April 8, 1969 J. D. McCARTNEY 3,436,783

PORTABLE PIPE THREAD CLEANING DEVICE

Filed Oct. 5, 1965 Sheet 1 of 2

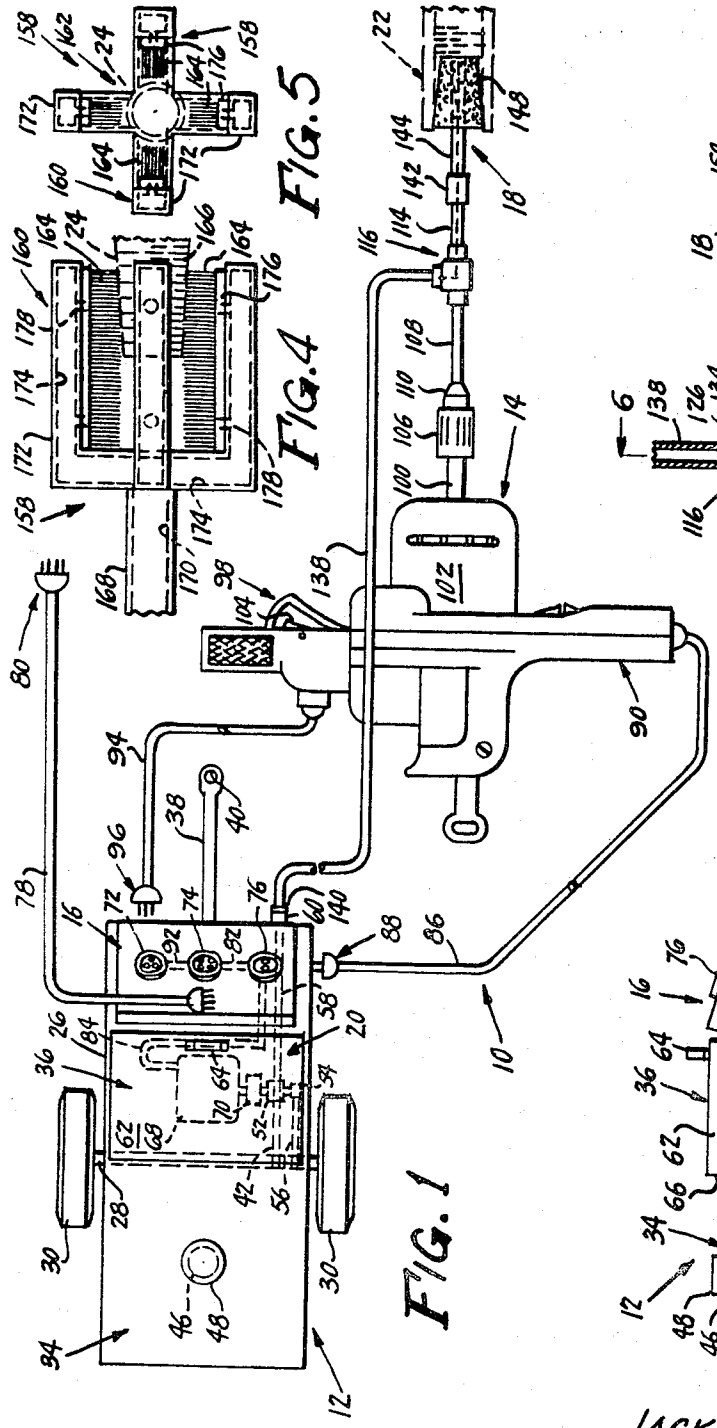


FIG. 1

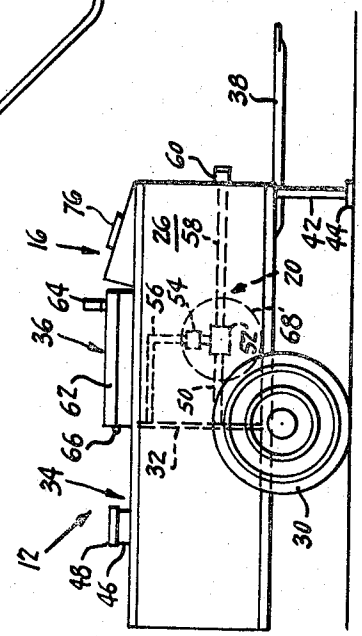


FIG. 2

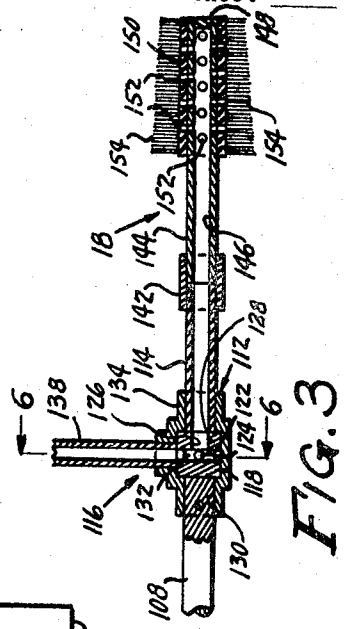


FIG. 3

FIG. 4

FIG. 5

INVENTOR.
JACK D. McCARTNEY

BY Kimmel, Crowell & Weaver
ATTORNEYS.

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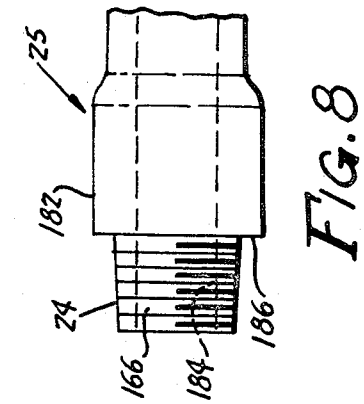


