

Sept. 30, 1947.

C. V. QUEEN

2,428,292

SPRAYING DEVICE FOR COATING THE INSIDE OF PIPE

Filed Nov. 16, 1944

2 Sheets-Sheet 1

Fig. 1

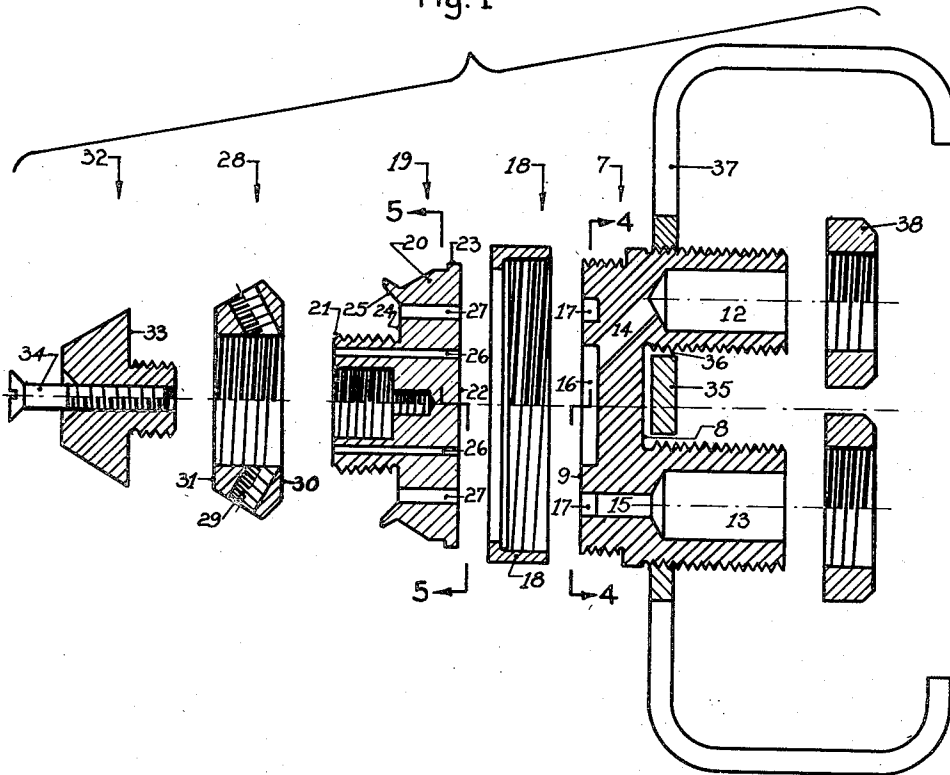


Fig. 2

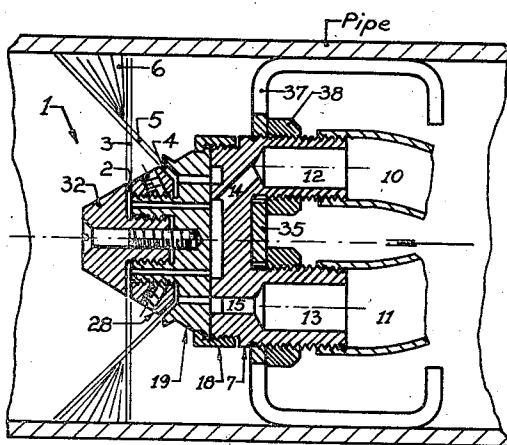
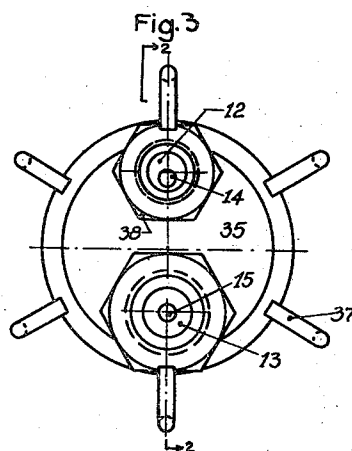


