United States Patent

[11] 3,601,085

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[45] Patented **Aug. 24, 1971**

[54] **PIPE-COATING APPARATUS**
1 Claim, 2 Drawing Figs.

[52] **U.S. Cl.** **118/6,** 118/7, 118/312, 118/318
[51] **Int. Cl.** **B05c 5/00,** B05c 7/02, B05c 11/08
[50] **Field of Search** ..... 118/2, 408, 409, 318, DIG. 10, 6, 312, 9, 7; 117/18, 21

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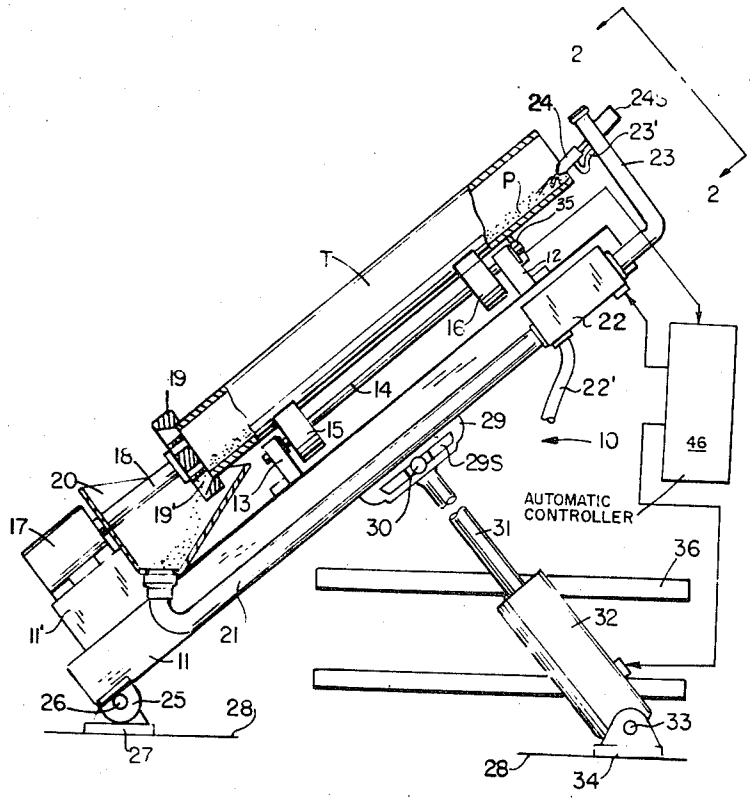
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Primary Examiner—John P. McIntosh

ABSTRACT: An apparatus and method are provided for coating sections of tube or pipe while the pipe is inclined to the horizontal. In one form of the invention, sections of pipe of equal length are individually fed to the apparatus along a horizontal transfer device such as a flight conveyor and, after being received by the coating apparatus, are tilted at an angle to the horizontal and are thereafter rotated about the longitudinal axis of the pipe while coating material is fed to the upper end. As a result, the handling of the pipe and the coating of the inside of same is relatively simple and may be effected immediately.