FIG. 8

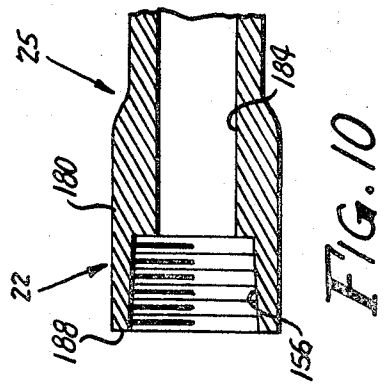


FIG. 10

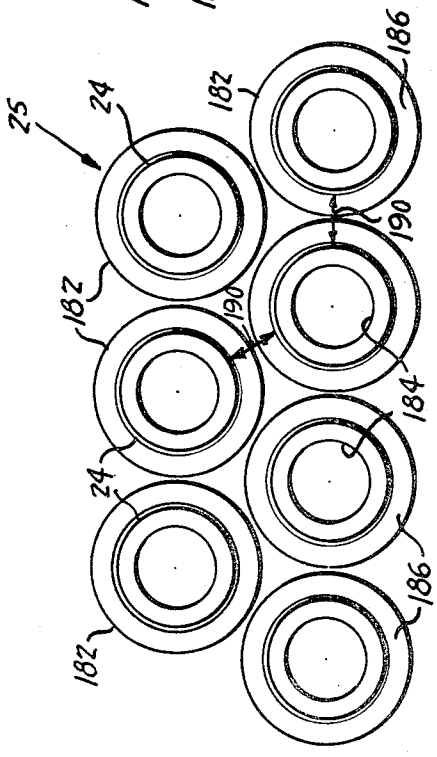


FIG. 7

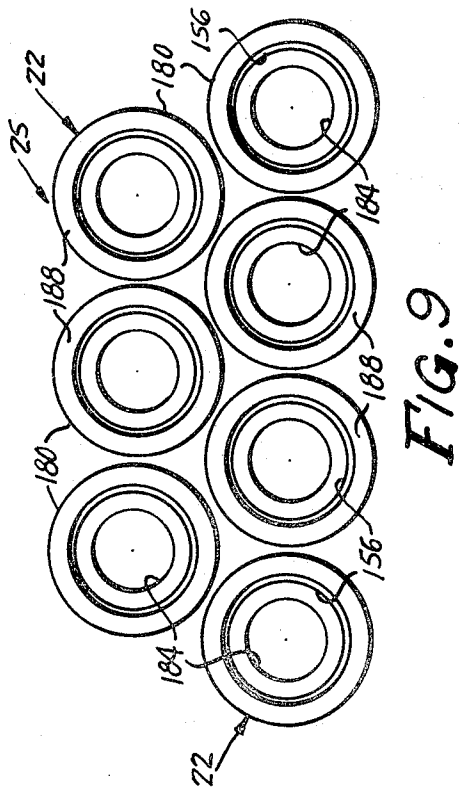


FIG. 9

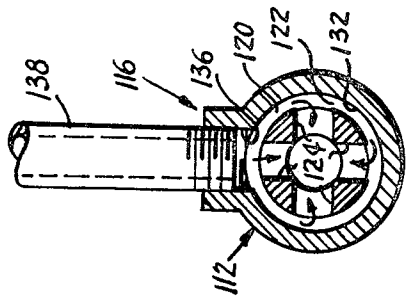


FIG. 6

INVENTOR.
JACK D. McCARTNEY

BY Kimmel, Crowell & Weaver
ATTORNEYS.

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PORTABLE PIPE THREAD CLEANING DEVICE

Jack D. McCartney, Box 519, Cut Off, La. 70345

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Int. Cl. B08g 1/04
U.S. Cl. 15—104.03 1 Claim

ABSTRACT OF THE DISCLOSURE

A portable male and female type thread cleaning device in which a trailer carries a tank of cleaning fluid, an electric pump for pumping the cleaning fluid, and an electric power takeoff panel. A portable cleaning gun is provided with hand controls for the electric pump and for its own motor and has a flexible conduit extending from the electric pump to a hollow shaft carrying pipe thread cleaning brushes. The brushes are rotated by the gun while cleaning fluid is directed through the hollow shaft and the brush to the threads.

This invention relates to a method and apparatus for cleaning internal and external threads of a threaded conduit, and more particularly to the cleaning of boxes and pins of oil field tubular goods, such as drill pipe, casing and tubing.

Oil field tubular goods are generally made with an externally threaded end called a pin and an internally threaded collar called a box for threadably receiving pins of similar goods. Oil field tubular goods are manufactured by large steel companies at central manufacturing plants and are transported by railroad or barge to a number of pipe yards of retail pipe distributors or oil companies. Because of the sporadic requirement of a particular odd size drill pipe, casing or tubing, the pipe is often stored in such pipe yards for considerable lengths of time prior to use. A large portion of the oil field equipment expended in this country is in southern Louisiana and the Texas Gulf Coast where environmental conditions are such to rapidly corrode threaded pipe sections, even when the pins and boxes are equipped with thread protectors which normally prevent only mechanical damage to the threads.

At the present time pipe is preferably stored in a pipe yard upon pipe racks which elevate the tubular goods from the ground to avoid ground or electrolytic corrosion thereof. Because of high atmospheric corrosion, pipe threads must be maintenanced at periodic intervals to preserve the useful life thereof and to protect the large amount of capital invested. Under present methods of thread maintenance, about five men are required to conduct a thread maintenance operation.

Another situation in which pipe threads must be cleaned in the oil field is during the reworking or recompletion of a pre-existing well. During such an operation, one or more strings of tubing are normally retrieved from the well in order to replace a packer, perforate a productive zone or the like. When the tubing is on the surface, the threaded joints are normally cleaned in order to remove paraffin, mud and the like.