Fig. 3



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2 Sheets-Sheet 2

Fig. 4

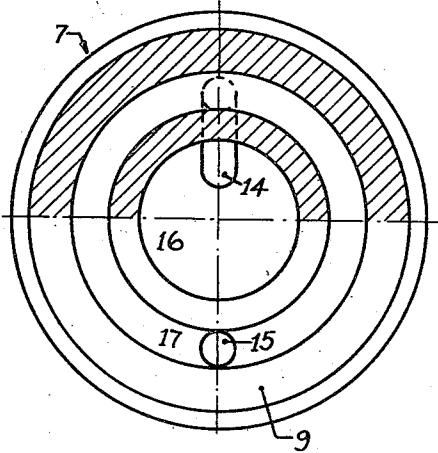


Fig. 5

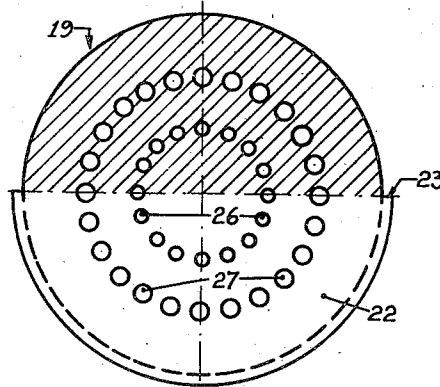


Fig. 6

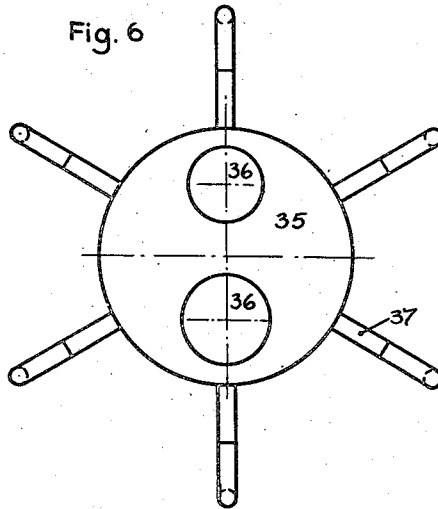
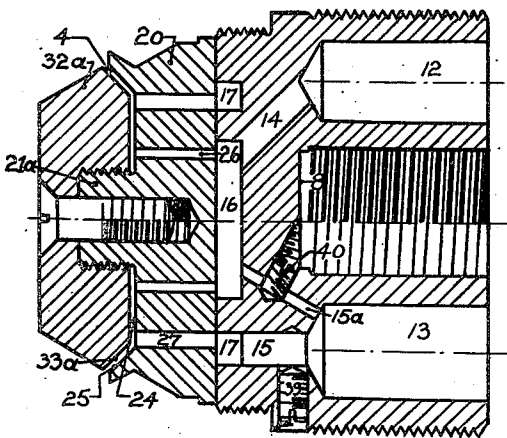


Fig. 7



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UNITED STATES PATENT OFFICE

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SPRAYING DEVICE FOR COATING THE
INSIDE OF PIPE

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8 Claims. (Cl. 91-45)

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This invention relates to a method of and a means for spraying pipe interiors.

In sea going vessels, for example, it is desirable to coat the interiors of the sea water pipes with a plastic compound or paint protecting it against corrosive materials and inhibiting marine growths. It has been proposed to do this simply by filling the pipe with the compound, permitting the excess to drain off and allowing the compound to dry. This practice is wasteful of both time and material. Various devices have also been proposed for coating pipe interiors but, so far as is known, these are not entirely satisfactory.

The principal object of the present invention is to provide a novel and simple method by which a continuous and uniform coating may be quickly and inexpensively applied to the interior of the pipe.

Another important object is to provide a novel, simple and inexpensive device which may be easily and quickly operated to coat a pipe uniformly throughout its length and which may be readily adapted to pipes of different diameters over a wide range.

Another object is to provide a device which insures the production of a uniform and continuous coat; the thickness of which may be predetermined over a relatively wide range.