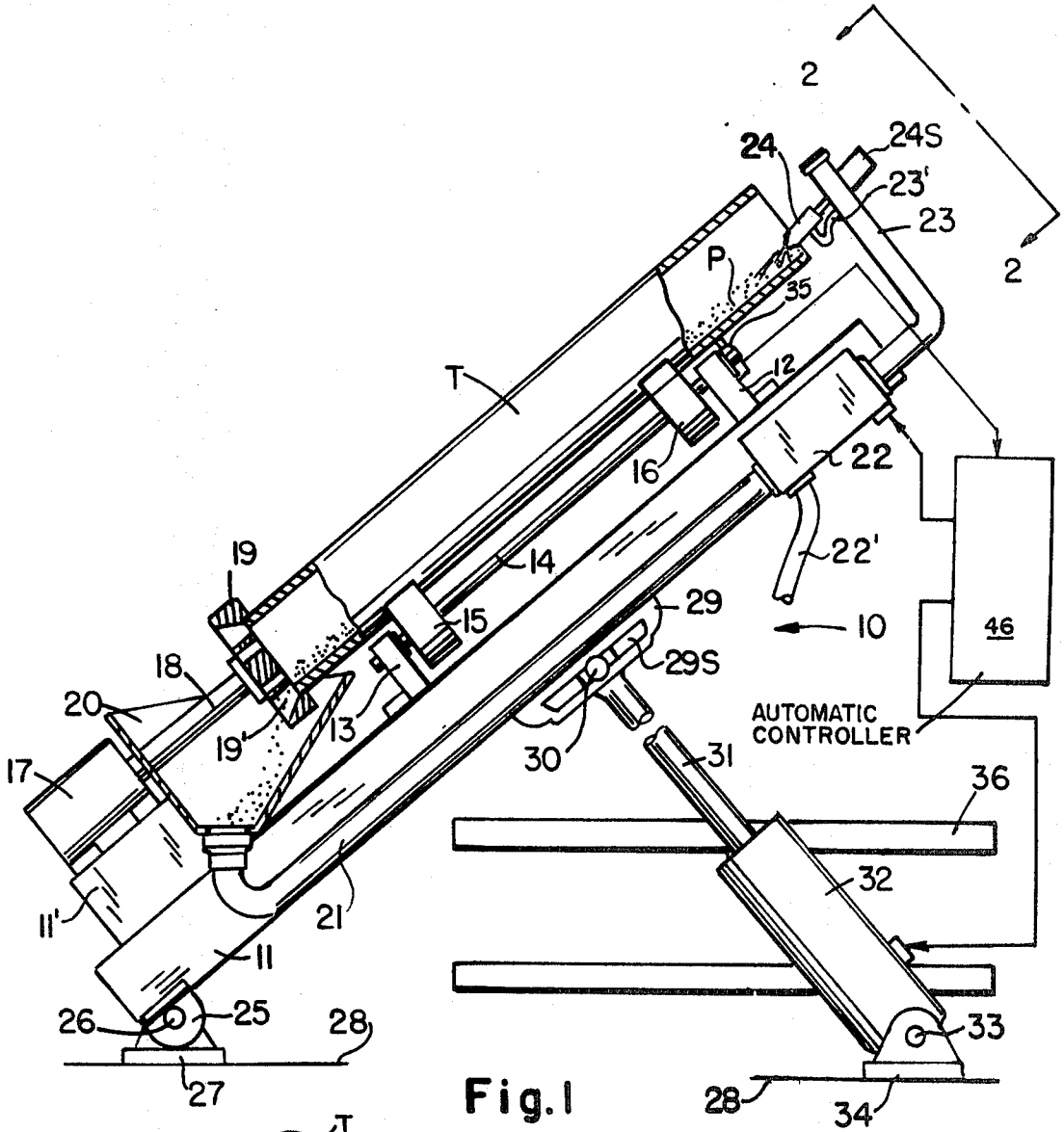


Fig. 1

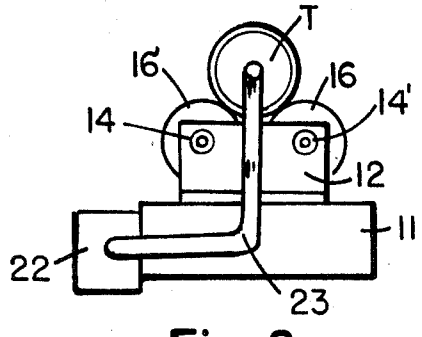


Fig. 2

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PIPE-COATING APPARATUS

RELATED APPLICATIONS

This is a continuation-in-part of application Ser. No. 305,002 filed Aug. 27, 1963, for Coating Apparatus and Method, now abandoned and having parent applications Ser. No. 589,300 filed June 4, 1956 now abandoned and Ser. No. 589,848 filed May 28, 1956 now U.S. Pat. No. 3,166,829.

SUMMARY OF THE INVENTION

This invention relates to an apparatus for coating sections of pipe or tube with a coating material which is fused or set by heat. The coating material may comprise either a thermoplastic polymer provided in particulate form such as in the form of a powder or a thermosetting resin which is also provided in particulate form, the particles of said coating material being introduced at the upper end of a pipe or tube to be coated and allowed to flow downwardly therethrough while said pipe or tube is rotated.

The instant invention is particularly concerned with an apparatus for coating pipe which is relatively simple in structure and may receive lengths of pipe fed thereto in a horizontal attitude such as along a flight conveyor or chute. Whereas other forms of coating apparatus require the lengths of pipe to be coated be in a vertical attitude which requires a substantially complex and space-consuming fixture or conveyor, the instant invention coats lengths of pipe which are disposed at an angle or oblique to the horizontal which attitude is derived by simple machine elements of the coating apparatus receiving each pipe length in a horizontal condition.

It is a primary object of the instant invention to provide a new and improved apparatus and method for coating pipe.

Another object is to provide an apparatus for coating pipe which is relatively simple in structure and simple in its operation.

Another object is to provide an apparatus for coating pipe which operates automatically and it does not require human attendance.

Another object is to provide an apparatus for coating pipe which receives pipe disposed substantially horizontally, partially upends said pipe to dispose it at an angle to the horizontal during the coating operation and thereafter lowers the pipe to a horizontal attitude upon completion of coating so that it may be conveyed by the same or other simple apparatus such as a flight conveyor.

With the above and such other objects in view as may hereafter more fully appear, the invention consists of the novel constructions, combinations and arrangements of parts as will be more fully described and illustrated in the accompanying drawings, but it is to be understood that changes, variations and modifications may be resorted to which fall within the scope of the invention as claimed.