Removing rust, corrosion, paraffin, mud and the like from pipe threads is a tedious operation requiring an unduly large working area having a continuous pipe rack over which the goods may be rolled. Generally, the first step is to remove a number of joints from a preexisting pipe stack, remove the thread protectors from each end of each joint (it being understood that tubing extracted from a well is not so equipped), and roll the pipe to a cleaning location. After the joint is at the cleaning location, one individual at each end of each joint manually cleans the threads at his end with a wire brush dipped in a cleansing solvent. Each end of the joint is then doped, a term of art which means the application of a protective grease, with the thread protectors being retrieved from

the position where they were removed and then reinserted into each end of each joint. After the cleaning operation is complete, the joint is rolled to a new storage area where a new stack composed of cleaned joints is accumulated.

It should be apparent from the preceding discussion that the cleaning of oil field pipe joints is a tedious and expensive operation requiring the employment of numerous workers.

It is accordingly a primary object of the instant invention to provide a method and apparatus for rapidly and economically cleaning the threaded ends of pipe joints.

Another object of the instant invention is to provide a method and apparatus for cleaning the threaded ends of pipe joints in which movement of individual joints is unnecessary.

Still another object of the instant invention is to provide a method and apparatus for cleaning threaded pipe joints in which cleaning brushes are rotated against the periphery of the threaded pin or box.

A further object of the instant invention is to provide a method and apparatus for cleaning threaded pipe connections in which a cleaning fluid impinges on the area sought to be cleaned with a rotating brush being used to abrade contaminating materials therefrom.

A still further object of the instant invention is to provide a portable cleaning device which allows an operator to move from location to location to clean threaded joints at various sites.

Other objects and advantages of the instant invention, as well as the invention itself, reside in the combinations of elements and manipulative steps, arrangements of parts and manipulative steps, and features of construction and operation, all as will be more fully pointed out hereinafter and disclosed in the accompanying drawing wherein there is shown a preferred embodiment of this inventive concept.

In the drawings:

FIGURE 1 is an overall organizational view of the apparatus of the instant invention showing a mobile trailer and a portable cleaning device;

FIGURE 2 is a side elevational view of the mobile trailer of FIGURE 1;

FIGURE 3 is a longitudinal cross-sectional view of the rotating brush and fluid delivery means for a box cleaning device of the instant invention;

FIGURE 4 is a side elevational view of a pin cleaning brush with a pin being shown in dashed lines;

FIGURE 5 is an end elevational view of the pin cleaning brush of FIGURE 4;

FIGURE 6 is a vertical transverse cross-sectional view of the rotary fluid connector of FIGURE 3 taken substantially along line 3—3 thereof viewing in the direction of the arrows;

FIGURE 7 is an end elevational view of a plurality of drill pipe joints showing the pin end thereof;

FIGURE 8 is a side elevational view of the pin of a drill pipe joint having externally upset ends;

FIGURE 9 is an end elevational view of a plurality of drill pipe joints showing the box end thereof; and

FIGURE 10 is a longitudinal cross-sectional view of the box of a drill pipe joint having externally upset ends.

Referring now to the drawing in detail, wherein like reference characters designate like elements throughout the several views thereof, there is indicated generally at **10** a thread cleaning device including a mobile trailer indicated generally at **12** and a portable cleaning gun designated generally at **14**. As will be more fully explained hereinafter, trailer **12** includes a power takeoff panel denominated generally at **16** providing an electrical connection between trailer **12** and cleaning gun **14** for rotating a cleaning brush designated generally at **18** through which is delivered a cleaning fluid through a

fluid delivery system shown generally at **20** for cleaning a box shown generally at **22** or a pin **24** of a tubular conduit designated generally at **25**.