The invention resides in the discovery that a continuous coating of uniform thickness may be easily and quickly applied to the interior of a pipe by drawing a spray mechanism centrally through the pipe while causing it continuously to discharge one thin annular sheet of plastic material outwardly in one direction and another separate sheet of fluid material, either plastic material, air, steam or other gas, outwardly in another direction such that the two sheets intersect at some distance away from the wall of the pipe, thereby causing the plastic material to be broken up or atomized to form a fine spray. By breaking this sheet into a spray, a uniform and continuous coating can be easily and quickly obtained and its thickness controlled by control of the rate of feed or the rate of movement.

An embodiment of the invention is illustrated in the accompanying drawing wherein:

Figure 1 is an exploded view in longitudinal section of a preferred form of spraying device constructed in accordance with the invention;

Figure 2 is a similar sectional view of the device showing the relationship of the assembled parts to each other and to the annular intersecting sheets within a pipe, this view corresponding to one taken on line 2-2 of Figure 3;

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Figure 3 is an end elevation of the device;

Figure 4 is a section along line 4-4 of Figure 1;

Figure 5 is a section along line 5-5 of Figure 1;

Figure 6 is a plan view of the guide mechanism;

5 and

Figure 7 is a central longitudinal section of a modification.

Method (1-6)

10 In accordance with my invention a plastic compound or paint, from a suitable source not shown, is fed to a suitable spray device 1 which discharges it from an annular peripheral slot 2 outwardly in the form of an annular sheet 3, while a source of air pressure, for example, is also fed to the device 1 which discharges it from an annular peripheral slot 4 outwardly in a form of an annular sheet 5, the sheets 3 and 5 being so directed that they intersect each other at some point between the device and the interior wall of the pipe. The air sheet 5 breaks up the plastic sheet 3 into an annular spray 6. Accordingly as the spray device 1 is moved axially along the center of the pipe under these conditions, the spray 6 effects a continuous and uniform coating of the compound on the walls of the pipe. While another plastic sheet or a sheet composed of steam or some other gas may be employed in place of air, an air sheet is preferred because it provides a relatively inexpensive means of atomizing the sheet and at the same time carrying off the volatile solvent normally contained in the plastic compound and in that way facilitating the quick drying of the compound.

Spraying device passageways

Specifically described, the spraying device 1 comprises: a body member also designated 1, of general circular cross-section having a peripheral face and a rear end face 8 and adapted to be moved centrally through the pipe; a pair of fluid connection terminals 12 and 13 on its rear face 8, one arranged to receive a plastic paint under pressure and the other to receive a gas, such as air, under pressure; and a pair of annular slots 2 and 4 formed in the peripheral face of the body member, one slot 2 being connected through one system of passageways in the body member to receive paint under pressure from said paint terminal 12 and arranged to discharge it in the form of a continuous annular sheet 3, extending from the periphery outwardly in one direction and the other slot 4 being connected by another system of passageways in said body member to receive gas from the gas terminal 13 and arranged to discharge it in the form of a

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continuous annular sheet 5 extending from the periphery outwardly in another direction, such as to intersect the plastic paint sheet 3, not only before it strikes the walls of the pipe, but with sufficient force to break up the paint sheet so as to create at the intersection an outwardly directed spray 6. One system of passageways comprises: a tunnel 14 leading from one terminal connection 12 into the body member; a central chamber 16 connected to receive fluid from tunnel 14; and a central annular series or squirrel cage arrangement of passageways 26 directing fluid from the central chamber 16 axially forward to the foremost annular slot 2. The other system of passageways similarly comprises: a tunnel 15 leading inwardly from the other terminal 13; a surrounding chamber 17 connected to tunnel 15; and a surrounding annular series or squirrel cage arrangement of passageways 27 connecting the surrounding chamber 17 to the other or rearmost slot 4.

End plate and front assembly

While variously constructed body members 1 may be provided with the foregoing tunnels, chambers, squirrel cage passageways and slots, we prefer a sectional member of the novel form shown, since it is easily dismantled or assembled and when dismantled, its parts can be readily cleaned of any residual paint or compound remaining in it while during assembly or use, it may be readily adjusted to vary the thickness of the sheets discharged. The body member illustrated comprises: an end plate; and a front assembly composed of a mushroom member, an annular ring and a front cone at the front or nose of the body member.

