United States Patent [19]

Sullivan

[11] **3,739,747**

[45] **June 19, 1973**

[54] **MACHINE FOR APPLYING COATING MATERIAL TO PIPE**

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[22] Filed: **Dec. 16, 1970**

[21] Appl. No.: **98,788**

[52] **U.S. Cl.** **118/320,** 118/321, 25/38

[51] **Int. Cl.** **B05b 13/02,** B28b 21/00

[58] **Field of Search** ..... 118/320, 321, DIG. 11, 118/DIG. 16; 25/38; 117/100 R, 100 B, 100 M; 239/9

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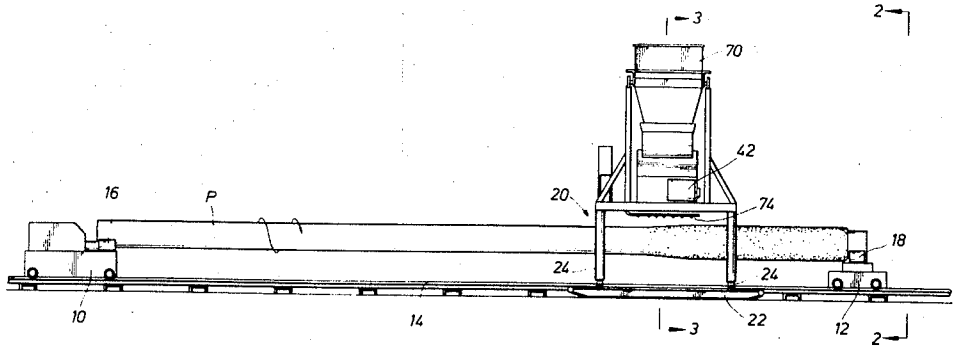
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[57] **ABSTRACT**

A machine for coating pipe, making use of a dry mixture of coating materials, such as hydraulic cement, sand or gravel, and weight imparting material such as barite, iron oxide, or the like. The machine has a rotary impeller for projecting the dry mix from a supply source of the same toward the pipe to be coated, and includes moistening means, such as a water spray, through which the dry mixture passes after leaving the impeller to form a wet mixture which is impelled against the pipe.

Means is provided for feeding the dry mix to the impeller in a substantially constant, regulated stream and for controlling the amount of water added whereby the consistency of the coating can be regulated. Mechanism is provided for causing the dry mix and water to be supplied simultaneously, automatically upon operation of the machine, and for independently regulating the flow of dry mix as well as the flow of water while the machine is in operation.

