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MEANS FOR APPLYING A LIQUID MATERIAL TO A SURFACE

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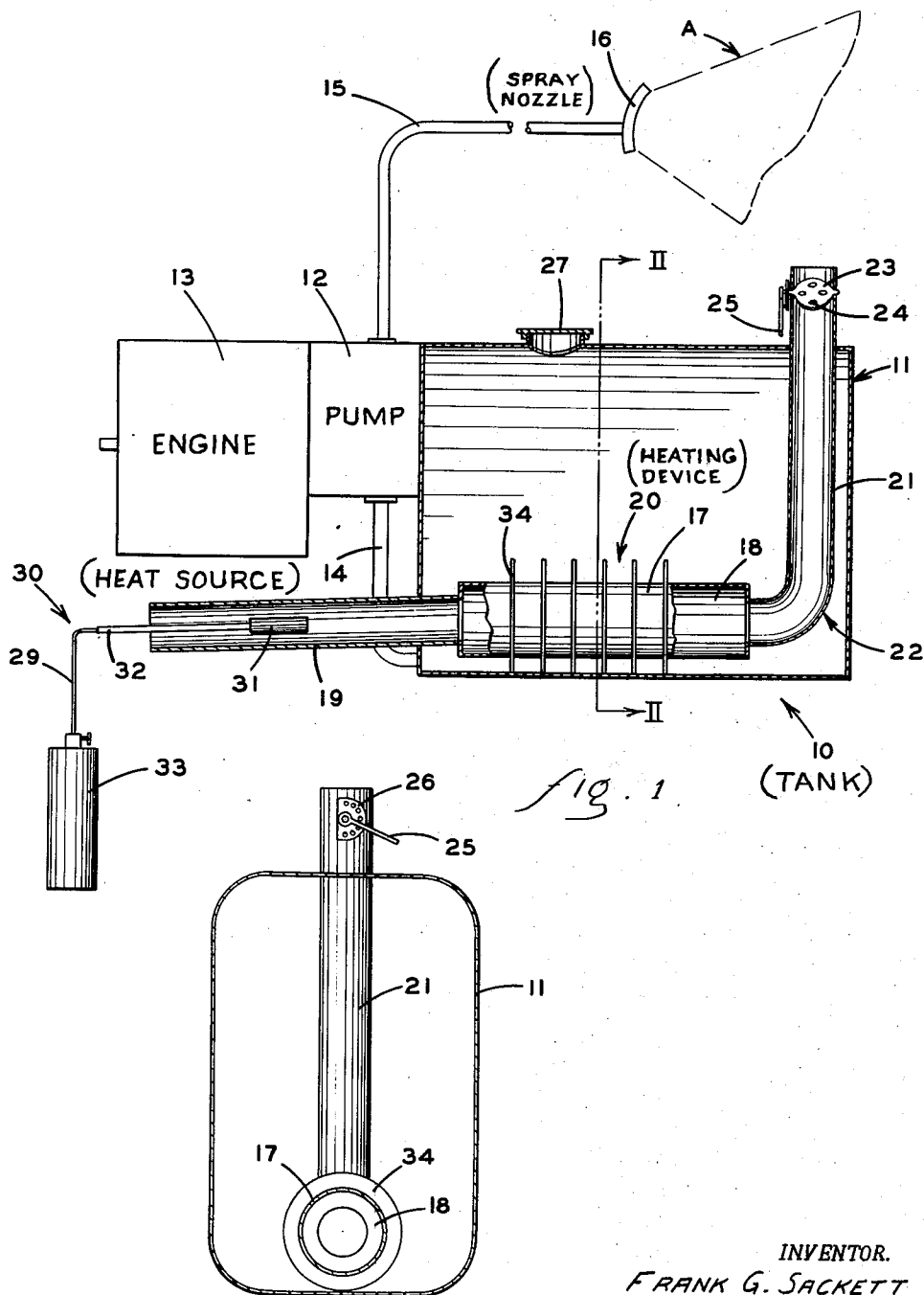


fig. 1

fig. 2

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MEANS FOR APPLYING A LIQUID MATERIAL TO A SURFACE

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1 Claim. (Cl. 299—35)

This invention relates in general to an apparatus and method for applying to a surface a quick drying, liquid material which has a high viscosity when cool and evolves inflammable fumes becoming explosive when mixed with air. More particularly, this invention relates to a device whereby such material can be safely heated to reduce its viscosity for application to such surface by spraying.