End plate (7—17)

The end plate 7 forms the rear face 8 of the body member and contains a front or mating face 9. The rear face 8 is provided with fluid terminals, which are connected through hoses 10 and 11 to suitable sources of plastic paint and air under pressure, the paint and air terminals being respectively designated 12 and 13. From the terminals 12 and 13, a pair of paint and air tunnels 14 and 15 respectively extend entirely through the end plate 7 to its mating face 9. The paint tunnel 14 terminates in a centrally disposed recess 16 formed in the front mating face 9 of the end plate 7 while the air tunnel 15 similarly terminates in a surrounding recess 17 which extends around the central recess 16.

Clamping ring (18)

The front assembly, which forms the peripheral spraying face of the body member, has a rear mating face. This assembly is clamped to the end plate 7, through a clamping ring 18, with its rear mating face, and the front mating face 9 of end plate 7, in mating relation. When the parts are thus clamped together, the front assembly cooperates with the end plate to cover the central and surrounding recesses 16 and 17 and thereby form central and surrounding chambers 16 and 17. The assembly also contains the peripheral slots 2 and 4 and the squirrel cage passageways connecting the central and surrounding chambers 16 and 17 to such slots.

Mushroom member (19—27)

The mushroom member 19 of the front assembly comprises a head 20 and a stem 21. The head 20 forms the rear mating face 22 of the assembly and provides a peripheral clamping flange

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23 which cooperates with clamping ring 18 to clamp the front assembly to the periphery of the end plate 7. The head 20 also provides a front face or shoulder 24 extending outwardly from the stem 21 and terminating in an inclined peripheral guide wall 25. The mushroom member contains the centrally disposed squirrel cage arrangement of passageways 26 extending from the rear mating face 22, in position to communicate with the central chamber 16, forwardly entirely through the head 20 and stem 21. It also contains the surrounding squirrel cage arrangement of passageways 27 extending from the rear mating face 22, in position to communicate with the surrounding chamber 17, forwardly entirely through the head, and terminating in the face of front shoulder 24. The stem 21 is threaded to receive the annular ring 28 of the front assembly.

Annular ring (28—31)

The annular ring 28, which can be adjustably positioned on stem 21 and rigidly secured in any adjusted position through set screws 29, forms that portion, of the peripheral wall of the body member, which lies between the discharge slots 2 and 4. The rear face 30 of this ring conforms in shape to the front shoulder 24 and inclined guide wall 25 of the head 20 and cooperates with the shoulder and guide wall to form the rearmost peripheral slot 4, the width of which depends upon the position of the ring 28 on the stem 21. The front face 31 of the ring 28 cooperates with the front end face of stem 21 to form one wall of the front peripheral slot 2, the other wall of which is formed by the rear shoulder of the front cone 32.

Front cone (32—34)

The front cone 32 forms the nose of the body member. It is adjustably threaded into a recess at the front end of the stem 21 so that its rear shoulder 33 may be adjustably positioned forwardly and rearwardly to vary the width of the front slot 2. The cone is centrally bored to receive a locking screw 34 which is threaded into the stem 21 at the bottom of its front end recess in order to lock the cone 32 in any of its adjusted positions.

It may be noted that the periphery of the body member 1 preferably is tapered as shown but this is not essential.

Operation and adjustment

With the foregoing arrangement, it will be appreciated that paint under pressure entering the paint terminal 12, passes successively through paint tunnel 14, central chamber 16, the inner squirrel cage of passages 26 into front slot 2 which permits it to discharge radially outward to form the continuous annular paint sheet 3. At the same time, air under pressure entering air terminal 13 passes successively through air tunnel 15, the surrounding chamber 17, the outer squirrel cage of passageways 27, into rear slot 4, which permits it to discharge outwardly in the form of a continuous annular air sheet 5, but which directs this sheet at an angle such that it intersects the paint sheet 3 at a short distance outwardly from the periphery of the body member. By adjusting the annular ring 28 and front cone 32 to provide peripheral slots of appropriate width and by selecting appropriate operating pressures for the paint and air, it is a simple matter to produce an air sheet 5 which will effectively atomize the paint sheet 3 and thereby create at the intersection between sheets an outwardly

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directed spray 6. With a properly atomized spray 6 of appropriate volume, the device may be manually pulled by means of hoses 10 and 11 through the pipe at a fairly rapid rate to produce a continuous and uniform coating of plastic material on the inner wall of the pipe.