Trailer **12** includes an enclosed housing **26** carrying at least one axle **28** on the ends of which are mounted a ground engaging wheel **30**. A vertical transverse wall **32** divides housing **26** into a cleaning fluid compartment shown generally at **34** and a motor and pump compartment indicated generally at **36**. A draw bar **38** is fixedly secured to one end of trailer **12** providing an aperture **40** which may be secured to a trailer hitch of a vehicle thus providing long range mobility for trailer **12**. In the alternative, draw bar **38** may be used to guide or push trailer **12** from one location to another inside a pipe yard. A kickstand **42** having an enlarged ground engaging flange **44** is pivotally mounted on the underside of housing **26** in order to level trailer **12** when it is stationary and in the operating position.

Fluid compartment **34**, which constitutes a part of fluid delivery system **20**, includes an externally threaded inlet **46** receiving a cap **48** which may be removed providing an entrance for cleaning fluid. An outlet conduit **50** connects fluid chamber **34** to the remainder of fluid delivery system **20** including a low volume low pressure pump **52** delivering fluid under pressure to a by-pass valve **54** communicating with the interior of fluid compartment **34** through a fluid return or by-pass line **56**. Pump **52** also delivers fluid to an outlet passageway **58** communicating with a quick-disconnect **60** positioned exteriorly of housing **26**. With valve **54** open and a cap placed on quick-disconnect **60**, it will be seen that fluid will be recirculated from fluid compartment **34** through outlet conduit **50**, pump **52**, valve **54** and by-pass line **56**.

The upper end of pump compartment **36** includes a lid **62** having a suitable handle **64** pivotally mounted as at **66** providing ingress to the interior of compartment **36**. Opening lid **62** will reveal an electric motor **68** positioned within compartment **36** connected to a clutch or coupling **70** drivingly engaged with pump **52**.

In the operation of fluid delivery system **20**, fluid compartment **34** will be filled with a suitable cleaning fluid, such as a solvent for rust, corrosion or the like. Valve **54** will be positioned in communication with fluid return line or by-pass **56** with electric motor **68** being actuated as more fully explained hereinafter resulting in the flow of cleansing fluid through outlet conduit **50**, pump **52**, valve **54** and by-pass **56** thus recirculating and agitating the cleaning fluid within compartment **34**. When it is desired to deliver cleaning fluid to gun **14**, valve **54** will be actuated to communicate through outlet passageway **58** to quick-disconnect **60**.

Power take-off panel **16** includes a plurality of electrical receptacles **72, 74, 76** which are illustrated as having varying numbers of prong-receiving openings for purposes of differentiation, but it is to be understood that receptacles **72, 74, 76** may have any number of openings needed for the purposes contemplated hereinafter. Receptacle **74** is preferably connected to a power cord **78** having a male plug shown generally at **80** for insertion into a hot receptacle of any desired type. Electrical power is generally available in pipeyards or adjacent a well that is being recompleted, but it is to be understood that trailer **12** may carry an electrical generator if electrical power is not available.

Receptacle **74** is connected by an electrical conduit **82** to receptacle **76** with a wire **84** leading to motor **68** and providing electrical energy with which to drive pump **52**. A pump control wire **86** leads from a male plug shown genreally at **88** insertable into receptacle **76** to a pump actuating mechanism shown generally at **90** secured to gun **14**. An electrical conduit **92** connects receptacles **72, 74** with receptacle **72** being connected by a control cord **94** having a male plug indicated generally at **96** to a shaft actuating means indicated generally at **98** on gun **14**.

When device **10** is positioned for cleaning the threads of a plurality of pipe joints, male plug **80** of power cord **78** will be inserted into an appropriate hot receptacle delivering electrical power to receptacle **74** on power take-off panel **16**. Male plug **88** of pump control wire **86** will be inserted into receptacle **76** with pump actuating means **90** being operable to close an electrical circuit including conduit **82**, wire **84** and control wire **86** to deliver electrical energy to operate motor **68**. Male plug **96** of control cord **94** will be inserted into receptacle **72** with actuating means **98** being operable to start the rotation of a shaft **100** of gun **14**.

