

July 16, 1968

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3,392,700

COMBINED SPRAY AND IMMERSION COATER FOR TUBULAR STOCK

Filed Aug. 7, 1964

3 Sheets-Sheet 1

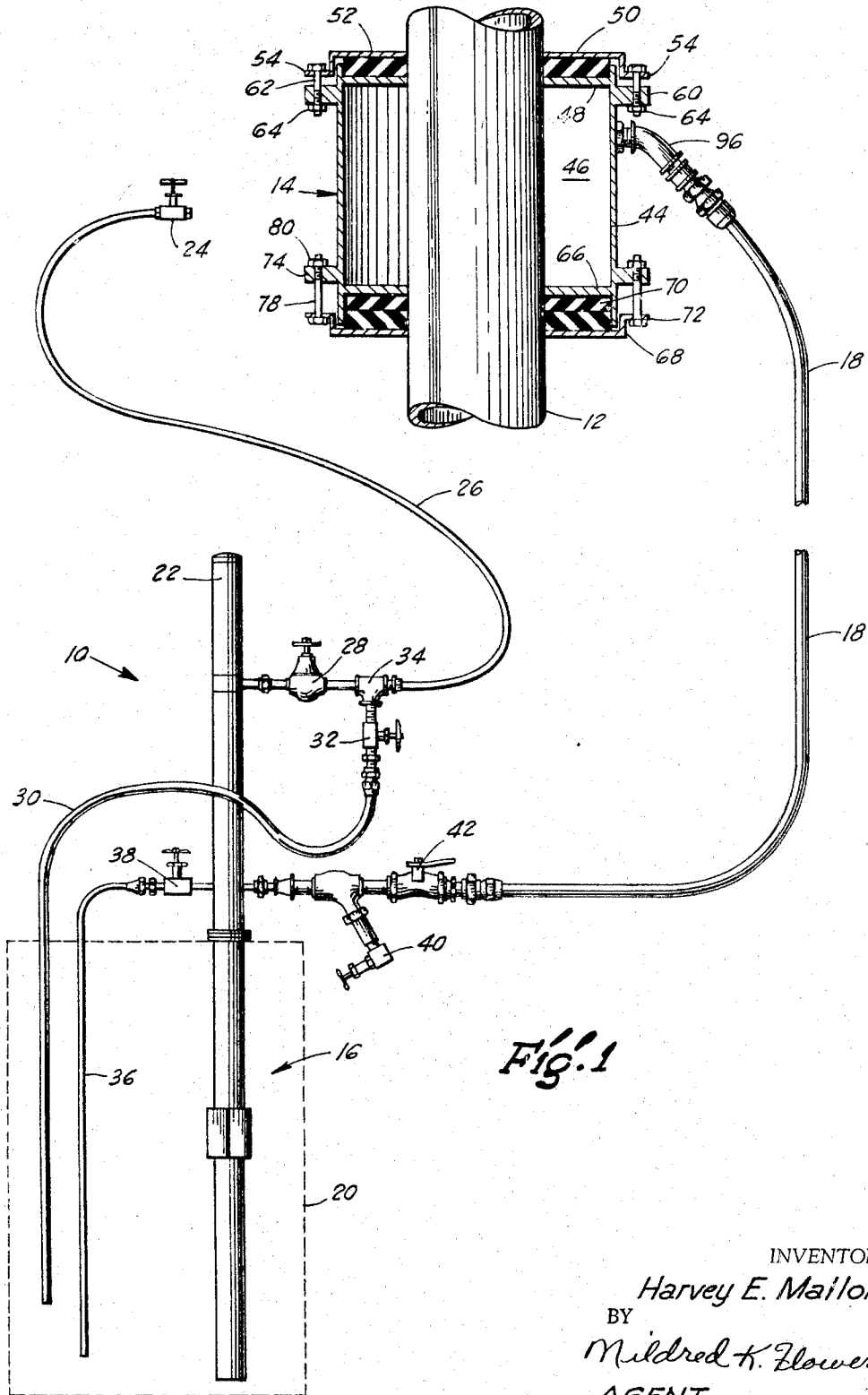


Fig. 1

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3 Sheets-Sheet 2

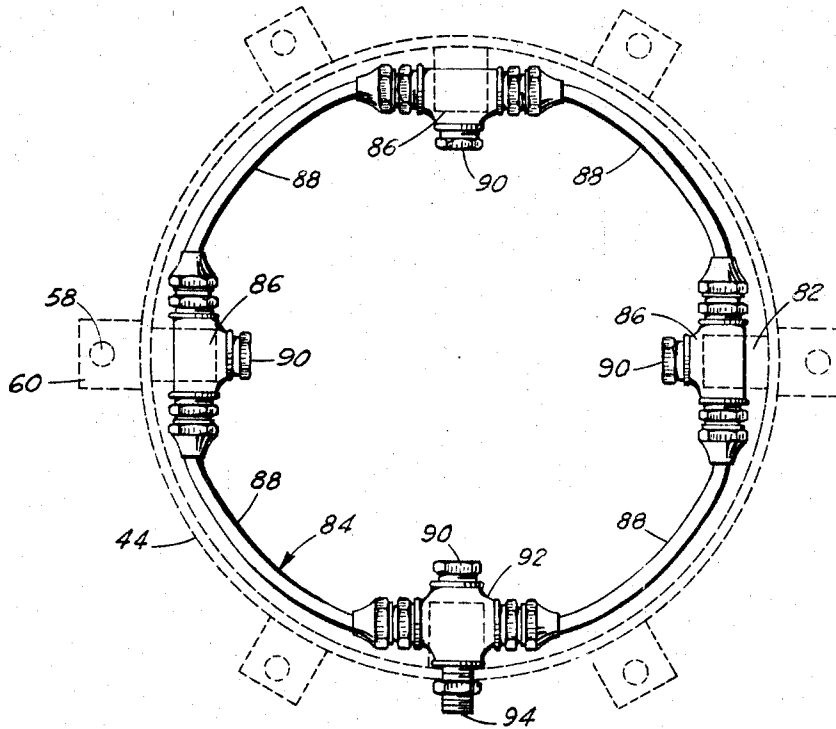


Fig. 2

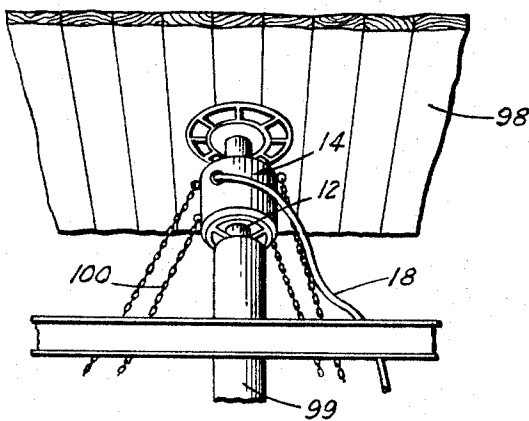


Fig. 3

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3 Sheets-Sheet 3

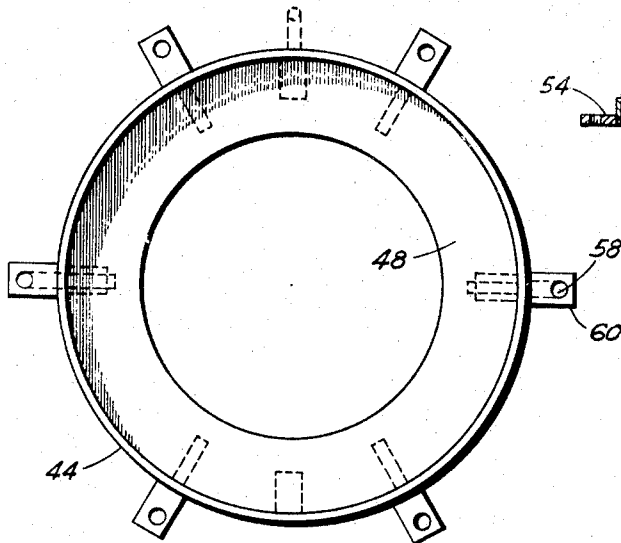


FIG. 7

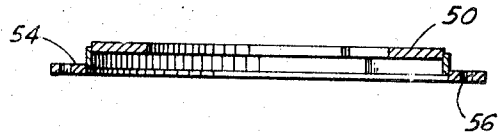


FIG. 4

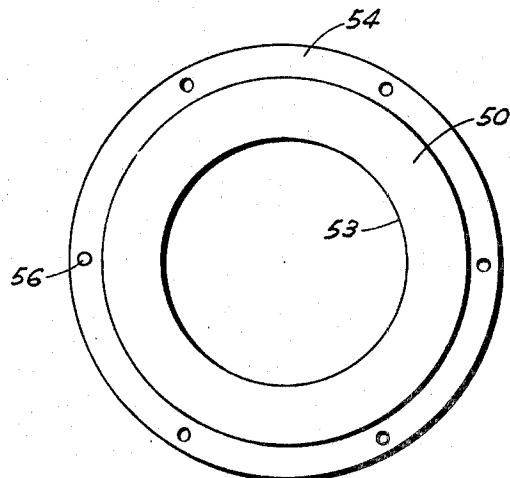


FIG. 5

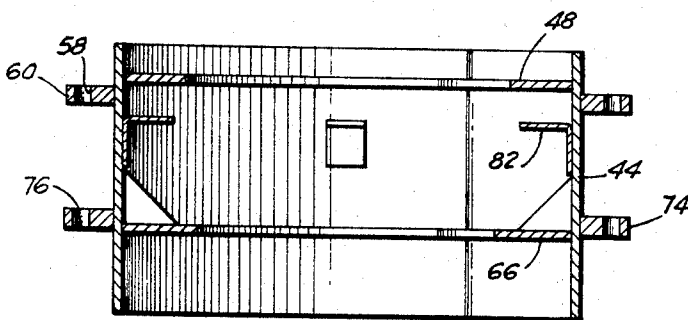


FIG. 6

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**COMBINED SPRAY AND IMMERSION COATER
FOR TUBULAR STOCK**

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Filed Aug. 7, 1964, Ser. No. 388,041