8 Claims, 5 Drawing Figures



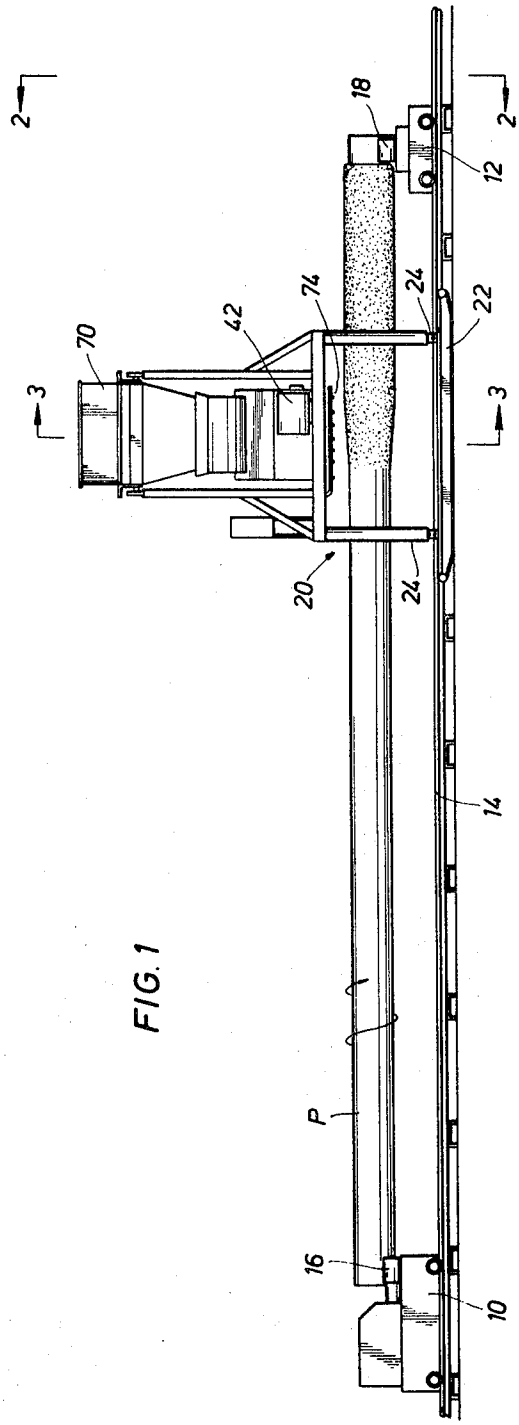


FIG. 1

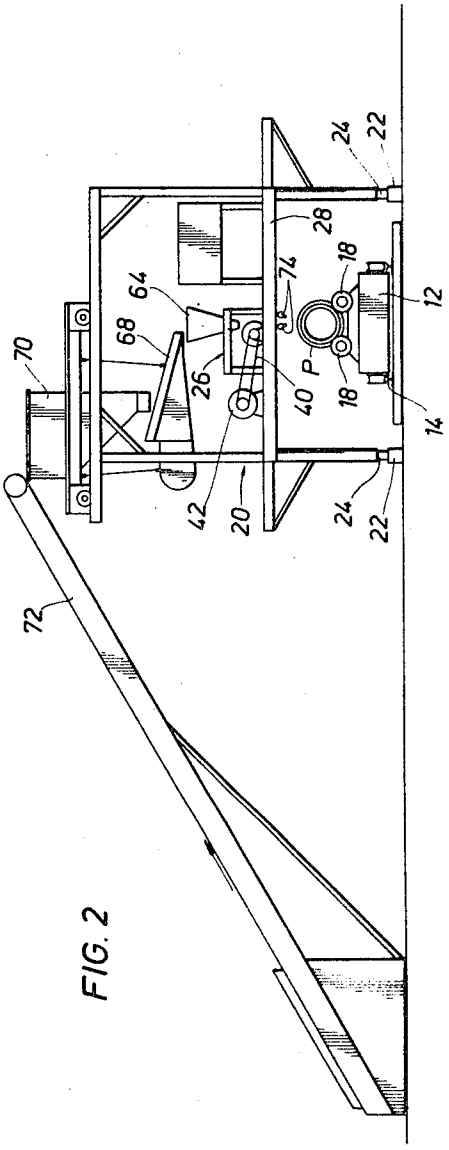


FIG. 2

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