PORTABLE ROTARY TUBE STRAIGHTENER APPARATUS

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Appl. No.: 14/312,766
Filed: Jun. 24, 2014

A portable rotary tubing straightener apparatus comprises a mobile console with spool mounting assembly. A motor is supported on the console and drives a shaft which mounts a drive roller. An adjustable tensioner assembly has a tension roller positionable opposite the drive roller. The drive and tension rollers are engageable at opposed locations of a continuous tubing. A rotary straightener assembly is disposed on the console. A motor carried by the console is activatable to rotate the rotary straightener assembly. A spool with metal tubing is mounted to the spool mounting assembly and passes tubing through the rotary assembly and between the rollers. Upon activating the motors, the tubing unwinds from the spool and exits in a continuous straightened condition from the drive and tension rollers. A rotary handle is employed for adjusting the tension in the tension roller.
PORTABLE ROTARY TUBE STRAIGHTENER APPARATUS

BACKGROUND

[0002] Briefly stated, a portable rotary tubing straightener apparatus comprises a mobile console. A spool mounting assembly is mounted to the console. A motor is supported on the console and drives a shaft which rotates a drive roller. An adjustable tensioner assembly has a tension roller positionable opposite the drive roller. The drive and tension rollers are engageable at opposed locations of a continuous tubing. A rotary straightener assembly is mounted to the console. A second motor is carried by the console and actuator to rotate the rotary straightener assembly. Upon mounting a spool with tubing to the spool mounting assembly and feeding tubing through the rotary assembly and between the rollers and activating the first and second motors, the tubing unwinds from the spool and exits in a continuous straightened condition from the drive and tension rollers.

[0003] In a preferred form, the adjustable tensioner assembly further comprises a pivot arm mounting a tension roller. A preferably positionable shaft engages the pivot arm and has a rotary handle. A safety cover has a pair of apertures and encloses the rotary straightener assembly wherein the rotary straightener assembly is disposed between the apertures and tubing is passable through the apertures and the rotary straightener assembly. Upright guides, each having an eye, guide entry of the tubing to the tensioner assembly. The mobile console also has a plurality of wheels. At least some of the wheels have a settable brake.

[0004] The safety cover is secured to the console by a safety latch. A safety interlock switch prevents operation in the event that the safety cover is not locked to the console. The safety cover preferably further comprises a pair of opposed handles to facilitate removal of the cover from the console.

[0005] A control panel has manually operating controls which control the speed of the first motor and the second motor. The rotary straightener assembly preferably comprises an arbor having a plurality of removable pegs.

[0006] The mobile console includes a perforated panel and a ventilation fan for ventilating heat from the console. The spool mounting assembly has an unwind mechanism which unwind tubing from a spool mounted to the spool mounting assembly.

[0007] A portable rotary tubing straightener apparatus comprises a console with a spool mounting assembly mounted to the console. A first motor is operably connected to drive a drive roller. An adjustable tensioner assembly includes a tension roller. The drive and tension rollers are engageable with a received tubing at generally opposed locations. A rotary straightener assembly is mounted to the console. Another motor carried by the console is actuatable to rotate the rotary straightener assembly. Upon mounting a spool with tubing to the spool mounting assembly and feeding tubing through the rotary assembly and between the drive and tension rollers and activating the first and second motors, the tubing unwinds from the spool and exits in a continuous, straightened condition from the drive and tension rollers.

[0008] The adjustable tensioner assembly further preferably has a pivot arm mounting the tension roller and a variably positionable shaft engages the pivot arm and has a rotary handle. A safety cover defines a pair of apertures enclosing the rotary straightener assembly. The rotary straightener assembly is disposed between the apertures. Tubing is passable through the apertures and the rotary straightener assembly. Upright guides each have an eye for guiding the tubing to a location between the drive roller and the tension roller.

[0009] The console is preferably supported on a plurality of omni-directional castor wheels. A control panel is mounted to the console and has an on/off switch for the first motor and an on/off switch for the second motor. In addition, the control panel has a dial for regulating the speed of the first motor and a second dial for regulating the speed of the second motor.

[0010] The rotary straightener assembly further preferably comprises an arbor having a plurality of removable pegs. The safety cover for the rotary straightener assembly is lockable to the console via a safety latch. A safety interlock switch is actuateable to prevent rotation of the rotary straightener assembly in the event that the safety cover is not properly latched to the console.

