Nov. 11, 1958 J. D. HOBDY 2,859,728

SPRAY NOZZLE

Filed Aug. 29, 1956 2 Sheets-Sheet 1

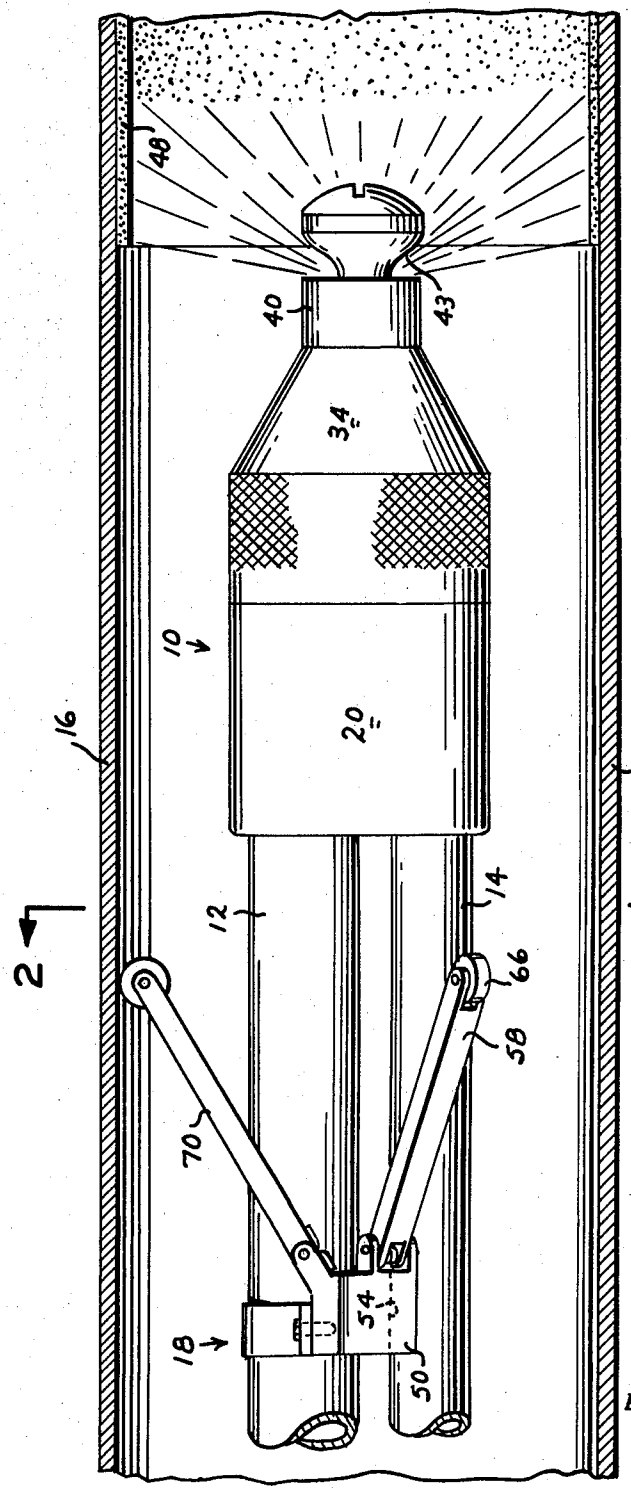

FIG. 1

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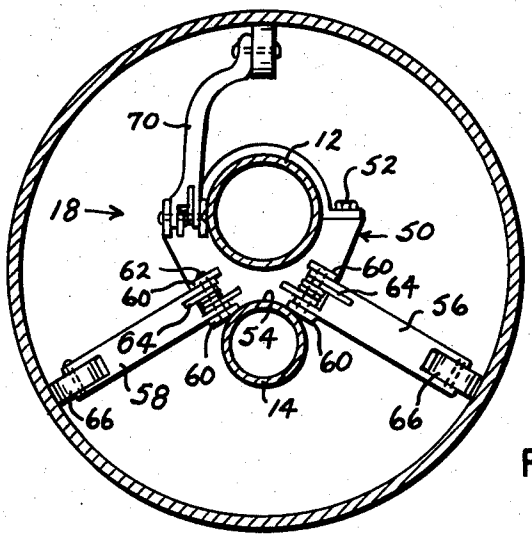