Guide mechanism (35—38)

In order to center the spray device 1 during its travel through the pipe, a guide mechanism is provided comprising: a plate 35 arranged to be placed over the rear face 8 of the end plate 7 and provided with openings 36 to accommodate the paint and air terminals 12 and 13; and a series of outwardly extending arms 37, the outer ends of which are turned to form runners. This guide may be readily clamped to the rear face 8 by means of clamp nuts 38 threaded to the paint and air terminals 12 and 13. For a pipe of one size a guide mechanism is provided of a diameter such that it will fit the interior of the pipe closely but not tightly. For larger or smaller pipe diameters, correspondingly larger or smaller guide mechanisms are provided.

Modification (39—40)

While a device, which effects a spraying action through the agency of two annular intersecting sheets, will normally be preferred, useful results can be obtained with a modified form having single annular discharge slot through which one fluid or liquid alone or two or more fluids or liquids in combination may be discharged. A modification of this character is shown in Figure 7.

In the modification of Figure 7, only one slot 4 is provided. The terminal 12 is connected through tunnel 14, chamber 16 and squirrel cage passages 26 directly to the slot 4, the stem 21a of the mushroom member being reduced in diameter so that the passages 26 extend through the head 20 of the mushroom member and not through the stem. The terminal 13 is connected as before through tunnel 15, surrounding chamber 17 and squirrel cage passages 27. In addition, the air tunnel 15 is provided with a valve, in the form of screw 39, for closing and opening the connection provided by the tunnel between terminal 13 and the surrounding chamber 17. Also the terminal 13 is connected to the central chamber 16 by an auxiliary tunnel 15a, which is provided with a valve, in the form of a screw 40, for closing and opening that connection. In this way the terminal 13 can be either shut off entirely or connected through either or both tunnels 15 and 15a as desired.

This modification omits the annular ring and provides a modified front cone 32a, which is arranged to screw over the stem 21a so that its shoulder 33a cooperates with the front shoulder 24 and inclined peripheral guide wall 25 of the mushroom member to define slot 4.

When terminal 12 is connected to a source of plastic paint under pressure, a continuous annular sheet of paint will be discharged from slot 4. If desired air or some other fluid can be connected through terminal 13 to pass either directly through tunnel 15 to slot 4, or indirectly through tunnel 15a to slot 4. This indirect connection has the advantage of enabling residue paint to be blown out of the device when the spraying operation is concluded.

Having described my invention, I claim:

1. A spraying device for spraying the interior of a pipe upon relative movement therethrough

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comprising: an end plate having a rear face, a front mating face, a fluid terminal connection on its rear face and an interior tunnel leading from that terminal connection to its front face; a front assembly having a peripheral face, a rear mating face, an annular slot in its peripheral face and a squirrel cage series of passageways leading from its rear mating face to said slot; and means for removably securing the end plate and assembly together with their mating faces in engagement with each other; at least one of said mating faces being recessed so that both cooperate in engagement to form a chamber which connects said tunnel to said squirrel cage passages.

2. The spraying device of claim 1 wherein the front assembly includes: a head providing the rear mating face of the assembly, presenting a front shoulder and containing said squirrel cage passages, the front ends of which terminate at said shoulder; and a ring-like member secured to said head and presenting a shoulder which cooperates with the shoulder of said head to form said slot.

