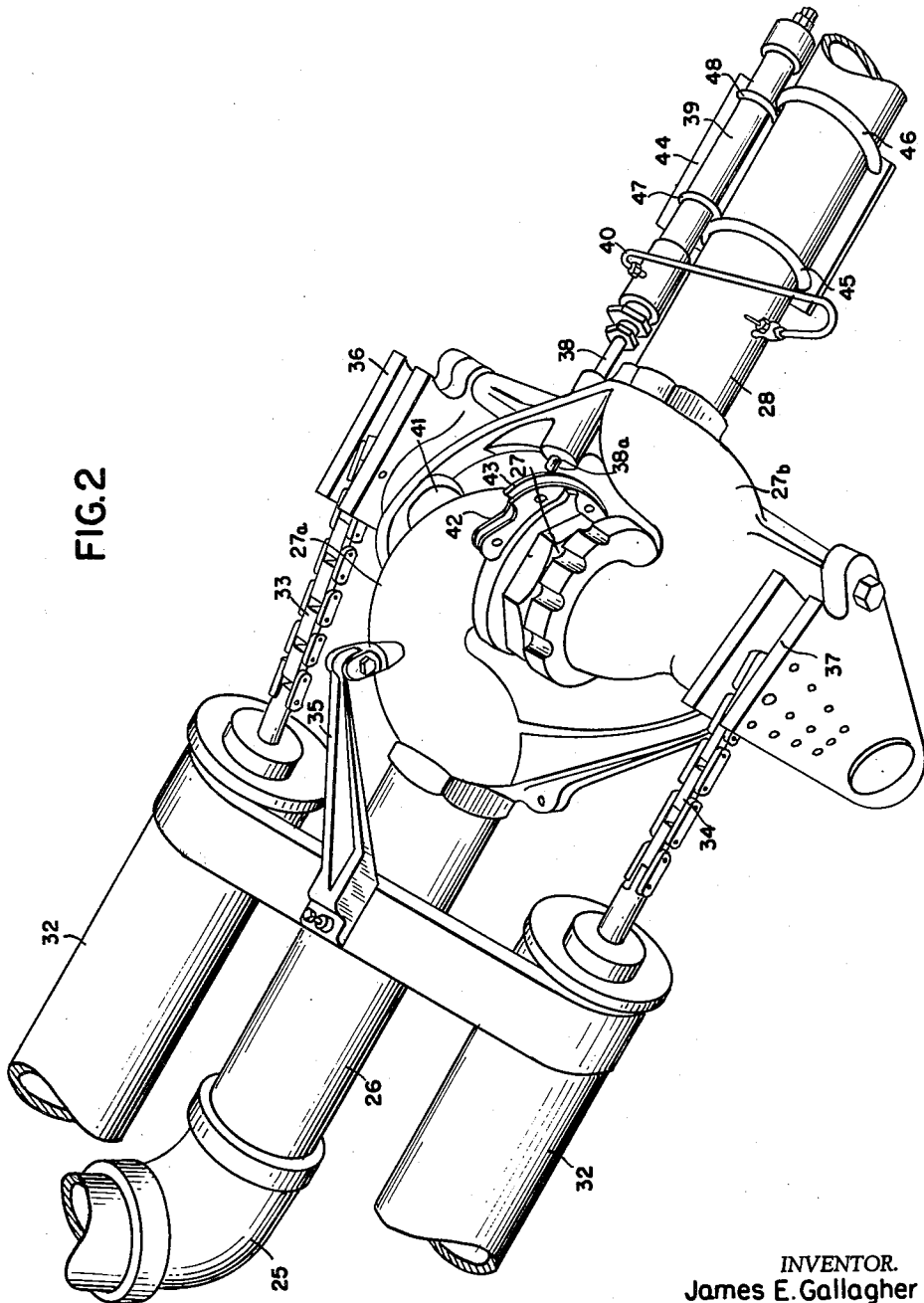


3,021,867

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Feb. 20, 1962

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GROUNDING SYSTEM FOR LIGHT OIL LOADING STATIONS

Filed April 6, 1959

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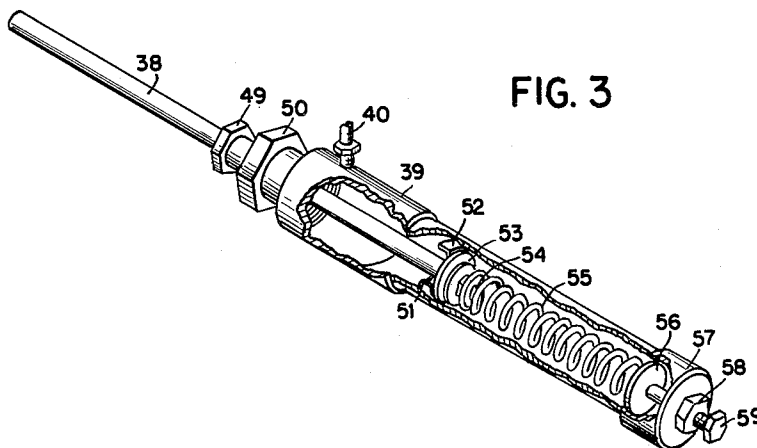


FIG. 3

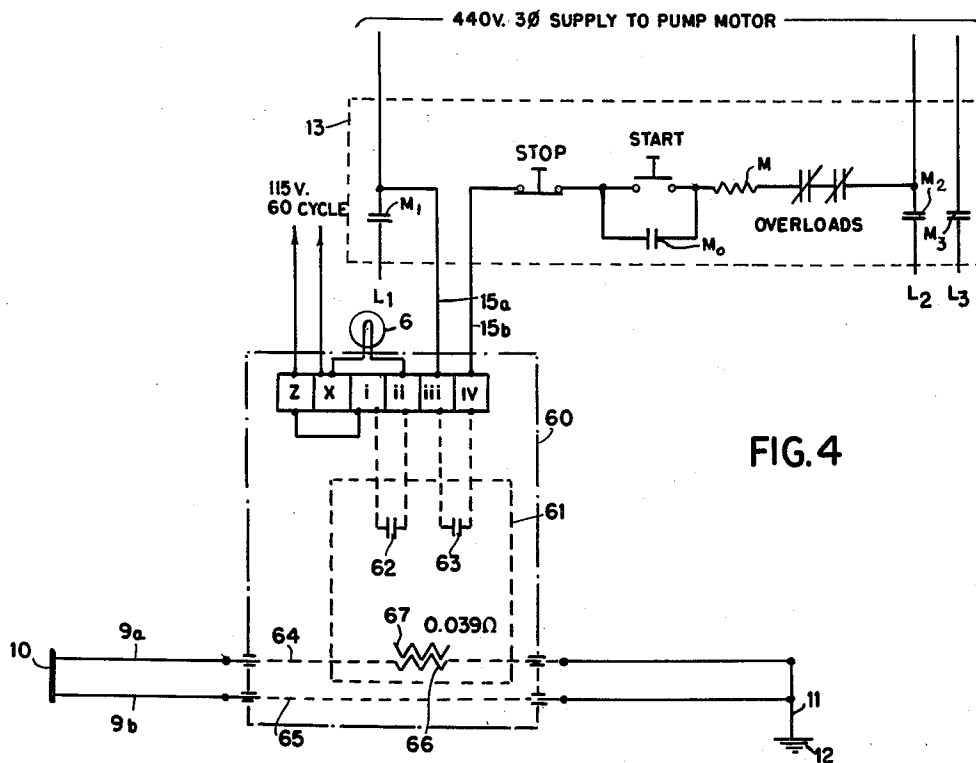


FIG. 4

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GROUNDING SYSTEM FOR LIGHT OIL
LOADING STATIONS

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1 Claim. (Cl. 137-565)

My invention relates to the loading of light oil trucks and, more particularly, to assuring that such loading takes place only after and while the trucks to be loaded are properly grounded.

