambient temperature of approximately 90° F.

3. A method according to claim 1, wherein the homogeneous coating composition is sprayed against said roof surface at such a rate that approximately 6 square feet of the roof surface are covered in from 3 to 6 seconds.

4. A method according to claim 1, wherein the coating composition is sprayed onto the roof surface at a rate of approximately 3 gallons per 100 square feet of roof surface.

5. A method according to claim 1, wherein a petroleum distillate is mixed with the roofing composition to compensate for the ambient temperature to cause the roofing composition to remain soft and tacky for a determined time, the amount of petroleum distillate being in the range of approximately from 1 percent to 15 percent by volume of the roofing composition, varying from approximately 1 percent diluent at an ambient temperature of 50° F. to approximately 15 percent diluent at an ambient temperature of 90° F.

6. A method according to claim 1, wherein the petroleum distillate is selected from the group consisting of kerosene, oleum spirits and naphtha.

7. A method according to claim 1, wherein the amount of diluent is selected to cause the coating mixture to set within approximately 20 minutes after being sprayed on the roof surface.

8. A method according to claim 1, wherein the roofing granules are of random sizes and shapes, including granules of extremely small size, to permit the formation of a granular layer which effectively forms a shield over the underlying layer of coating composition.

9. A method according to claim 1, wherein the roofing granules comprise a granulated material of crushed quartz or crushed slate.

10. A method according to claim 1, wherein the roofing granules are intermixed with a gaseous stream and are sprayed onto the layer of coating composition when the coating composition is still in the soft and sticky condition.

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