2 Claims. (Cl. 118—72)

ABSTRACT OF THE DISCLOSURE

Combined spray and immersion chamber for coating tubular stock wherein the chamber entrance forms a cleaning wiper, the chamber bottom a coating-doctor and the spray coater means is disposed at an upper section of the chamber, whereby coating material may be collected to form a bath in the lower section of the vertically arranged chamber.

This invention relates to improvements in processing pipes, tubular members, cylindrical objects, and the like, and more particularly, but not by way of limitation, to means for coating the outer periphery of tubular members.

In the oil and gas well drilling industry a well bore is normally drilled by means of an elongated rotating stem or strip of drill pipe extending longitudinally through the bore and carrying a drill bit at the lower end thereof. The drill pipe is usually metallic and is subjected to considerable deterioration due to the corrosive elements normally present in the fluids contained with the well bore during the drilling operation. In an effort to reduce the corrosion of the drill pipe, it is common practice today to add a suitable corrosion inhibitor through the pumping equipment utilized for circulating drilling fluids, or the like, through the well bore in order that some of the inhibitor may be deposited on the outer periphery of the pipe. Whereas this application of the corrosion inhibitor may somewhat reduce the corrosive effects on the pipe, it will be readily apparent that there is no assurance whatsoever that a complete or efficient coating of the pipe will be accomplished by this method.