FIG. 2

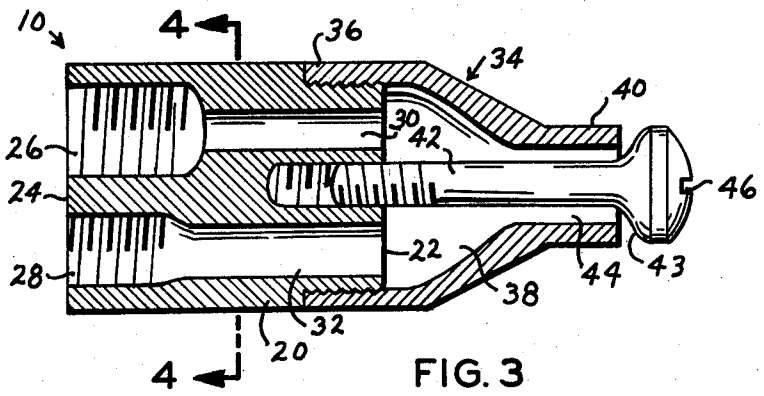

FIG. 3

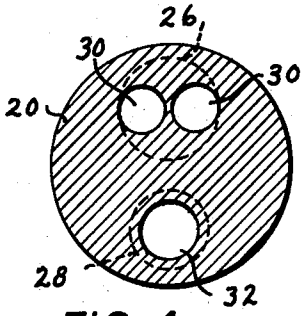

FIG. 4

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SPRAY NOZZLE

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2 Claims. (Cl. 118—306)

The present invention relates to spraying apparatus, and more particularly to a device for spray coating the interior of tubular members, such as pipe.

It is often desirable to coat the interior surface of pipe for one or more of the following reasons: to resist corrosion and contamination or abrasion; to prevent solid deposits on the pipe wall resulting in wall turbulence; and to minimize friction and thus carrying as great a volume as possible.

Heretofore an effort has been made to coat the interior surfaces of pipe by rolling, which requires manually placing a quantity of the coating materials within the pipe and then tilting the pipe while slowly turning the same, as the material rolls down the tilted angle of the pipe. The objection to this method of coating, in addition to the increased cost of handling and labor, lies in the fact that the coating materials must be diluted considerably to maintain a fluid consistency during the time-lapse required for rolling the pipe, which results in the coating having poor cohesive and adhesive qualities, and its being full of laps, pin holes and sags or runs. This method of application often produces an uneven coating, there being portions where there is an excess of coating material and other portions where there is insufficient coating material, and a consequent resulting loss of tensile strength caused by the coating sheet frequently flaking off of the coating.

It is therefore the principal object of this invention to provide an apparatus for evenly spray-coating the interior surfaces of pipe.

Spray coating the interiors of pipe by pneumatic means is not new; but the devices for this purpose, as revealed by the prior art, are without practical success when attempting to coat the pipe with coal tar which is one of the principal and preferred materials. Each of the devices, as revealed by the prior art, is constructed in such a manner that it will spray only those materials which have been thinned considerably with a solvent. Even when liquified by a solvent to a desired spraying consistence, coal tar has a viscosity which precludes its use in any of the conventional spray nozzles presently available for the reason that the tar clogs the openings within the spray head.

It is therefore a similarly important object of this invention to provide a spray nozzle, such as the present device, which will easily spray coal tar.

Another object is to provide a device of this class which features an outlet for forming an annular spray.

Another object is to provide a device of this class which may be easily adjusted for regulating the thickness of each coating application of the materials, as desired.

Another object is to provide a device of this class which is substantially self-centering within the section of pipe while being progressively moved therethrough during the spraying operation.

An additional object is to provide a device of this character which has a minimum of working parts to become worn or out of order, and which may therefore be manufactured at a relatively lower cost.

Still another object is to provide a spray nozzle of this nature which may be easily disassembled for cleaning.

The present invention accomplishes these and other objects by providing a substantially cylindrical body having a hollow converging forward end portion forming a mixing chamber and having an open mouth at the forward end. The body is further provided with longitudinal bores opening into the mixing chamber. An adjustable spray deflector is centrally carried by the body in concentric relation within the mixing chamber and projects forwardly of the open mouth end. Tubular conductors threadedly connected to the longitudinal bores at the rearward end of the body convey spray materials and air, under pressure, to the mixing chamber. A carriage connected to the conductors and having spring loaded supporting arms and rollers, maintains the spray body aligned axially within the pipe to be coated.

Other objects will be apparent from the following description when taken in conjunction with the accompanying two sheets of drawings, wherein:

Figure 1 is an elevational view of the device in operation within a length of pipe, the pipe being shown in cross section;

Figure 2 is a vertical cross sectional view taken substantially along line 2—2 of Fig. 1;

Figure 3 is a horizontal cross sectional view of the spray nozzle, per se; and,

Figure 4 is a vertical cross sectional view taken substantially along line 4—4 of Fig. 3.