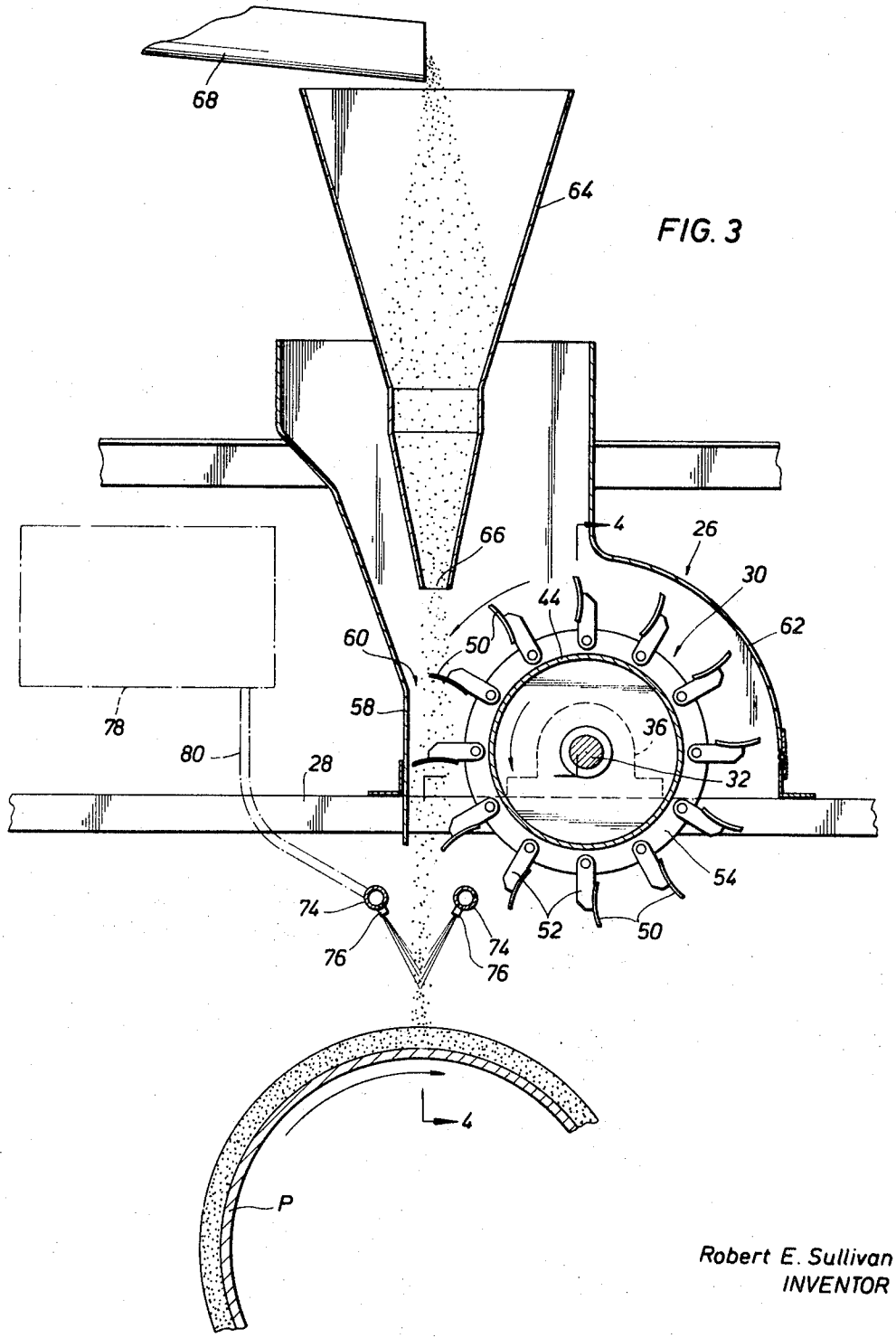


FIG. 3

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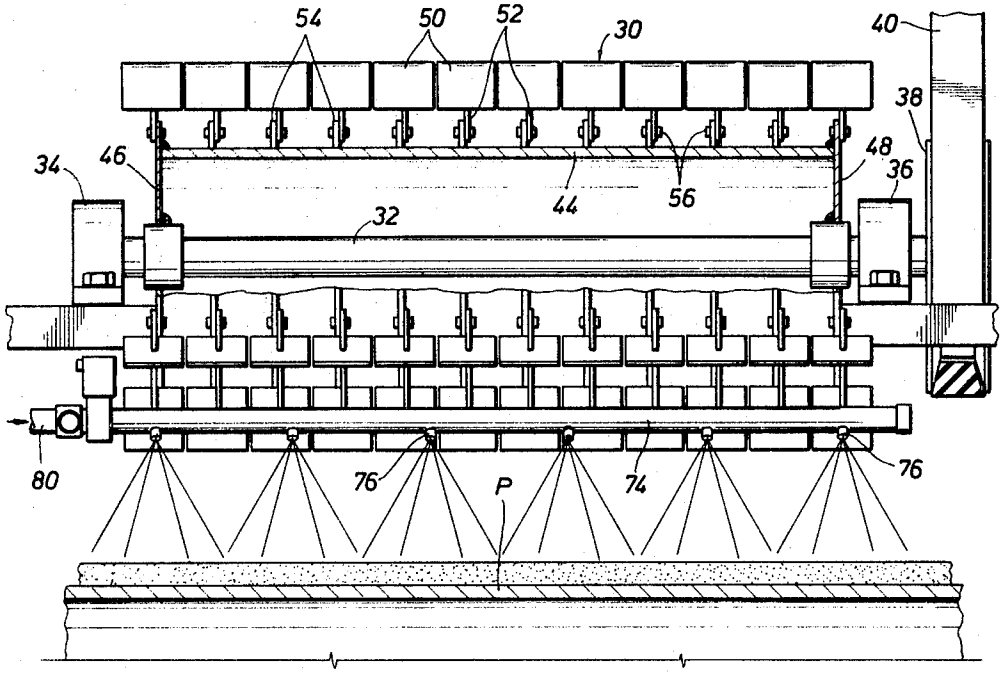