The present invention contemplates means for coating the outer periphery of the drill pipe prior to insertion thereof into the well bore, and assuring a complete and efficient coverage or coating of the entire outer periphery of the pipe for substantially eliminating the detrimental corrosion thereof from contact with the well fluids. The novel apparatus comprises a chamber for receiving the drill pipe therethrough and wherein a suitable corrosion inhibitor is applied to the outer periphery of the pipe portion disposed within the chamber. The inhibitor solution is sprayed onto the outer periphery of the pipe as the pipe moves through the chamber, and, of course, the excess portion of solution in the spraying operation will accumulate in the lower portion of the chamber for further assuring an efficient coating of the entire outer periphery of the pipe. In addition, wiper means is provided in combination with the chamber for spreading the coating evenly on the exposed surfaces of the pipe. Thus, the pipe is positively coated to assure a complete coverage of the entire outer surface thereof, and the coating is applied before the pipe is disposed within the bore hole, thus assuring that the pipe is efficiently protected prior to any contact with the corrosive well fluids.

Whereas the invention as particularly set forth herein is related to the coating of well bore drill pipe with a suitable corrosion inhibitor, it is to be understood that the means may be effectively utilized for the coating of

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substantially any tubular or cylindrical member, or the like, with substantially any desired substance. For example, paint, or plastic materials in liquid form may be applied to the outer surfaces of pipes, or the like; pipe lines may be exteriorly coated with suitable corrosive resistant materials; pipe or tubular members being stored in pipe racks, or the like, may be coated with weather resistant materials for protection of the stored equipment.

It is an important object of this invention to provide means for efficiently coating the outer periphery of tubular members and the like.

It is another object of this invention to provide means for coating the outer periphery of a tubular member, or the like, wherein the coating is positively applied to the entire exposed outer surface of the tubular member.

Another object of this invention is to provide means for applying a coating to the outer periphery of a tubular member, or the like, wherein the coating is evenly distributed around the entire exposed surface thereof.

Still another object of this invention is to provide means for applying a coating to the outer periphery of a tubular member, or the like, which is simple and efficient in operation and economical and durable in construction.

Other and future objects and advantageous features of the present invention will hereinafter more fully appear in connection with a detailed description of the drawings in which:

FIGURE 1 is a generally schematic elevational view of a coating apparatus embodying the invention, with portions thereof depicted in section for purposes of illustration.

FIGURE 2 is a plan view of the spraying portion of an applicator apparatus embodying the invention with portions shown in dotted lines for purposes of illustration.

FIGURE 3 is a perspective view of a portion of the lower surface of a well derrick floor and depicts a coating apparatus in position around a portion of a drill string.

FIGURE 4 is a sectional elevational view of a cover member which may be utilized with a coating apparatus embodying the invention.

FIGURE 5 is a plan view of the cover member depicted in FIGURE 4.

FIGURE 6 is a sectional elevational view of a housing portion for a coating apparatus embodying the invention.

FIGURE 7 is a plan view of a housing depicted in FIGURE 6.

Referring to the drawings in detail, and particularly FIGURE 1, reference character 10 generally indicates a coating apparatus for applying a coating to the outer periphery of a tubular member 12. As depicted herein, the apparatus 10 is utilized in a well bore drilling operation and the tubular member 12 is preferably a drill pipe. However, it is to be understood that the invention is not limited to utilization in the oil and gas well drilling industry. The coating apparatus 10 comprises a fluid receiving portion 14 disposed around the pipe 12 and in communication with a fluid reservoir portion 16 through a suitable conduit 18.