Like characters of reference designate like parts in those figures of the drawings in which they occur.

In the drawings:

The reference numeral **10** indicates, as a whole, a spray head or nozzle operatively connected to a pair of tubular conductors **12** and **14**. The conductors **12** and **14**, and the nozzle **10**, are axially supported within a pipe **16** by a carriage indicated generally at **18**.

Referring now to Figs. 3 and 4 it may be seen that the nozzle comprises a substantially cylindrical body **20** having parallel forward and rearward ends **22** and **24**, respectively. The body is bored a selected depth from its rearward end **24** to form a large bore **26** and smaller bore **28** both offset with relation to the longitudinal axis of the body. The body **20** is drilled from its forward end **22** to form two longitudinal parallel smaller bores **30** which communicate with the large bore **26**. The bore **28** is reduced in diameter and is extended through the forward end **22** of the body, as at **32**. The larger bore **26** carries the spray materials, preferably coal tar, and the purposes of the two smaller communicating bores **30** are to convey this fluid through the body **20** in spaced relation with its axis, for the reasons which will presently be apparent. A reducer or tapered sleeve **34** has its larger end portion **36** threadedly connected to the forward end portion of the body **20**, thus forming a forwardly converging mixing chamber **38** forwardly of the body. The reduced cylindrical end **40** of the sleeve **34** is thus disposed forwardly of the body **20** and forms an open mouth end for the mixing chamber in axial alignment with the body **20**. An elongated rod-like nozzle head **42** is threadedly connected axially to the forward end **22** of the body by a threaded perforation, and extends forwardly through the mixing chamber **38** and the open mouth end **40**. The free end of the nozzle head **42** is provided with an annular arcuately flared surface **43** adjacent the open mouth end **40**. Externally the larger end **38** of the sleeve is substantially equal with the periphery of the body **20** and the wall thickness of the sleeve is such that the end of the mixing chamber **38** adjacent the forward end **22** of the body is greater than the combined distance across the bores **30** and **32** to permit free entry of spray fluid, coal tar, and air, into the mixing chamber. Diametrically the

size of the open mouth end 40 is such that the nozzle head 42 axially disposed therein forms a partially restricted 360° passageway 44. However, it is to be understood that this passageway 44 is sufficiently large to permit free flow of spray fluid, such as coal tar, therethrough. A screw driver slot 46 is provided on the forwardly projecting free end of the nozzle head 42 for longitudinally adjusting the same to regulate the opening between the forward end of the passageway 44 and the flared surface 43. This adjustment increases or decreases the volume of materials forced therethrough, as desired, and thereby determines thickness of each coating 48 as the same is applied to the pipe, Fig. 1. The passageway 44 may be entirely closed by simply screwing the nozzle head inwardly until the flared surface 43 is seated against the open end 40.

The conductors 12 and 14 are threadedly engaged within the respective bores 26 and 28 and extend rearwardly therefrom in parallel relation. The rearward end of the conductor 12 is operatively connected to a supply of coal tar, or the like, not shown. Similarly, the rearward end of the conductor 14 is operatively connected to a supply of compressed air, not shown. Control valves, not shown, associated with each respective conductor, regulate the flow of coal tar and air, or the like, through the conductors 12 and 14 to the spray head 10.

The supporting means or carriage 18, which movably supports the conductors and centers the spray nozzle 10 within the pipe, comprises a holder or clamp 50 in the form of a split band which encircles the conductor 12 adjacent but spaced from the nozzle 10, and is held thereon by bolts 52. An arcuate recess 54, in the lower portion of the clamp 50, co-operatingly receives a peripheral portion of the conductor 14 therein. As seen in Figs. 1 and 2, a pair of support arms 56 and 58 having bifurcated ends, are pivotally connected between bosses 60 by pins 62 to the forwardly disposed face of the clamp 50 in angular depending forwardly diverging relation. A helical spring 64, wound around each respective pivot pin 62 within the bifurcated pivotally connected end, urges the free end of the support arms 56 and 58 downwardly against the inner surface of the pipe 16, and thus supports the conductors 12 and 14 and the nozzle 10. Wheels or rollers 66 journaled by the bifurcated free end of each of the arms 56 and 58 rollably support the carriage 18. As a means of insuring the centering of the nozzle 10 within the pipe 16, a third arm 70 is similarly pivotally connected by a spring loaded bifurcated end to the upper portion of the clamp 50 and extends angularly upwardly from the same to contact with its wheel equipped free end the upper portion of the interior surface of the pipe 16. The wheels or rollers of the three support arms 56, 58 and 70 thus contact the interior of the pipe in substantially equal circumferentially spaced-apart relation. Therefore, as shown in Fig. 2, the two arms 56 and 58 substantially support all the weight of the device within the pipe and the upper arm 70 prevents the springs 64 on the lower arms from holding the nozzle 10 above the longitudinal axis of the pipe 16.