Power cord **78** is preferably of a sufficient length to allow trailer **12** to be positioned adjacent a plurality of pipe joints to be cleaned with motor control wire **86** and control cord **94** being of sufficient length to allow considerable operator movement with gun **14**. Gun **14** may be a one-half inch commercially available electric drill having a casing **102** housing an electric motor driven by electrical power transmitted through control cord **94** and operated by a trigger **104** of actuating means **98**. Gun **14** also includes rotatable shaft **100** driven by an electric motor within casing **102** carrying a chuck **106** on the end thereof for receiving a rotatable brush **18**.

Brush **18** is connected to a shank **108** having an enlarged connector **110** on the end thereof releasably secured in chuck **106** in a conventional manner. Shank **108** is fixedly secured to an adaptor shown generally at **112** which is in turn fixedly mounted on a tubular conduit **114** leading to brush **18** all of which are rotatably mounted in a T **116** as may be seen in FIGURE 3. As may be seen in FIGURES 3 and 6, connector **112** includes a cylindrical plug **118** fixedly secured to the terminal end shank **108** connected to an intermediate section **120** forming a circumferential groove **122** connected by a plurality of radial conduits **124** to a central longitudinal extending passageway **126** formed by a terminal section **128** of connector **112**.

T **116** forms a first passageway **130** rotatably receiving shank **108**, a second enlarged passageway **132** rotatably receiving connector **112** with a third passageway **134** rotatably receiving the end of tubular conduit **114**. T **116** forms a fourth passageway **136** substantially perpendicular to second enlarged passageway **132** threadably receiving a fluid conduit **138** connected by a quick-disconnect fluid tight connector **140** to quick-disconnect **60** on trailer **12** as may be seen in FIGURE 1.

As should be apparent, the activation of pump **52** will deliver fluid through outlet passageway **58**, quick-disconnects **60**, **140** and fluid conduit **138** interiorly of T **116**. Fluid will exit from conduit **138** into groove **122** of connector **112** in the pass through radial passageways through brush **18** as will be more fully explained hereinafter.

Tubular conduit **114** carries a coupling **142** for receiving in fluid passing relation a shaft **144** of brush **18** forming a passageway **146** closed by a plug **148** at the terminal end thereof. Fixedly mounted adjacent the terminal end of shaft **144** is a sleeve **150** with a plurality of apertures **152** communicating through the terminal section of shaft **144** and sleeve **150**. Sleeve **150** carries a multiplicity of outwardly extending bristles forming a brush **154** which is preferably frusto-conical in configuration in order to efficiently clean a series of internal inwardly diminishing threads **156** in box **22** of tubular conduit **25** as may be seen in FIGURE 10.

Referring now to FIGURES 1, 3, 9 and 10, it will be seen that the manipulation of actuating means **90** as well as trigger **104** of shaft actuating means **98** will deliver pressurized cleaning fluid through outlet apertures **152** and brush **154** and rotate shank **108**, conduit **114** and shaft **144** thus imparting rotation to brush **154**. Since pipe is conventionally stored in a truncated pyramidal configuration such as may be seen in FIGURE 9, any thread protectors received by threads **156** may be removed with brush **154** being rotated and inserted into box **22** of each of conduits **25** without requiring the

movement of each of conduits **25** horizontally. It should be remembered that the conventional manner of cleaning pipe threads requires each individual conduit to be moved horizontally such that the worker may reach internal threads **156** with a hand brush.

Referring now to FIGURES 4 and 5, a pin cleaning brush is shown generally at **158** including a frame shown generally at **160** forming a central well designated generally at **162** into which a plurality of frame mounted brushes **164** extend. As may be seen in FIGURE 4, pin **24** extends into central well **162** with brushes **164** cleaning a series of external outwardly diminishing threads **166**. Frame **160** includes a shaft **168** forming a passageway **170** for engagement with coupling **142** for rotation therewith and a plurality of evenly spaced conduits **172** which are illustrated as rectangular in configuration, but which may be of any suitable shape forming internal passageways **174** receiving cleaning fluid through conduit **114**.