FIG. 4

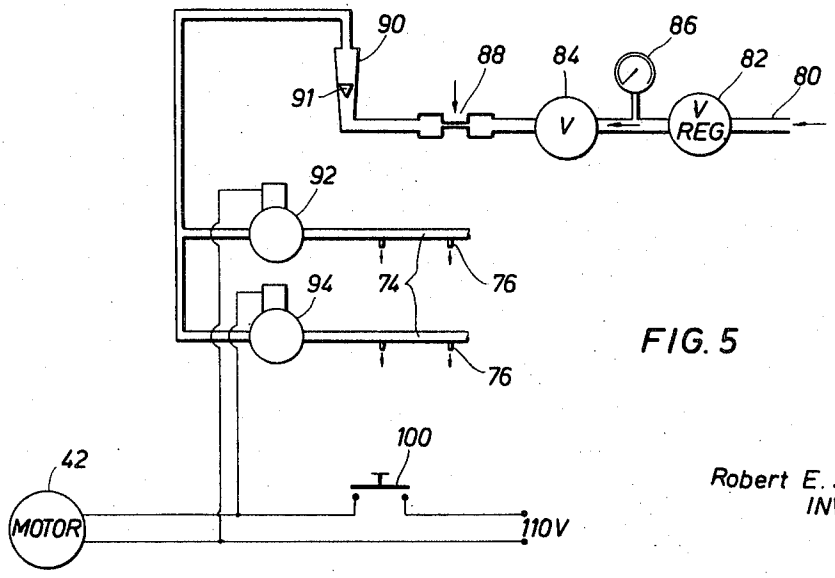


FIG. 5

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MACHINE FOR APPLYING COATING MATERIAL TO PIPE

BACKGROUND OF THE INVENTION

In the coating of pipe, and more especially in the application to pipe of an external protective or weight imparting coating, such as heavy concrete, it has been customary heretofore to prepare a wet mixture of concrete which is then applied to the pipe by an impeller mechanism, such as rotary brushes, or the like. The wet concrete mix is usually propelled horizontally onto the pipe, while the pipe is moved longitudinally and rotated, relative to the impelling mechanism, to control the thickness of the layer of concrete which is applied.

The coating of pipe in this manner makes it necessary to prepare large quantities of wet concrete, which is a relatively heavy material, which must be handled by the impeller mechanism, thus necessitating heavy impeller equipment, expensive to maintain and operate. Moreover, the preparation of the wet concrete mixture of the desired consistency is difficult to accomplish, substantial variations in the consistency resulting in lack of proper adherence of the coating to the pipe, and the loss of large quantities of coating material. Changes in the consistency of the coating material are very difficult, if not impossible, to make during the application of the material to the pipe.

A wet mixture, for use with coating apparatus of the kind heretofore commonly employed, is very difficult to prepare in the large quantities needed and having the proper consistency to secure adequate adherence to the pipe, while controlling the thickness of the coating which is applied.

Attempts have been made to employ a continuous process of mixing a wet concrete coating material for application to pipes, but due to the fact that the coating material must be prepared in very large quantities, under carefully controlled conditions, to provide a coating of constant consistency, such methods have not proven satisfactory.