[0011] A portable rotary tubing straightener apparatus comprises a console. A spool mounting assembly is mounted to the console. A motor is supported on the console and drives a drive member. An adjustable tensioner assembly has a pivot arm mounting a tension member. The drive and tension members are engageable at generally opposed locations of a continuous tubing to advance the tubing. A rotary straightener assembly is mounted to the console. A second motor is carried by the console and actuator to rotate the rotary straightener assembly. Upon mounting a spool with tubing to the spool mounting assembly and feeding tubing through the rotary assembly and between the drive and tension members and activating the motors, the tubing unwinds from the spool and traverses a generally linear path from the rotary assembly and exits in a continuous straightened condition from the drive and tension members.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] FIG. 1 is a perspective view of a portable rotary tube straightener apparatus together with a spool of tubing and further illustrating the operation to produce straightened tubing.

[0013] FIG. 2 is an enlarged perspective view of a straightener drive sub-assembly of detail A of the straightening apparatus of FIG. 1;

[0014] FIG. 3 is an enlarged front end view, portions removed, of the straightener apparatus of FIG. 1;

[0015] FIG. 3A is an enlarged view of detail D of FIG. 3;

[0016] FIG. 3B is an enlarged view of detail H of FIG. 3;

[0017] FIG. 4 is a top plan view, partly in diagram form, of the portable straightener apparatus, the spool and the tubing of FIG. 1;

[0018] FIG. 4A is an enlarged sectional view taken along the line F-F of FIG. 4;

[0019] FIG. 5 is a left side elevational view of the portable straightener apparatus, spool and tubing of FIG. 1, partly in diagram form, and portions removed to show interior detail;

[0020] FIG. 5A is an enlarged sectional view, partly in diagram form, taken along the line G-G of FIG. 5,
[0021] FIG. 6 is a perspective view of the portable rotary tube straightener apparatus of FIG. 1, together with the spool and tubing, taken from generally the opposite side thereof;

[0022] FIG. 7 is a right side elevational view of the portable straightener apparatus, the spool and the tubing of FIG. 6;

[0023] FIG. 8 is a top plan view of the portable straightener apparatus, the spool and the tubing of FIG. 7;

[0024] FIG. 9 is a side elevational view, partly in diagram form, of the portable rotary tube apparatus, the spool and the tubing of FIG. 1;

[0025] FIG. 10 is an enlarged top plan view of a control panel for the portable straightener apparatus of FIG. 1; and

[0027] FIG. 11 is a photograph of a disassembled rotary straightener assembly employed in the portable straightener apparatus together with a tool employed for setting the rotary straightener assembly.

DETAILED DESCRIPTION

[0028] With reference to the drawings wherein like numerals represent like parts throughout the several figures, a portable rotary tubing straightener apparatus is generally designated by the numeral 10. The straightener apparatus is adapted to receive and mount a spool 12 of tubing 14 and to feed the tubing in the feed direction indicated to automatically straighten the tubing for usage. The tubing 14 typically has a continuous long-length configuration of uniform diameter and is manufactured from various metal and steel alloys. The tubing 14 has numerous usages, such as high pressure fuel lines and hydraulic controls. The tubing 14 is typically wound onto spools for storage and transport.

[0029] The portable straightener apparatus 10 comprises a mobile console 20 having a cabinet form with a heavy duty base 21 supported by omni-directional caster wheels 22. The caster wheels 22 have a manually settable brake 23 for immobility of the wheels. In the illustrated embodiment, there are six caster wheels. The console 20 has side panels 24, 25 and 26, a front panel 28 and a rear panel 29. Panel 25 is perforated to provide ventilation. Representative dimensions in inches for one embodiment are indicated in FIGS. 3, 5 and 9.

[0030] A spool support stand 40 is mounted at the rear of the console. The unwinder assembly 40 functions to facilitate the rotation of spool 12 to unwind the tubing 14. The spool support stand assembly includes a laterally projecting axle 42 for receiving the spool and a retaining cap 44 for locking the received spool 12 to the axle 42.

[0031] The console 20 includes an upper platform 30 which mounts and receives a safety cover assembly 50. The cover assembly 50 encloses a rotatable elongated rotary straightener assembly 60. The rotation of the rotary assembly 60 acts to progressively alleviate coiling in the tubing. The safety cover assembly 50 includes a lower rear aperture 51 and a frontal aperture 53 through which the tubing to be straightened is passed. The safety cover assembly 50 includes an open box-like enclosure with a pair of handles 52 for lifting same from the platform for removal when desired.