3. A spraying device for spraying the interior of a pipe upon relative movement therethrough comprising: a body member of general circular cross section having peripheral and rear end faces and adapted to be moved centrally through the pipe; a pair of fluid connection terminals on the rear face, each arranged to receive a fluid material under pressure; and a pair of annular slots formed in the peripheral face of the body member, one slot being connected through the body member to receive fluid from the one terminal and arranged to discharge it in the form of a continuous annular sheet extending from the periphery outwardly in one direction and the other slot being connected through said body member to receive fluid from the other terminal and arranged to discharge it in the form of a continuous annular sheet extending from the periphery outwardly in another direction such as to intersect the first mentioned sheet not only before it strikes the walls of the pipe but with sufficient force to break up the first mentioned sheet so as to create at the intersection an outwardly directed spray.

4. A spraying device for spraying the interior of a pipe upon relative movement therethrough comprising: a body member of generally circular cross section having peripheral and rear end faces and adapted to be moved centrally through the pipe; a pair of fluid connection terminals on the rear face, each arranged to receive a fluid material under pressure; means forming one system of passages extending forwardly through the body member, said system being connected at its rear end to one terminal and terminating at its front end in a central squirrel cage series of forwardly extending passageways; means forming another system of passages extending forwardly through the body member, said system being connected at its rear end to the other terminal and terminating at its front end in a surrounding squirrel cage series of forwardly extending passageways; and a pair of annular slots formed in the peripheral face of the body member, one slot being connected to receive fluid from the forward end of one system of passages and arranged to discharge it in the form of a continuous annular sheet extending from the periphery outwardly in one direction and the other slot being connected to receive fluid from the forward end of the other system of passages and arranged to discharge it in the form of a continuous annular sheet extend-

ing from the periphery outwardly in another direction such as to intersect the first mentioned sheet not only before it strikes the walls of the pipe but with sufficient force to break up the first mentioned sheet so as to create at the intersection an outwardly directed spray.

5. A spraying device for spraying the interior of a pipe upon relative movement therethrough comprising: a body member of general circular cross section having peripheral and rear end faces and adapted to be moved centrally through the pipe; a pair of fluid connection terminals on the rear face, each arranged to receive fluid under pressure; means forming within the body member a central chamber for fluid from one terminal and a surrounding chamber for fluid from the other terminal; means forming a tunnel leading from each terminal to its respective chamber; a central squirrel cage series of passageways leading from the central chamber axially forward within the body member; means forming a surrounding squirrel cage series of passageways leading from the surrounding chamber axially forward within the body member; and a pair of annular slots formed in the peripheral face of the body member, one slot being connected to receive fluid from one squirrel cage series of passageways and arranged to discharge it in the form of a continuous annular sheet extending from the periphery outwardly in one direction, the other slot being connected to receive fluid from the other squirrel cage series of passageways and arranged to discharge it in the form of a continuous annular sheet extending from the device outwardly in another direction such as to intersect the first mentioned sheet not only before it strikes the walls of the pipe but with sufficient force to break up the first mentioned sheet so as to create at the intersection an outwardly directed spray.

6. The spray device of claim 5 wherein said body member comprises: an end plate forming the rear face of the body member and having a front mating face, the plate containing said tunnels which lead toward its mating face; a front as-

sembly forming said peripheral face of the body member and having a rear mating face, the assembly containing said central and surrounding squirrel cage passageways in its interior and said slots in its peripheral face; and means for removably securing the plate and assembly together with their mating faces in engagement with each other; at least one of said mating faces being recessed so that both cooperate in engagement to form said central and surrounding chambers.

7. The spray device of claim 5 wherein said body member includes: an annular ring positioned between slots and having a peripheral face forming that portion of the peripheral face of said body member which extends between slots, a rear face which cooperates with the body member to form one slot and a front face which cooperates with the body member to form the other slot, said ring being mounted for axial adjustment to vary the axial width of at least one slot.

8. The combination with the spraying device of claim 1 of a guide mechanism for supporting said spraying device centrally within a pipe during its movement through the pipe, said mechanism comprising: a central frame removably securable to said end plate in axial alignment therewith; and a radial series of arms having their inner ends secured to said frame and their outer ends turned in the form of sled runners, the runners being spaced from the axial center of the device a distance approximating the radius of said pipe.

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