The fluid reservoir portion 16 may be of any suitable type and as depicted herein includes a fluid storage vessel 20 (shown in dotted lines) for receiving a suitable coating material (not shown) therein. For purposes of the present description, the fluid utilized for the coating of the pipe 12 is a corrosion inhibitor in a liquid state. A suitable pump 22 is carried by the vessel 20 and may extend into the interior thereof for a purpose as will be hereinafter set forth. The pump 22 may be of a hydraulic operated or pneumatic operated type, as desired, and as utilized in conjunction with an oil or gas well bore drilling opera-

tion, it may be considered desirable to utilize pressure fluid which is normally present in the vicinity of the drawworks (not shown) of the well drilling apparatus. It is common practice to provide a ball valve 24, or the like, at the drawworks for connecting the pressure fluid, such as compressed air, but not limited thereto, with pressure operated equipment. Consequently, the pump 22 may be connected with the valve 24 through a suitable flexible conduit 26 and a regulator valve 28 in order to supply the pump with pressure fluid for the operation thereof. In addition, a bypass conduit 30 having a suitable needle valve 32 provided therein may be interposed in the conduit 26 between the valve 24 and pressure regulator 28 by a suitable T-fitting 34 in order to selectively direct a portion of the pressure fluid into the vessel 20 in order to assure a sufficient agitation of the corrosion inhibitor contained therein to assure an efficient operation of the pump 22 and maintain the inhibitor in a substantially uniformly mixed condition in the vessel 20 during operation of the apparatus 10. A suction conduit 36 is disposed within the vessel 20 and is in communication with the pumping chamber (not shown) of the pump 22 through a suitable needle valve 38. The pumping chamber is in communication with the conduit 18 through a suitable blowout valve 40 and ball valve 42, or the like, whereby the corrosion inhibitor may be pumped from the vessel 20 into the fluid receiving apparatus 14 in a manner and for a purpose as will be hereinafter set forth.

The fluid receiving portion 14 comprises a housing 44 disposed around the outer periphery of the pipe 12 for providing an annular chamber 46 therearound. The housing 44 may be of substantially any desired overall length in accordance with the space requirements in the particular installation. For example, the housing as depicted in FIGURE 1 is somewhat more elongated than the housing as depicted in FIGURE 6. In addition, certain internal portions of the fluid receiving portion 14 are omitted in FIGURE 1 for purposes of clarity. An upper inwardly directed circumferential flange 48 is provided on the inner periphery of the housing 44 for supporting an annular resilient or flexible wiper member 50 which may be of any well known type. An upper cover member 52 having a central bore 53 (FIGURE 5) for receiving the pipe 12 therethrough is disposed adjacent the wiper 50 for cooperating with the flange 48 to maintain the wiper 50 in a sufficiently compressed condition whereby the inner periphery thereof bears against the outer periphery of the pipe 12 for a purpose as will be hereinafter set forth.

The cover 52 is adjustably secured to the housing 44 in any suitable manner for maintaining the wiper 50 in compression and as shown herein is provided with an outwardly extending circumferential flange 54 having a plurality of circumferentially spaced apertures 56 which may be disposed in substantial alignment with the apertures 58 of a plurality of outwardly extending flanges 60 provided on the outer periphery of the housing 44. Threaded studs 62 may be disposed through a plurality of the aligned apertures 54 and 58 for securing the cover 50 on the upper end of the housing 44, and complementary nuts 64 may be used therewith for adjustably securing the cover 52 on the housing 44.

A lower inwardly directed circumferential flange 66 is provided on the inner periphery of the housing 44 and is spaced below the flange 48 in order to provide a bottom for the chamber 46. A lower cover member 68 similar to the cover member 52 is secured to the lower end of the housing 44 and spaced from the flange 66 for supporting a plurality of annular resilient or flexible wiper members 70 therebetween. The wipers 70 are similar to the wiper 50 and engage the outer periphery of the pipe 12 for a purpose as will be hereinafter set forth. Whereas two of the wipers 70 are depicted herein, it is to be understood that a single wiper, or substantially any number thereof may be utilized, as desired. The cover member 68 is ad-

justably secured to the lower end of the housing 44 in any suitable manner for cooperation with the flange 66 to maintain the wiper members 70 in a compressed condition and against the outer periphery of the pipe 12. As shown herein, the cover 68 is provided with an outwardly extending apertured flange 72 similar to the flange 54 for cooperation with a plurality of radially outwardly extending flanges 74 provided on the outer periphery of the housing 44. The flanges 74 are similar to the flanges 60 and are each provided with an aperture 76 whereby a plurality of the apertures 76 may be aligned with the apertures of the flange 72 of the cover 68 for receiving threaded studs 78 therethrough. The studs 78 may be utilized in combination with the nuts 80 for adjustably securing the lower cover 68 to the housing 44.