Persons acquainted with the use and application of tar or asphalt base paint or coatings have long recognized that the viscosity of such materials increases very substantially with a moderate reduction in temperature. However, it is also well known that such materials provide excellent protective coatings which are water repellent and corrosion resistant. As used herein, the term "materials" will refer to said tar or asphalt base coatings.

The high viscosity of such materials, when cool, renders their application very difficult, even with a brush, to such as the outside walls of a foundation or the interior walls of a silo. Thinners, such as hydrocarbon mixtures, are often added to such materials in an effort to reduce their viscosity. However, the materials are ordinarily prepared with the maximum permissible amount of such thinner as part of their ingredients. Thus, additional thinner reduces, if not destroys, the adhesive qualities of the material and increases their lethal characteristics. Particularly, where natural rubber is mixed with such material, the additional thinner will even destroy the protective value of the coating.

Since heating such materials over an open flame is out of the question, the user must ordinarily wait until the weather conditions are favorable to apply the coating. Even under the most favorable conditions of high outside air temperature, the material is too thick to be sprayed effectively in its original prepared form. Therefore, it is usually applied with a brush.

Brushing such a coating on a large surface is not only extremely time consuming and costly, but is not satisfactory. The brush tends to wipe the coating off the high spots on a surface, such as concrete, thereby defeating the purpose of the coating. Further, if the coating must be made in a confined zone, such as on the interior walls of a silo, the fumes become highly dangerous. Such fumes are not only highly explosive, but noxious also. Thus, the painter must take frequent rests from his work to avoid being overcome. Where additional thinner is used to reduce the viscosity of the material, the fumes increase.

By way of example, applying such material with a brush to the inner wall of a standard 12' by 50' silo requires in excess of 10 hours by one man. During this time, he is continuously exposed to a fatal explosion of the fumes, or being overcome by the fumes and suffering a fatal fall.

Silos, for example, must be coated when they are empty, which occurs only during limited periods each year. Thus, according to present methods and means, the owner of a silo must elect between waiting for hot weather or accepting a thinned coating which in most known instances

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is unsatisfactory. In either case, the material is applied by brush at a very high cost. As a third alternative, the silo can be used uncoated. The acid from the silage will then corrode the silo and greatly reduce its useful life. An uncoated metal silo, for example, will corrode through in two or three years, particularly if hay is stored therein. A concrete silo will last a little longer. Where the walls are properly coated, the same silos will remain completely usable for many times as long.

Thus, present methods and means for applying such materials have greatly retarded their use because: they can be applied only during very warm weather; they must be applied by brush which is very costly and dangerous to the worker; and the resulting coating is often unsatisfactory even though applied under the most favorable weather conditions.

Accordingly, a primary purpose of my invention has been to provide a method, and apparatus therefor, whereby said materials can be quickly and satisfactorily applied to a surface regardless of the temperature of the outside air and without changing the ingredients or desirable characteristics of the material as prepared and delivered for use.

A further object of this invention is the provision of a method and means, as aforesaid, whereby said materials can be applied by spraying without exposing the workman to the dangers incident to the present methods and means of such application.

A further object of this invention is the provision of a mechanism or apparatus for reducing the viscosity of the coating material by heating it so that it can be sprayed upon said surfaces in a fraction of the time required to paint such surfaces with said coating, without exposing the fumes of the material to the source of such heat in a dangerous manner, without exposing the workman to the noxious effects of the fumes and without adding more dangerous amounts of thinner to the material, which thinner decreases its adhesion and attacks its desirable properties and characteristics.

A further object of this invention is the provision of a mechanism, as aforesaid, which is easy to operate, simple to produce, effective in operation, greatly reduces the cost of applying the coating to a surface and makes possible such application under otherwise adverse temperature conditions.

Other objects and purposes of this invention will occur to persons familiar with this type of equipment upon reading the following specification and examining the accompanying drawings in which:

Figure 1 is a partial, vertical, central cross-sectional view of my invention.

Figure 2 is a sectional view substantially as taken along the line II—II of Figure 1.

In meeting the objects and purposes set forth above, as well as others related thereto, I have devised a method which may be carried out by means of an apparatus comprising a tank for containing the coating material in a liquid form and an engine driven pump connected to said tank for moving said liquid therefrom into a hose or other conduit connected to said pump. A heating device comprising a heating chamber is disposed within said tank and provided with an inlet pipe and an outlet stack. Means is provided for introducing heat into said inlet pipe.