Operation

In operation the nozzle 10 and conductors 12 and 14 are connected with the carriage, as disclosed hereinabove, and inserted into one end of preferably a horizontally disposed pipe 16. The length of the conductors may be varied to accommodate different lengths of pipe, but it is to be understood that they are preferably to be at least as long as the pipe to be coated. The conductors 12 and 14 are connected to a source of supply of suitable coating materials and air, respectively. The materials and air supply, not shown, are both preferably maintained under 120 pounds of pressure. With the nozzle in position at one end of the pipe, the supply of coal tar and air, or the like, are turned into the conductors 12 and 14. The coal tar is forced forwardly and outwardly from the mixing chamber 38 through the open mouth end 40 in an annular spray regulated by the flared surface 43, as disclosed hereinabove, as the device is progressively moved through the pipe. The solvent used in partially thinning the coal tar is preferably very volatile so that the drying time required for each coating of the pipe will be approximately 30 to 45 minutes. I have found that an application of two coatings tends to seal the surface of the pipe, resulting in a coating of longevity with a minimum of restriction of the bore of the pipe. The pipe need not be handled or moved during the coating operation, but can be coated while racked. Thus, it may be seen that the flared surface 43 on the nozzle head 42, in co-operation with the unrestricted open passageway 44, permits free flow of the heavy coating material, such as coal tar, therethrough, thereby overcoming the defects of conventional 360° spray heads, which tend to clog with spray materials caught on obstructing projections or restricted passageways.

Obviously the invention is susceptible to some change or alteration without defeating its practicability, and I therefore do not wish to be confined to the preferred embodiment shown in the drawings and described herein, further than I am limited by the scope of the appended claims.

I claim:

1. A nozzle for spray-coating the interior surface of pipe with coal tar, including: a cylindrical body having a forward and a rearward end, said body having at least two relatively large longitudinal bores laterally off-set from its axial center; a reducing sleeve threadedly connected at its larger end to the forward end of said body and extending forwardly therefrom for forming a forwardly converging mixing chamber having a cylindrical forward portion terminating in a forwardly open mouth end; an elongated nozzle head adjustably carried longitudinally by the body within said mixing chamber and projecting axially forward of said open mouth end, said nozzle head having an annular flared surface adjacent said open mouth end for deflecting the coal tar to form an annular spray in co-operation with said open mouth end; and conductors threadedly engaged within the bores at the rearward end of said body for conveying coal tar and air under pressure to the mixing chamber.

2. An apparatus adapted to be progressively moved axially within a pipe for spray-coating the interior surface thereof with a spray of coal tar having a rapidly evaporating solvent for forming upon evaporation of the solvent a protective coating on said surface, including: a pair of elongated conductors arranged in closely spaced-apart parallel relation for conveying spray fluid and air under pressure; carriage means for centrally supporting said conductors for movement within the pipe, said carriage means comprising a clamp encircling and rigidly connected to one of said conductors intermediate its ends, three supporting arms each pivotally connected at one end to said clamp in spaced-apart relation, whereby the free ends of said arms contact the interior surface of said pipe in circumferentially equal spaced-apart relation, a roller carried by the free end of each said arm, spring means associated with each respective said arm adjacent its pivoted connection for holding said rollers in contact with the pipe and supporting said conductors; and a spray nozzle threadedly connected to one end of said conductors in axial alignment with said pipe, said spray nozzle including, a cylindrical body having relatively large longitudinal bores laterally off-set from its axial center in communication with said conductors, a reducing sleeve threadedly connected at its larger end to the forward end of said body opposite said conductors and extending forwardly from said body for forming a forwardly converging mixing chamber having a cylindrical forward portion terminating in a forwardly open-mouth end, and an elongated nozzle head adjustably carried

longitudinally by said body within said mixing chamber and projecting axially forward of said open-mouth end, said nozzle head having an annular flared surface adjacent said open-mouth end for deflecting the coal tar to form an annular spray in co-operation with said open-mouth end.

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