A plurality of circumferentially spaced support brackets 82 (FIGURE 6) are provided on the inner periphery of the housing 44 and spaced below the upper flange 48 for supporting a circular spray assembly generally indicated at 84 in FIGURE 2. The spray assembly 84 comprises a plurality of suitable T-fittings 86 maintained in spaced relation by a plurality of arcuate conduit sections 88. An inwardly directed nozzle member 90 is carried by each T-fitting 86 for directing a fluid stream radially inward within the chamber 46. At least one of the nozzles 90 is carried by suitable cross fitting 92 in lieu of a T-fitting and the cross 92 carries a nipple 94 oppositely disposed from the respective nozzle 90 and which extends radially outwardly through an aperture (not shown) provided in the sidewall of the housing 44 for connecting the cross 92 with an elbow 96 (FIGURE 1). The elbow 96 in turn is suitably connected with the conduit 18. Thus, the fluid from the vessel 20 may be directed through the conduit 18 by the pump 22 and into the spray assembly 84 for spraying of the fluid onto the outer periphery of the pipe 12.

Operation

When it is desired to coat the outer periphery of the drill pipe 12 being used in a well drilling operation, the coating apparatus 10 may be utilized in association with the drawworks (not shown) and well derrick (not shown) normally used in connection with the drilling operation. As shown in FIGURE 3, the fluid receiving portion 14 may be disposed beneath the well derrick floor 98 and above the well head 99 and secured in position therebetween in any suitable manner (not shown) for receiving the drill pipe 12 therethrough. It is preferable to secure the housing 44 in a manner to preclude rotation thereof during movement of the pipe 12 therethrough, and as depicted in FIGURES 3, a plurality of chains 100 may be utilized in conjunction with a plurality of the apertured flanges 60 and 74 for securely anchoring the housing 44 against rotation.

The pump 22 may be connected with the valve 24 by the conduit 26 in order to direct the pressure fluid from the drawworks (not shown) to the pump for actuation thereof. As hereinbefore set forth, a portion of the pressure fluid, which may be compressed air, but is not limited thereto, is directed into the vessel 20 for agitating the corrosion inhibitor fluid contained therein. Upon actuation of the pump 22, the corrosion inhibitor fluid is moved through the suction conduit 36, through the pumping chamber (not shown), and into the conduit 18 for discharge into the chamber 46 through the spray nozzles 90. Of course, the flow of the corrosion inhibitor from the pump 22 to the conduit 18 may be controlled by operation of the valve 42, as is well known. In one position for the valve 42, the flow of the fluid will be interrupted and in another position for the valve 42, the flow of the fluid will be maintained through the conduit 18.

As the drill pipe 12 is moved longitudinally downwardly through the chamber 46 by means of the rotating Kelly (not shown), as is well known in well drilling operations, the wiper 50 will initially engage the outer

periphery of the pipe for cleaning thereof. As the pipe continues to move downwardly through the housing 44 the outer periphery of the pipe portion disposed within the chamber 46 between the wipers 50 and 57 will be efficiently coated with the corrosion inhibitor by the spray nozzles 90. In addition, surplus fluid will accumulate in the lower portion of the chamber 46, thus providing an additional coating of the pipe 12 moving therethrough. Of course, the engagement of the wipers 70 against the outer periphery of the pipe substantially precludes loss of the accumulated fluid from the chamber 46. In addition, the wipers 70 function to spread the coating of the inhibitor evenly around the outer periphery of the pipe 12 emerging from the chamber 46.