[0032] With reference to FIG. 11, the rotary straightener assembly 60 comprises an elongated arbor 130 which includes access openings 132, 134 and 136. Pegs 142, 144 and 146 are adjusted essentially radially relative to the arbor and are respectively secured by three nuts 148. The pegs 142, 144 and 146 have a generally flat base and are inverted and inserted into the respective openings 132, 134 and 136 and secured by the nuts 148. The pegs are specifically designed for a given tubing size and progressively elastically deform the tubing to make it straight. A tool 150 applies torque to adjust the nuts which are threaded to the arbor.

[0033] Two substantially identical, spaced upright tube guides 54 and 56 are mounted to the platform 30 forwardly of the cover assembly 50. The guides 54 and 56 have eyes 57 and 59, respectively, for slidably receiving the tubing 14. The guides 54, 56 and eyes 55, 57 align with the apertures 53. A third guide 58 with an eye 59 is mounted rearwardly of the cover assembly 50 to guide the tubing to the rotary straightener assembly 60.

[0034] With additional reference to FIG. 3B, a projecting latch 64 is secured by a side lock mechanism 66 for securely maintaining the safety cover assembly in a fixed locked position to the top of the platform 30. A safety interlock switch 68 is mounted to a sensor mount 69 to ensure that the safety cover 50 is locked in position while the apparatus is operating.

[0035] The guides 56 and 58 respectively support the aligned eyes 57 and 59 which slidably receive and guide the tubing for passage to the straightener drive subassembly 80 (best illustrated in FIG. 2). The straightener sub-assembly 80 is mounted to the platform 30 at a forward location.

[0036] With reference to FIG. 3, the console 20 has an interior support shelf 32 which mounts a motor 70. The motor 70 is preferably a 10 horsepower 3 phase 1200 RPM induction motor which drives a timing belt 72. The timing belt 72 ultimately rotary drives the rotary assembly 60. A control module 34 for the motor is mounted to the side of the console. The opposing side of the console includes a vent 36 and a ventilator fan 38 for the motor 70.

[0037] With reference to FIG. 2, the straightener drive subassembly 80 comprises a pair of supports 82 which mount a 3 horsepower, 3 phase 1800 RPM induction motor 90. The motor drives a drive wheel shaft 92 which mounts a heavy duty drive wheel 94. A mounting plate 96 supports an adjustable tensioner assembly 100. The tensioner assembly 100 employs a pivotal tension arm 102 which in turn mounts a heavy duty idler roller 104. The drive roller 94 and idler roller 104 are positioned in opposed relationship. The tubing 14 is captured between the rollers 94 and 104 and propelled linearly outwardly therefrom.

[0038] A screw shaft 108 having a rotary handle 110 is variably positionable to regulate the tension applied by the idler roller 104 against the tubing. The actuation and operation of the motor 90 causes the rollers to engage opposite sides of the tubing 14 and to progressively payout the tubing 14 in a straight linear fashion as tubing is unwound from the spool.

[0039] A module 34 houses a PLC, breakers, a transformer, a power supply and a contactor (not illustrated).

[0040] With reference to FIG. 10, the console has a control panel 120. The control panel includes a rotary dial 122 which via a potentiometer regulates the speed of motor 70 and a second rotary dial 124 which via a potentiometer regulates the speed of motor 90. The motors are turned on and off by a switch 126. An emergency stop button 128 is also supplied to stop the motors in an emergency situation. Upon turning on the on/off switch 126, a ventilation fan 38 is also activated. The fan is activated to control the temperature within the console in the vicinity of the motor 70.

[0041] The speeds of the motors 70 and 90 are synchronized so that the straightening at the straightener assembly 60 and the drive sub-assembly 80 and the unwinding of the spool...
is coordinated. The tension on the tubing 14 between the rollers 94 and 104 is adjusted by the handle 110 to provide the proper opposed drive engagement.

[0042] While a preferred embodiment has been described, the foregoing description should not be deemed a limitation of the invention. Accordingly, various adaptations, modifications and alternatives may be provided without departing from the spirit and the scope of the present invention.

1. A portable rotary tubing straightener apparatus comprising:
   a mobile console;
   a spool mounting assembly mounted to said console;
   a first motor supported on the console and operatively connected for rotating a drive roller;
   an adjustable tensioner assembly having a tension roller positionable opposite said drive roller, said drive and tensioner rollers engageable at opposed locations of a continuous tubing;
   a rotary straightener assembly mounted to said console;
   a second motor carried by said console and activatable to rotate said rotary straightener assembly;
   wherein upon mounting a spool with tubing to said spool mounting assembly and feeding tubing through the rotary assembly and between said rollers and activating said first and second motors, said tubing unwinds from said spool and exits in a continuous straightened condition from said drive and tension rollers.