It is well-known that a serious hazard exists when a truck which is improperly grounded is loaded with a light oil such as kerosene. Improper grounding can be masked by such things as a defective grounding clamp, a faulty cable or a high resistance contact with the metal of the truck due to paint or other insulating media. In addition, it is possible for the operator to overlook entirely the grounding of the truck or to overlook the breaking of the grounding connection during the loading process by, for instance, the inadvertent removal of the clamps by which the truck is grounded.

It is the object of my invention to provide light oil loading station racks with means for properly grounding the trucks to be loaded and with means of preventing the transfer of such light oils, whether by pumping or by gravity or both, from the racks to the trucks if such grounding is or becomes imperfect. "Light oil" is here defined as a hydrocarbon liquid having a gravity above 25.0 API. Oils falling in this category include domestic fuel oils, naphthas, solvents, kerosene, gasoline and aromatics.

These and other objects are accomplished by my grounding system which includes, in combination with a light oil loading line pump, a generally horizontally disposed light oil loading rack arm assembly, an electronic grounding detecting device and a hydraulic locking device for the loading rack arm assembly. The electronic grounding detecting means, e.g., a commercially available Nelson Grounding Indicator, operates an energizing relay the contacts of which are interposed in the electrical circuit of the motor driving the loading rack pump. So long as a proper grounding is signaled by the detector, the loading rack pump can be started or can continue to operate. If it is not signaled, the relay prohibits the starting of the pump or the continuance of its operation and, therefore, the delivery of oil to the loading rack by its pump. The hydraulic locking device for the loading arm assembly includes a locking bar for preventing the movement downward of the vertically swivelling portion of the loading arm assembly, i.e., that portion hereinafter to be termed the loading rack spout, into the loading hatch of the truck and, therefore, for preventing the emptying of the rack by gravity of such oil as it may contain whether or not the pump is operating. The locking bar which is also the piston rod in a spring-loaded piston cylinder having fluid inlet means is actuated, i.e., held in a locking position with respect to the vertically swivelling loading rack spout, by the spring-driven piston and is released by a countervailing hydraulic pressure against the piston head. The piston head, then, is disposed between the fluid inlet means and the spring. The hydraulic pressure in the cylinder is drawn with the oil from the loading arm assembly via the fluid inlet means and such pressure, e.g., about 50 pounds, is available in the loading rack assembly only when the pump is operating and forcing oil into it.

For a more complete understanding of the practical application of the features and principles of my inven-

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tion, reference is made to the appended drawings in which:

FIGURE 1 is a side elevation of a light oil loading rack and a grounding system in accordance with my invention;

FIGURE 2 is an isometric elevation of a loading rack arm assembly vertical swivel in cooperation with the hydraulic locking device of the system of my invention;

FIGURE 3 is an isometric elevation of the hydraulic locking device of the system of my invention; and,

FIGURE 4 is the circuit diagram of electronic elements of the system of my invention in simplified form.

FIGURE 1 shows a loading rack which includes oil loading line 1 running from loading line pump 2 to the horizontally extending loading arm assembly. The air eliminators, strainers and metering devices normally present in such an oil line are not shown. Neither are the storage tanks from which electric motor-driven pump 2 draws the oil. Supporting column 3 holding loading line 1 upright at and by means of bracket 4 is, on the other hand, shown in FIGURE 1, as are various elements of the system of my invention. These elements include the electronic grounding detector 5 affixed to column 3; the grounding detector signal light 6; the truck 7 to be loaded through loading hatch 8; grounding leads 9a and 9b and clamp 10 connecting truck 7 to ground lead 11 and ground 12 via grounding detector 5; external stop, start and overload control unit 13 and, control unit lines L₁, L₂, L₃, 15a, and 15b connecting grounding detector 5 and the motor of loading line pump 2 via control unit 13.