SUMMARY OF THE INVENTION

Briefly described, the coating apparatus of the present invention comprises an impeller mechanism which may be operated to impel a dry mixed and subsequently moistened coating material against the external surface of a pipe which is being moved longitudinally and rotated at a location to receive the coating material. The coating material is supplied to the impeller mechanism by feeding means which receives the dry mix from a storage hopper, and the dry mix which is propelled toward the pipe passes through a moistening zone in which water is sprayed into the stream of dry mix to properly moisten the same to accomplish the hydration of the cement and bring the mixture to a consistency to adhere to the pipe.

The impeller mechanism is formed with a throat portion through which the dry mix moves downwardly under the influence of gravity and the additional propulsion provided by the impeller, to form a stream of material of restricted cross-sectional area which then passes through the water spray so that the mixture is uniformly moistened during its propulsion toward the pipe to be coated.

Means is provided for controlling the feed of the dry mix to the impeller mechanism, and also for controlling

the amount of water which is added to the mixture after it leaves the impeller mechanism. Means is also provided for automatically supplying water to the dry mixture upon operation of the impeller mechanism, and for shutting off the supply of water when operation of the impeller mechanism ceases.

The coating mechanism may also include means for supporting the pipe to be coated for longitudinal movement and for rotation during such movement beneath the coating mechanism, whereby the thickness of the coating applied to the pipe may be closely controlled.

BRIEF DESCRIPTION OF THE VIEWS OF THE DRAWINGS

FIG. 1 is a side elevational view, on a reduced scale, illustrating a preferred embodiment of the pipe coating machine of the invention, showing the same in position for operation in the coating of a section of pipe;

FIG. 2 is an end elevational view of the invention as illustrated in FIG. 1;

FIG. 3 is a cross-sectional view, on an enlarged scale, taken along the line 3—3 of FIG. 1, looking in the direction indicated by the arrows;

FIG. 4 is a cross-sectional view, taken along the line 4—4 of FIG. 3, looking in the direction indicated by the arrows; and,

FIG. 5 is a diagrammatic view illustrating the piping arrangement and control mechanism by which the supply of water to the machine is controlled and the electrical circuitry by which the operation of the machine is controlled.

DETAILED DESCRIPTION OF A PARTICULAR EMBODIMENT OF THE INVENTION

The invention is illustrated herein in connection with its use for the application of a coating to the external surface of a pipe, such as the pipe P, which is suitably mounted for longitudinal movement beneath the coating apparatus and for rotation about its axis during such movement. For this purpose, the pipe is supported for rotation on wheeled carriages **10** and **12** which are movable along the trackway **14** extending beneath the coating apparatus, each of the carriages being provided with a set of spaced apart rollers, such as those shown at **16** and **18**, upon which the pipe is supported at its ends, the rollers **16** of the carriage **10** being suitably driven by any usual means such as an electric motor, whereby the pipe may be rotated about its axis.

The carriage **10** is also provided with suitable means for propelling the same along the trackway **14**, in a usual manner. By this arrangement the pipe P may be moved longitudinally beneath the coating apparatus and rotated during such movement at any desired speed while the coating is being applied to the exterior of the pipe.

The coating applying apparatus of the invention includes a supporting frame, generally designated **20**, of generally rectangular configuration, which may be suitably mounted as by means of skids **22** which are spaced apart at suitable distance for engagement with the ground on opposite sides of the trackway **14**, to support the coating applying mechanism at any desired location along the trackway and above the same. The frame **20** may include suitable means such as telescoping legs **24** by which the height of the frame may be adjusted to maintain the coating apparatus at a desired elevation above the pipe P.

The coating mechanism includes an impeller housing, generally designated **26**, whose upper and lower ends are open, and which is supported at its lower end on cross members such as that shown at **28**, of the supporting frame.