2. The portable straightener apparatus of claim 1 wherein said adjustable tensioner assembly further comprises a pivotal arm mounting said tension roller.

3. The portable straightener apparatus of claim 2 further comprising a variably positionable shaft engaging said pivot arm and having a rotary handle.

4. The portable straightener apparatus of claim 1 further comprising a safety cover defining a pair of apertures and enclosing said rotary straightener assembly, said tubing passable through said apertures and the rotary straightener assembly.

5. The portable straightener apparatus of claim 4 further comprising at least one upright guide having an eye for guiding entry of said tubing to said tensioner assembly.

6. The portable straightener apparatus of claim 1 wherein said mobile console includes a plurality of wheels.

7. The portable straightener apparatus of claim 6 wherein at least some of the wheels have a settable brake.

8. The portable straightener apparatus of claim 4 wherein said safety cover is secured to said console by a safety latch and a safety interlock switch is activatable to prevent operation in the event that the safety cover is not locked to the console.

9. The portable straightener apparatus of claim 1 wherein the rotary straightener assembly comprises an arbor having a plurality of removable pegs.

10. The portable straightener apparatus of claim 1 wherein said mobile console includes a perforated panel and a ventilation fan for ventilating heat from the console.

11. The portable straightener apparatus of claim 1 wherein said spool mounting assembly has an unwinder mechanism which unwinds tubing from a spool mounted to said spool mounting assembly.

12. The portable straightener apparatus of claim 1 wherein said spool mounting assembly is engaged by a drive roller.

13. The portable straightener apparatus of claim 4 wherein said safety cover further comprises a pair of opposed handles to facilitate removal of the cover from the console.

14. A portable rotary tubing straightener apparatus comprising:
   a console;
   a spool mounting assembly mounted to said console;
   a first motor supported on the console and operatively connected for driving a drive member;
   an adjustable tensioner assembly including a tension member, said drive and tension members disposed at generally opposed positions;
   a rotary straightener assembly mounted to said console;
   a second motor carried by said console and activatable to rotate said rotary straightener assembly;
   wherein upon mounting a spool with tubing to said spool mounting assembly and feeding tubing through the rotary assembly and between said drive and tension members and activating said first and second motors, said tubing unwinds from said spool and exits in a continuous straightened condition from said drive and tension members.

15. The portable straightener apparatus of claim 14 wherein said adjustable tension assembly comprises a variably positionable shaft engaging a pivot arm and having a rotary handle.

16. The portable straightener apparatus of claim 14 further comprising a safety cover defining a pair of apertures and enclosing said rotary straightener assembly wherein said rotary straightener assembly is disposed between said apertures and said tubing is passable through said apertures and said rotary straightener assembly.

17. The portable straightener apparatus of claim 14 further comprising an upright guide having an eye for guiding entry of said tubing to a location between said drive member and said tension member.

18. The portable straightener apparatus of claim 14 wherein said console is supported on a plurality of omnidirectional caster wheels.

19. The portable straightener apparatus of claim 14 further comprising a control panel mounted to said console and having an on/off switch for said first motor and an on/off switch for said second motor and a first dial which regulates the speed of the first motor and a second dial which regulates the speed of the second motor.

20. The portable straightener apparatus of claim 14 wherein said rotary straightener assembly further comprises an arbor having a plurality of removable pegs which interact with saidPEGs.

21. The portable straightener apparatus of claim 14 further comprising a safety cover for said rotary straightener assembly and wherein said safety cover is lockable to said console via a safety latch and a safety interlock switch prevents rotation of the rotary straightener assembly in the event that the safety cover is not properly latched to the console.

22. A portable rotary tubing straightener apparatus comprising:
   a console;
   a spool mounting assembly mounted to said console and receiving a spool of continuous metal tubing;
   a first motor supported on the console and operable to drive a drive roller;
   an adjustable tensioner assembly having a pivot arm mounting a tension roller, said drive and tension rollers
engagable at generally opposed locations of said continuous tubing to advance said tubing;
a rotary straightener assembly mounted to said console and serially receiving a portion of said tubing;
a second motor carried by said console and activatable to rotate said rotary straightener assembly;
wherein upon passing tubing through the rotary assembly and between said drive and tension rollers and activating said first and second motors, said tubing unwinds from said spool and traverses a generally linear path from said rotary assembly and exits in a continuous straightened condition from said drive and tension rollers.