Construction

As shown particularly in Figure 1, the apparatus or mechanism 10 is comprised of a tank 11, pump 12 and engine 13 interconnected and intersupported in a conventional manner for easy transport, as on a truck bed (not shown). The pump is driven by the engine 13 to remove said liquid from the tank 11 through the suction conduit 14 and force said liquid through the hose 15

to a spray head or spray nozzle 16. The engine 13 is connected to the pump 12 by suitable, conventional clutch means, not shown, whereby said pump can be started and stopped alternatively at the will of an operator. The tank 11 may be of any size or shape as desired or required, but in this particular embodiment a 400 gallon tank is used. The engine 13 may be of any suitable type, but in this embodiment is gasoline driven and connected to the pump 12. The pump 12 likewise may be of any convenient, conventional type for transferring liquid and urging it into the hose 15 under a pressure, in this embodiment, of between 600 and 800 pounds per square inch. The hose 15, having a ¾ inch diameter, was found satisfactory with one type of material. The spray head 16 utilized in this example, provides a relatively narrow but long spray pattern, about as indicated by the dotted lines A.

An elongated casing 17, which defines the heating chamber 18 of the heating device 20 is provided in the tank 11 and runs lengthwise thereof substantially from one end to the other thereof. A cylindrical casing approximately 8 inches in diameter was found satisfactory for operation with said 400 gallon tank in one particular installation. An inlet pipe 19 is connected, as by welding, to that end of the casing 17 adjacent the pump 12 and communicates with the chamber 18 therein. Said pipe extends from said casing, through a suitable opening in the tank 11, substantially beyond the outside of said tank. Said inlet pipe 19 is firmly secured, as by welding, to said tank at the point of passing therethrough to prevent leakage. A stack 21 is connected to the other end of the casing 17 and communicates with the heating chamber therein. Said stack 21 is provided with a 90 degree bend at 22, the remainder and major portion of the stack 22 extending vertically up through the tank 11 and extending slightly beyond the upper surface thereof. As in the case of the pipe 19, the stack 21 is secured to the tank at the point of its extension therethrough and is also secured to the casing 17, as by welding.

In this particular embodiment it has been found satisfactory to provide inlet and stack pipes having an outside diameter of approximately 6 inches each. For reasons appearing hereinafter, the inlet pipe is preferably constructed of very heavy gauge material. The casing 17 and the stack 21 may be constructed of relatively lighter gauge material. However, in each instance the gauge of the material is adequate to withstand the temperature to which the part is exposed and that is the principal limiting factor, if any. In this embodiment the gauges of the pipe stack and casing are substantially the same.

It will be recognized that the particular dimensions recited with respect to the casing 17, the inlet pipe 19 and the stack 21 are for illustrative purposes only and represent such sizes in a particular mechanism presently and satisfactorily in operation.

That portion of the stack 21 extending above the tank 11 is provided with a stack damper 23 having a butterfly valve which is provided with a plurality of openings 24. The damper is pivoted in the stack in a conventional manner and provided with the control arm 25 and position quadrant 26, as shown in Figure 2, in a conventional manner.

The heat source 30 is comprised of a heating torch 31 attached to a wand or handle 32 which in turn is connected by an appropriate conduit 29 to the fuel reservoir 33. In this particular embodiment the reservoir is portable and carries about 5 gallons of fuel, such as gasoline.

Radiation fins 34 may be provided around the casing 17 and secured, as by welding, thereto for increasing the surface to which the liquid in the tank 11 may be exposed during the heating thereof. As indicated, the liquid in the tank 11 is free to circulate completely around

the casing 17 and those portions of the inlet pipe 19 and stack 21 disposed within said tank 11. Any excess heat, not utilized in the heating chamber 23, will be radiated to a considerable extent by the stack 25 to the liquid material surrounding said stack. Thus it becomes important for a substantial portion of the stack to be within the tank 11.

The tank 11, inlet pipe 19, stack 21 and fins 34 may be fabricated from any convenient, conventional metal, such as steel, which will withstand the temperatures to which they are exposed during normal operation, and which will transfer heat effectively.

The particular apparatus 10, described hereinabove, is, and has been, used for reducing to practice my improved method in a very satisfactory manner.

Operation

In carrying out my method, which necessitates the operation of a mechanism in the nature of that hereinabove described, I first fill the tank 11 through the filler port 27 with liquid coating material, such as the tar or asphalt base coating mentioned hereinabove. I then ignite the torch 31 and place it in the inlet pipe 19. The damper 23 is preferably preset in a position suitable to get the best draft commensurate with the least amount of heat loss. The perforations or openings 24 in the damper 23 prevent a blow back or blow out of the torch 31 in the event that the damper 23 has inadvertently been left completely closed at the beginning of the operation.