Within the impeller housing an impeller, generally designated **30**, is rotatably mounted on a shaft **32**, mounted in suitable bearings **34** and **36**, and which extends at one end beyond the impeller housing for the attachment thereto of suitable means, such as a pulley **16** about which a driving belt **40** is extended, which may be operated by any suitable means such as an electric motor **42**. The impeller includes a cylindrical drum **44** suitably attached to the shaft **32** as by means of end plates **46** and **48** and to which is attached a plurality of impeller blades **50**. The blades **50** are curved and of generally rectangular shape, and each of the blades is connected to the drum by means of an arm **52** adjustably connected to an external ring **54** attached to the drum as by means of a bolt **56** whereby the angular position of the blade may be positioned as desired.

The impeller housing also has a curved wall **62** along which the impeller blades pass during the rotation of the impeller to act as a fan to cause a current of air to enter the lower end of the housing and to create a down draft through the throat **60**.

A downwardly extending, downwardly tapered hopper or chute **64** extends into the upper end of the impeller housing and is formed at its lower end with a nozzle-like discharge outlet **66** which is vertically aligned with the throat **60** to discharge a dry mixture of coating material downwardly into the throat.

Above the upper end of the trough **64** an adjustable downwardly sloping chute **68** is supported with its discharge end positioned to discharge material into the upper end of the hopper, and above the chute **68** a downwardly opening hopper **70** is movably supported for adjustment longitudinally of the chute to discharge dry mixed coating material onto the chute.

The supply hopper **70** is adapted to be filled by a belt conveyor **72** extending upwardly from the ground and which is supplied with the dry mixed coating material from any desired source such as a cement mixer or the like.

Below the discharge end of the throat **60**, spaced apart parallel water supply pipes **74** are supported, extending horizontally in the direction of the longitudinal axis of the pipe P and which pipes are perforated or provided with suitable discharge nozzles **76** spaced longitudinally therealong and directed to discharge a spray of water which converges downwardly to moisten the dry mixed coating material as the same is discharged from the throat toward the pipe P. The water supply pipes are supplied with water from any suitable source, such as the tank **78**, through a supply conduit **80**, under the control of valve mechanism to be described in detail hereinafter.

The control mechanism by which the operation of the apparatus is controlled is illustrated diagrammatically in FIG. **5** wherein the water supply pipe **80** is shown provided with valves **82** and **84**, between which a pressure gauge **86** is located to allow the pressure supplied through the line **80** to be adjusted as desired. The pipe **80** may also have an orifice device **88** through which water flows through a sight gauge **90**, also connected into the pipe **80** and from which the water then flows to the spray pipe **74** through solenoid actuated valves **92** and **94** by which the supply of water to the spray pipes is cut off when the impeller is not operating.

The sight gauge **90** is of a conventional type having a float **91** located therein, past which water may flow to cause the float to rise to a height dependent upon the amount of water which flows through the gauge. By this arrangement, the amount of water flowing through the supply pipe **80** may by visually observed and the valves may be adjusted manually to maintain the flow of water at a constant volume during the operation of the apparatus.

In the operation of the apparatus, constructed as described above, a dry mixture of the coating materials to be applied, such as hydraulic cement, sand, or gravel, and protective or heavy materials, such as barite, iron oxide, or the like, is prepared in any convenient manner at the ground level and is fed into the supply hopper **70** by the elevating conveyor **72**.

The outflow of the dry mix from the supply hopper **70** to the trough **64** may be conveniently controlled by adjusting the chute **68** to regulate the downward flow of material into the trough. By this means, the dry mix may be fed downwardly into the throat **60** through the lower end nozzle **66** of the trough at a substantially constant rate, which may be adjusted as desired.

As the downflow of dry mix takes place through the throat **60**, the impeller is operated at a speed to propel the mix downwardly toward the pipe P at a desired rate, the impeller blades **50** being adjusted angularly so that the blades clear the wall **58** of the impeller housing at a distance which will most effectively propel the mix through the throat.

During the operation of the impeller, the impeller blades **50** act as a fan to cause a current of air to be blown in the direction of the flow of the mix to cause the mix to move toward the wall **58** of the impeller housing, thus confining the downflow of the mix and preventing the spreading or diffusion of the stream as it passes out of the lower end of the throat.