In the drawings:

FIG. **1** is a side view of the pipe coating apparatus of the instant invention with parts broken away to illustrate the operation thereof; and

FIG. **2** is a view taken from the upper end of part of the apparatus of FIG. **1**.

There is shown in FIGS. **1** and **2**, an apparatus **10** for coating the interior surface of lengths of tubing or pipe T fed thereto from a transfer apparatus such as flight conveyor or other suitable means for carrying lengths of said tube in a horizontal attitude. The transfer apparatus is referred to by the general notation **36** and may comprise any suitable mechanical motor driven device such as a flight conveyor or other transfer means to which sections of said tubing T are fed to the coating apparatus **10**. Control of flow of said tube sections T to the transfer apparatus **10** is effected either by spacing said tube lengths a predetermined distance apart on the transfer apparatus **36** or by interlocking the operation of said transfer apparatus to the operation of the coating apparatus which will be described hereafter.

As the coating material is preferably provided in particulate or other suitable fluent form and preferably comprises a polymer which is fused or set by heat, the sections of tubing T are preferably preheated to such a temperature before they are fed to the coating apparatus, that the desired fusion or setting of coating material disposed within the tubing as defined hereafter, will be effected. Said preheating may be accomplished by passing the tubing T either on the conveyor **36** or prior to being transferred thereto, through a heating oven, an electrical induction field or other suitable means.

The apparatus **10** includes a platform or base **11** which is pivotally mounted at one end and is raised from a horizontal position whereby it may receive individual sections of the pipe T to be coated from the conveyor or transfer device **36** on which they are carried horizontally, to a position such as that illustrated in FIG. **1** which tilts the pipe T to an angle oblique to the horizontal such that particulate or liquid coating material may be disposed in the upper end thereof and will flow downwardly completely through the pipe and out the lower end, as illustrated, while a certain amount of the coating material becomes disposed against the inside surface of the pipe wall and forms a coating thereon.

The base of platform **11** supports on its upper surface a pair of platelike brackets **12** and **13** each of which supports the ends of a pair of shafts **14** and **14'** which respectively support a pair or rollers or ball bearings denoted **15** and **16** which cooperate with respective freewheeling rollers supported by the opposite shaft in receiving a section of pipe T therebetween to permit the rotational support of said pipe by said rollers. When the base **11** is in a horizontal attitude and aligned with the end of the transfer device **36**, a section of pipe which is carried by said transfer device, or rolled therealong, may be disposed between the rollers **16**, **16'** and **15**, **15'** (not shown) as clearly illustrated in FIG. **2**.

Provided at the lower end of the platform **11** is a support **11'** for a drive motor **17** having an output shaft **18** at the end of which is mounted a subplatform or receptacle **19'** against the upper surface of which the lower end of the pipe T engages upon lifting the platform to approximately the attitude illustrated in FIG. **1**. In other words, the pipe T slides downwardly along the upper surfaces of the supporting rolls **15**, **15'** and **16**, **16'** until it engages the upper surface of the subplatform **19**. The subplatform **19** is a spiderlike configuration containing a plurality of openings **19'** therein through which excess particulate coating material P which has not adhered to the surface of the pipe may flow into a receptacle hopper **20** at the end of which is connected a hose **21** which extends to a motor-operated suction pump **22** for recirculating the excess coating material to the means admitting same to the upper end of the pipe. When the pipe T engages the upper surface of subplatform **19**, its weight is sufficient to create enough friction between the end of the pipe and the upper surface of member **19** to permit the pipe to be rotated slowly as the shaft **18** is rotated by means of the rotating drive motor within the drive means **17**.

Coating material, such as particulate plastic, is dispensed in the upper end of the pipe T by means of a nozzle **24** which is supported on the shaft of a push-pull solenoid **24** S and which has a flexible inlet tube **23'** extending from a pipe **23** connected to the pump **22** which receives plastic coating material not only from the hopper **20** but from a further supply thereof situated on the floor or frame **28** of the apparatus, though not shown but connected to the pump **22** through a flexible conduit **22'** which is shown in part. The push-pull solenoid **24S** is utilized to permit the retraction of the flow nozzle **24** towards the pipe **23** a degree to permit it to clear the end of the pipe T as it is predeterminately fed to the receiving rollers **15**, **15'** and **16**, **16'**. Upon upending the pipe to an attitude oblique to the horizontal as illustrated in FIG. **1**, the solenoid **24S** operates automatically to project the nozzle **24** to dispose its end just at or within the pipe **35** so that coating material flowed from said nozzle will be disposed only within the pipe, although a hopper may also be used to catch excess coating material should the nozzle **24** not be projected and retracted as described.