The fire from the torch 31 passes through the inlet pipe 19 into the heating chamber 18 where, due to the larger size of the casing 17, said fire expands and, through turbulence, circulates throughout the heating chamber instead of passing directly therethrough and up the stack 21. This heat is transmitted by radiation through the casing, and by means of the fins 34 where used, into the liquid material surrounding said casing 17 within the tank 11. After proper resetting of the stack damper 23, if required, no further attention need be given to the device 20 until the material is properly heated.

After a reasonable period of time, depending upon the temperature of the outside air and the liquid material in the tank 15 when the heating process begins, said liquid becomes sufficiently reduced in viscosity for application. Usually, such heating requires from 15 to 30 minutes and can be accomplished while the apparatus is being moved from one job site to the next. Thus, under normal circumstances, no time is lost while the material is being heated. Movement of the apparatus 10, as by a truck, develops a considerable suction in the stack 21 as the air rushes past its open, upper end. Normally, such suction would extinguish the flame produced by the torch. However, the perforated damper provides adequate draft at speeds up to 60 miles per hour without adversely affecting the torch flame or the heating action.

When the material is properly heated, as to about 140° or 150° F., the engine 13 is started. The material now flows freely and easily through the conduit 14, the pump 12, the hose 15 and out of the spray nozzle 16, upon the urging of the pump 12. As stated above, starting and stopping of the pump, hence such flow, may be controlled by conventional clutch means. If the weather is unusually cold, the torch 31 may be continued in operation to provide additional heat to the liquid material in the tank 15 during the spraying operation. However, under normal circumstances, the preliminary heating is sufficient to keep the material in the tank 15 adequately warm during the spraying operation. In a normal spraying operation of the interior walls of a 12' by 50' silo, for example, the spray application of the coating material requires between 10 and 15 minutes, including the time required for the workman to change his position from the

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bottom of the silo to the top of the silo, or vice versa, in covering all of the inner, walled area. Thus, even under the most adverse weather conditions, the time required for the spraying operation is so short as to permit only a negligible drop in temperature of the material within the tank 15.

It has been found upon examination of wall coated in the above manner that an even coating of substantially the same thickness throughout the interior wall of the silo can be applied with ease and within the short time periods mentioned above.

By practicing my method with the apparatus described herein, it is possible to accomplish safely the same amount of work in a matter of minutes which, under present methods, requires many hours of dangerous and generally unsatisfactory work for the reasons stated hereinabove. It will be recognized that the specific structure described herein represents one particular, preferred mechanism whereby my method can be practiced and that other similar mechanisms could be devised for practicing the same method. It is also pointed out that no changes have to be made in the form of the liquid coating material as prepared and delivered for application by my method and means. Thus, said material retains all of its desired characteristics and properties which make the ultimate results highly satisfactory.

Accordingly, although I have described a particular apparatus for practicing my method, it will be recognized that modifications of structure can be made within the purview of this invention without departing from the scope thereof and the appended claim will cover such modifications unless they specifically state to the contrary.

I claim:

An apparatus for applying a quick drying, highly viscous and undiluted liquid asphalt material to a surface located at a substantial distance from the means containing the asphalt material, the combination comprising: tank means defining a chamber for said asphalt; an elongated, substantially horizontal casing defining a heat-

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ing compartment within said chamber near to, and spaced from, the lower wall thereof; a plurality of spaced fins embracing said casing and extending outwardly therefrom into said chamber; an exhaust stack communicating with one end of said compartment and extending upwardly through, and out of, said chamber; an inlet pipe communicating with the other end of said compartment and extending out of said chamber, said stack and said pipe being substantially smaller in cross-sectional areas than said compartment, and said stack and said pipe combining with said compartment to form a single, L-shaped passageway disposed substantially completely within said chamber, whereby a maximum heat transfer and a gravity draft are effected; heat generating means, including a gasoline burning torch mounted upon an elongated handle, removably insertable into the extended end of said pipe for introducing heat into said compartment; a perforated damper mounted in the upper end of said stack for controlling the draft through said passageway; a pump capable of developing a pressure in excess of 600 p. s. i., and conduit means connecting said input of said pump to the lower end of said tank; an elongated, flexible conduit connected at one end to the output of said pump; a spray nozzle connected to the other end of said flexible conduit; and an engine drivingly connected to said pump and capable of causing said pump to develop a pressure in excess of 600 p. s. i. at said nozzle.

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