As the stream of dry mix passes downwardly from throat **60** between the water supply pipes **74**, water will be sprayed from the pipe through the nozzle **76** into the dry mix to thoroughly moisten same, the amount of water so added to the dry mix being regulated by the operator to form a coating mixture which is sufficiently moistened to properly hydrate the hydraulic cement, and having a consistency to stick on the pipe P as it is impelled against the external surface of the pipe to form a substantially uniform coating on the pipe.

In the operation of the apparatus, the operator may control the speed of rotation of the pipe, as well as its rate of longitudinal movement beneath the coating apparatus, and upon closing of the switch **100**, the motor **42** will be operated to rotate the impeller at a predetermined speed while at the same time the solenoid valves **92** and **94** will be opened to supply water to the spray pipes **74**. By observing the position of the float **91** in the sight gauge **90**, the operator may adjust the flow of water to the spray pipes by suitably adjusting the valves **82** and **84** to maintain the float at a substantially constant position in the sight gauge, thus assuring a constant rate of supply of water to the dry mixture which is being impelled toward the pipe P.

By suitably regulating the movement of the pipe beneath the coating apparatus, as well as the rate at which the dry mixture is being impelled toward the pipe and the amount of water which is sprayed into the mixture,

it will be apparent that the consistency of the mixture may be regulated as desired and the thickness of the coating which is applied to the pipe may be controlled.

It is to be noted that the radius of the curvature of the impeller blades **50** may be selected, and the angle of the adjustment of these blades relative to radii of the impeller passing through the pivot point provided by the bolts **54** may also be adjusted in a manner to provide the most efficient propelling of the mixture through the throat **60** while at the same time reducing any tendency to flow back in the impeller housing, thus enabling the coating apparatus to be readily adjusted for most efficient operation.

The coating material may be prepared as a dry mixture which is easily controlled, and which may be impelled against the external surface of a pipe while water may be added to the dry mix during its movement toward the pipe to control the consistency and hydration of the mixture just before the coating reaches the surface to which it is being applied.

Having thus clearly shown and described the invention, what is claimed as new and desired to secure by Letters Patent is:

1. A pipe coating apparatus comprising

a housing having an inlet and an outlet below the inlet;

means for introducing a dry coating material into the housing through the inlet;

a rotating impeller in the housing positioned for coaction with the material to propel the material through said outlet with increased velocity from said impeller;

said impeller including a generally horizontal shaft and generally circular hub thereabout with a plurality of curved impeller blades on said hub for engaging the material and propelling it downwardly through said outlet;

means for supporting a pipe for horizontal movement along and rotation about its axis below said outlet at a point to intercept the dry material from said outlet; and,

means for adding water to the dry material prior to its contact with the pipe to convert the dry material into an adhesive mixture.

2. The structure of claim **1** including a downwardly directed elongated outlet cooperative with said housing wherein the axis of elongation is parallel to the axis of the pipe.

3. The structure of claim **1** wherein said impeller includes a plurality of individually positioned and adjustable blades spaced about said hub, said blades including a structural support member connected to said hub and supporting a curved face having a radius of curvature facing the direction of rotation of said impeller, and including connective means for connecting said support members to said hub.

4. The apparatus of claim **3** including in said adding means a multiple outlet water spray system parallel to the pipe and directing a stream of water toward the stream of dry material and intercepting such dry material prior to coating the pipe.

5. The apparatus of claim **1** further including an elongate funnel shaped inlet having a greater dimension along along an axis parallel to the pipe to be coated, said inlet opening into said housing at a point above said rotating impeller but not vertically above the axis of rotation thereof and on the side of said impeller which is downwardly directed in movement.

6. The apparatus of claim **1** including means for rotating the pipe.

7. The apparatus of claim **6** including means for translating the pipe longitudinally.

8. The apparatus of claim **1** wherein said housing is open at its bottom portions and said rotating impeller co-acts with one edge wall thereof to define said outlet.

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