It will be readily apparent that the drill pipe 12 is efficiently and thoroughly coated with the corrosion inhibitor prior to insertion thereof in the well bore. Thus, the pipe is effectively protected from deterioration due to the corrosive effects of the fluids contained within the well bore.

When the drill pipe 12 is removed from the well bore, the pipe will be moved upwardly through the housing 44. In this instance, it may be preferable to close the valve 42, or stop the operation of the pump 22, to preclude spraying of the inhibitor fluid onto the pipe. The wipers 70 and 50 will efficiently wipe or clean the outer periphery of the pipe during the pulling operation. Of course, it is usually necessary to coat the pipe with the inhibitor subsequent to each removal thereof from the well bore.

As hereinbefore set forth, whereas the particular embodiment of the invention set forth herein is directed to utilization with a drill pipe, it is to be understood that substantially any tubular or cylindrical object may be coated in a similar manner with substantially any desired coating material. For example, tubular members may be coated with paint, or with plastic coating materials, in the manner as hereinbefore set forth by moving the tubular member through the housing 44, or by moving the housing 44 with respect to the tubular member, as desired.

From the foregoing, it will be apparent that the present invention provides means for coating the outer periphery of tubular members, or the like. The novel apparatus is particularly designed and constructed for applying a thorough coating to the outer surfaces of the tubular member and spreading the applied coating to assure a complete coverage and an even distribution of the coating thereon. The novel means is simple and efficient in operation and economical and durable in construction.

Changes may be made in the combination and arrangement of parts as heretofore set forth in the specification and shown in the drawings, it being understood that any modification in the precise embodiment of the invention may be made within the scope of the following claims, without departing from the spirit of the invention.

What is claimed is:

1. An apparatus for applying a coating material to the outer periphery of a tubular member and comprising a fluid receiving portion adapted for receiving the tubular member therethrough, said fluid receiving portion comprising a housing disposed around the tubular member, first wiper means comprising an entrance to the housing for initially engaging the outer periphery of the tubular member moving therethrough, adjustable means secured

to the housing for maintaining the first wiper means in engagement with the outer periphery of the tubular member, spray means provided in the housing for receiving the coating material to spray the coating material onto the outer periphery of the tubular member, second wiper means comprising the bottom of said housing for engaging the outer periphery of the tubular member whereby a portion of the coating material may accumulate in the bottom of the fluid chamber for immersing and further coating the outer periphery of the tubular member, said second wiper engaging the outer periphery of the tubular member subsequent to the first and second applications of the coating material for spreading the coating material evenly around the exterior of the tubular member, and adjustable means secured to the housing for maintaining the second wiper means in engagement with the outer periphery of the tubular member.

2. An apparatus for applying a coating material to the outer periphery of a tubular member and comprising a fluid reservoir portion for storing the coating material, a fluid receiving portion adapted for receiving the tubular member therethrough, conduit means connecting the fluid reservoir portion with the fluid receiving portion, pump means carried by the fluid reservoir portion for moving the coating material through the conduit means and to the fluid receiving portion, said fluid receiving portion comprising a housing disposed around the tubular member, first wiper means comprising an entrance to the housing for initially engaging the outer periphery of the tubular member moving therethrough, adjustable means secured to the housing for maintaining the first wiper means in engagement with the outer periphery of the tubular member, spray means provided in the housing and connected with the conduit means for receiving the coating material therefrom to spray the coating material onto the outer periphery of the tubular member, second wiper means comprising the bottom of said housing for engaging the outer periphery of the tubular member whereby a portion of the coating material may accumulate in the bottom of the fluid chamber for immersing and further coating the outer periphery of the tubular member, said second wiper engaging the outer periphery of the tubular member subsequent to the first and second applications of the coating material for spreading the coating material evenly around the exterior of the tubular member, and adjustable means secured to the housing for maintaining the second wiper means in engagement with the outer periphery of the tubular member.

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