The horizontally disposed loading arm assembly of the loading rack is shown in FIGURE 1 and this assembly includes horizontally swivelling pipe connecting joint 16 which connects loading line 1 to the downwardly extending arm of T-shaped pipe section 17. It also includes plug 18 which closes off the upwardly extending arm of pipe section 17 and furnishes a base for the journal means 19 mounted thereon. Journal means 19 is, in turn, held in bearing means 20 mounted on support column 3 of the loading rack. Thus, horizontally swivelling pipe connecting joint 16, journal means 19 and bearing means 20 enable the rotation of pipe section 17 about the axial line formed by its arms and, in the depicted instance, for better than 270°. The leg of pipe section 17, of course, extends radially from such axis.

Further, the loading arm assembly of FIGURE 1 includes a brace 21 which runs between and is connected to flanges on the upwardly extending arm and the horizontally extending leg of T-shaped pipe section 17. Next in the loading arm assembly are pipe connecting elbow joint 23, a second horizontally swivelling pipe connecting joint 24, pipe connecting elbow joint 25 and pipe section 26, all of which conduct the light oils pumped from loading line 1 by way of pipe section 17. This fluid connection thereafter continues by means of vertically swivelling pipe connecting joint 27, the first half 27a of which is visible, and the other parts of what I have termed the loading rack spout, i.e., pipe section 28 connected to the second half 27b (see FIGURE 2) of pipe connecting joint 27, loading valve 29 connected to pipe section 28, pipe section 30 connected to loading valve 29, and loading nozzle 31 with a deflector T connected to pipe section 30. As shown in FIGURE 1, the loading spout is in its normal vertically inclined position.

As shown in FIGURES 1 and 2, the loading arm assembly includes parts by which the vertical movement of the loading rack spout at vertically swivelling pipe connecting joint 27 is partially governed. Among these parts are chains 33 and 34 emanating from so-called loader 32, e.g., a commercially available Oilco Springmatic #462 Long Range Loader, and bumper arm 35 mounted on loader 32 and impinging upon second half

27b of vertically swivelling pipe joint 27 when the loading rack spout is out of use and elevated. Other parts are grooved adjustable chain lever arm 36 and grooved adjustable chain lever arm 37 mounted on second half 27b of vertically swivelling pipe joint 27 and connected to chains 33 and 34, respectively.

FIGURES 1 and 2 show, further, the hydraulic locking device for the loading rack arm assembly of the grounding system of my invention. In FIGURE 1, visible parts of the device include swivel locking piston rod 38 (shown in locking position), piston cylinder 39, and oil tube 40. Piston cylinder 39 is mounted on pipe section 28 with which it is placed in fluid connection by oil tube 40. In another embodiment of my invention, however, piston cylinder 39 can be mounted on the loader side of vertically swivelling pipe connecting joint 27, rather than as here shown, i.e., on the loading rack spout side.

The vertically swivelling pipe connecting joint 27 of the loading arm assembly and the hydraulic locking device for the loading arm assembly of my grounding system are shown more clearly in FIGURES 2 and 3. In FIGURE 2, the vertically swivelling pipe connecting joint 27 is in an unlocked position (in contrast with FIGURE 1), i.e., in the position of delivering oil to the loading rack spout as it is pumped through pipe section 26. This means that there is no contact between bumper arm 35 and the second half 27b of pipe connecting joint 27 as there is in FIGURE 1 where the loading rack spout is depicted as not in use and in a vertically inclined position. However, the downward movement in vertically swivelling pipe connecting joint 27 is restrained. Thus, when the loading rack spout made up the second half 27b of pipe joint 27, pipe section 28, etc., is depressed by the operator, grooved adjustable chain lever arms 36 and 37 which are rigidly affixed to the casting that is the second half 27b also rotate downwardly about the center line of pipe joint 27 and the coinciding center line of journal means 41 mounted on the casting that is the first half 27a of pipe joint 27. But this downward rotation is resisted by the tension in chains 33 and 34 which are connected to grooved adjustable chain lever arms 36 and 37, respectively, and this tension is created by springs or the like in the two cylinders of loader 32. Indeed, were the operator not depressing the loading rack spout, this tension would incline such spout vertically as is shown in FIGURE 1, unless, of course, counterbalancing was employed to hold the spout in any given position.