The lower end of platform **11** has a plurality of brackets **25** secured thereto which support a horizontal shaft or pins denoted **26** which are also supported within one or more pillow blocks **27** to permit pivotal movement of the assembly with respect to the floor or frame of the machine denoted **28**. Lifting and lowering the assembly is effected by means of an air or hydraulic cylinder actuator **32** the lower end of which is pivoted on one or more pillow blocks supporting a pin **33** secured to the cylinder **32**, said pillow blocks being supported by the machine frame or floor **28**. The output shaft **31** of the actuator has a pin **30** secured near its end, which pin rides in a slot **29S** or track associated with a bracket **29** secured to the underside of the platform **11**. Thus, as the shaft **31** is projected and retracted, platform **11** will be raised and lowered about the axis of the pin **26** to permit receiving a tube T from the transfer device **36** and after the described coating operation is completed, transferring the coated tube or either to said transfer device **36** or another transfer device or platform located on the other side of the platform **11**.

The described operation of transferring a section of pipe to the nested location between the rolls **15**, **15'** and **16**, **16'**, tilting of the platform to an oblique attitude, rotation of shaft **18** to rotate the pipe T, movement of the injection nozzle **24** and/or the injection of particles into the upper end of the pipe, termination of rotation of the shaft **18**, tilting of the platform **11** to a horizontal attitude, retraction, in certain instances, of the shaft **18** to permit the subplatform **19** to clear the end of the pipe T and the operation of suitable transfer apparatus to push or lift the pipe T from its location between the rolls **15** and **16** to remove it from the coating apparatus onto a receiving conveyor or ramp, may be effected by means of an automatic cycle controller **46** such as a multicircuit, self-resetting timer having outputs connected to the controls for the various described actuators and motors to predeterminately control the operation of same in a cycle whereby a predetermined coating action will be effected. Notation **35** refers to a limit switch supported by the bracket or plate **12** and having an actuator arm which is operative to become deflected or depressed when a section of pipe T is delivered between the rolls **15**, **15'** and **16**, **16'** as described. The limit switch may be connected to a multicircuit timer **46** located either on the platform **11** or somewhere else on the described apparatus and operative to initiate its cycle of control of the described apparatus each time the limit switch is so actuated. Other suitable means for detecting the pipe T when it is disposed on the apparatus **10** or on the transfer apparatus **36** such as photoelectric magnetic, fluidic, induction, capacitance or other detection means may be employed to effect the initiation of the described automatic cycle of operations. An automatic controller employing a recording member such as a punched card, magnetic tape, disc, drum or other form of easily variable programming means may be preferably utilized to effect predetermined or variable coating operations relative to pipes of different diameter, wall thickness or materials.

Variations in the apparatus illustrated in FIGS. **1** and **2** include (a) modification of the receiving means shown in FIGS. **1** and **2** supported above platform **11** so as to receive a plurality of sections of pipe or tube fed thereto in a horizontal attitude and to simultaneously effect the inside coating of each of said pipes or tubes; (b) lifting of the pipe T to an almost vertical attitude and the filling of the interior thereof with coating material which is retained within the pipe for a predetermined period of time until a predetermined thickness of coating has been effected after which valves or stoppers in the subplatform **19** are open to permit the excess, unfused coating material to flow out the end of the pipe into the collection hopper prior to lowering the pipe to a horizontal position for transferring it off the coating apparatus as described. It is noted that the solenoid **24S** positioning the nozzle **24** may also comprise a motor-driven device and may have a substantially long shaft which is variably adjustable in throw in accordance with control from an automatic controller computer so as to accommodate different lengths of pipe automatically and without the need for a manual change in the apparatus.

I claim:

1. Apparatus for coating pipe comprising:

a support tiltable from a first attitude to a second attitude,

means for feeding elongated sections of pipe which are open at both ends to said support,

receiving means for predeterminately locating a pipe section on said support when said support is in said first attitude,

power-operated means for tilting said support from said first and said second attitude to position a pipe section disposed on said receiving means with its longitudinal axis oblique to the horizontal,

power means for rotating said pipe about its longitudinal axis when disposed oblique to the horizontal,

means for flowing coating material into the upper end of said pipe when disposed oblique to the horizontal as it is rotated to cause part of said coating material to become coated onto the inside surface of the wall of said pipe as the coating material flows through the pipe and in a manner whereby part of the coating material flows out of the lower end of the pipe,

means located at the lower end of said pipe for receiving coating material from the lower end of the pipe and

means for recirculating said received coating material to said means for flowing coating material into the upper end of said pipe, and

automatic control means operative after a predetermined layer of said coating material becomes coated on the inside wall of a section of pipe disposed on said support for terminating the flow of coating material and controlling operation of said means for tilting said pipe to dispose said pipe horizontally whereby the coated pipe may be removed from said support.