Brushes **164** are mounted on brush blocks **176** fixedly secured to the inner side of conduits **172** with a plurality of apertures **178** providing communication between passageways **174** and brushes **164** to allow the injection of cleaning fluid onto threads **166**. While brushes **164** are illustrated as forming a cylindrical central well **162**, it should be pointed out that they may form a frustoconical opening for closely receiving pin **24**.

Conduits **25** are illustrated as joints of drill pipe having externally upset ends **180**, **182** adjacent box **22** and pin **24** with a longitudinal passageway **184** providing communication between the ends of pipe **25**. As may be seen in FIGURE 8, the inner end of pin **24** is of a lesser diameter than externally upset end **182** of joint **25** forming a shoulder **186** which, when pin **24** is threadably received by box **22** cooperates with a shoulder **188** to prevent overtightening of the joint.

Each of rectangular conduits **172** and its associated brush **164** are sized such that they are no thicker than the shortest distance between the roots of pins **24** of adjacent conduits **25**, this distance being shown by a double headed arrow **190** in FIGURE 7. It will be apparent, therefore, that pins **24** of the truncated pyramidal stack of pipes of FIGURE 7 may be cleaned by rotating pin cleaning brush **158** and delivering cleaning fluid through conduit **114** and passageway **170** with pins **24** being sequentially received between brushes **156** without the requirement of horizontally moving any of joints **25**, thus saving considerable effort and labor in thread maintenance.

Although FIGURES 7 to 10 inclusive have illustrated the cleaning of drill pipe, it should be understood that the method and apparatus of the instant invention may be conveniently utilized with any conventional conduits requiring periodic cleaning of the ends thereof. In the operation of the instant invention, it is preferred that box cleaning brush **18** and pin cleaning brush **158** be rotated at a high rate, such as between 500 and 1000 r.p.m. with the delivery of cleaning fluid through outlet apertures **152**, **178** kept at a minimum to conserve the relatively expensive cleaning fluid, and in all events be kept less than 2.0 gallons per minute.

It is now seen that there is herein provided an improved method and apparatus for cleaning pipe threads, having all of the advantages of the instant invention and others, including many advantages of great practical utility and commercial importance.

Since many embodiments may be made of the instant inventive concept, and since many modifications may be made in the embodiments hereinbefore shown and described, it is to be understood that the foregoing is to be interpreted merely as illustrative and not in a limiting sense.

I claim:

1. A pipe thread cleaning device comprising

a mobile trailer,

a cleaning fluid tank mounted on said trailer,

an electric pump mounted on said trailer for pumping cleaning fluid from said tank,

an electric power takeoff panel on said trailer,

means detachably electrically connecting said panel to a source of electricity,

means electrically connecting said electric pump to said panel,

a portable cleaning gun including an electric motor having an elongated shaft means extending from one end thereof,

a pair of oppositely disposed handles rigidly secured to said gun,

a hand actuated control for said motor disposed in one of said handles,

flexible means detachably electrically connecting said motor control to said panel on said trailer,

a hand operated control for said electric pump in the other of said handles,

flexible means detachably electrically connecting said electric pump control to said panel on said trailer,

a T rotatably receiving said shaft means intermediate the opposite ends thereof, said shaft means having a central conduit in the portion thereof extending from said T oppositely of said motor,

a flexible conduit detachably connected at one end to the outlet side of said electric pump and at its opposite end to a side port of said T conducting cleaning fluid flow from said electric pump to the central conduit of said shaft means,

a brush, and

means mounting said brush on the free end of said shaft means, said mounting means including a plurality of outlet apertures communicating with the central conduit in said shaft means for directing cleaning fluid through said brush onto the threads of a pipe to be cleaned.

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MORRIS O. WOLK, *Primary Examiner.*

J. ZATARGA, *Assistant Examiner.*

U.S. Cl. X.R.

15—104.04, 104.05; 134—6, 8