Further, with respect to the hydraulic locking device for the loading arm assembly shown in FIGURE 2, locking piston rod 38 is shown in the open position. This means that locking bar 38 is sufficiently retracted into piston cylinder 39 so that its end 38a cannot be received in the lock 42 of cam 43 mounted on the original casting web of first half 27a of pipe joint 27, and so that the loading rack spout can be depressed by the hand of the operator. Also shown in FIGURE 2 are piston cylinder 39 mounted to pipe section 28 by flat plate 44 and U-bolts 45, 46, 47 and 48 and oil tube 40 fluidly linking piston cylinder 39 and pipe section 28.

FIGURE 3 shows the various parts of one of the embodiments of the hydraulic locking device for a loading arm assembly of the system of my invention. These parts include locking bar 38, packing gland bushing 49, end bushing 50, oil tube 40, piston cylinder 39, spring holding washer 51, cup gasket 52, washer 53, hexagonal nut 54, spring 55, spring holding disc 56, end cap 57, lock nut 58, and spring adjusting cap bolt 59.

FIGURE 4 shows a simplified circuit diagram of the electrical elements of the system of my invention. A terminal strip with six connection points, i.e., Z, X, i, ii, iii and iv, is mounted inside an explosion-proof housing 60. The ground detecting unit 61 is also mounted in housing

60. Points i, ii, iii and iv are, as shown in FIGURE 4, connected to contacts actuated by relays 62 and 63 which are integral parts of grounding detector 61.

FIGURE 4 also shows lines 64 and 65 and coil 66 in line 64 and within grounding detector 61. These components, together with truck grounding leads 9a and 9b, clamp 10, ground lead 11 and ground 12, go to make up the ground circuit which ground detecting unit 61 oversees. The dots at the ends of lines 64 and 65 and in the rest of this circuit represent connection terminals. Wire seal points which are necessary to prevent vapor leakage into housing 60 are symbolized by = at the points where lines 64 and 65 enter and leave housing 60. In addition, FIGURE 4 shows 0.039² segment 67 transformer-coupled with coil 66. Segment 67, an electrical bridge component, controls the electrical actuation of relays 62 and 63. Again, FIGURE 4 shows external stop, start, and overload control unit 13. In this unit relay contacts M₀, M₁, M₂ and M₃ are inserted in the starting circuit and motor power lines L₁, L₂ and L₃ and the relays are actuated by high impedance relay coil M.

The system of my invention involves the interaction and cooperation of its three primary parts. When the loading rack operator attaches grounding clamp 10 to truck 7 as shown in FIGURE 1 and wires 64 and 65 of FIGURE 4 are connected, coil 66 of grounding detector 61 is effectively short-circuited and segment 67, in turn, energizes two circuits by means of relays 62 and 63. The first of these circuits is that of signal light 6 which takes the following path: from point Z which is connected to the 115 volt, 60 cycle power supply to point i, through the contacts of relay 62 to point ii, through signal light 6 to X which is also connected to the power supply. Similarly the relay 63 contacts lying between point iii and point iv are closed when truck 7 is properly grounded and the 440 volt, 3 phase electrical supply is connected to the motor of pump 2, albeit by means of the external stop, start and overload control unit 13. In other words, after the grounding circuit is satisfied and the "start" switch is closed, a flow of current is established through the high impedance relay coil M and this closes the contacts of relays M₀, M₁, M₂ and M₃ in lines L₁, L₂ and L₃, respectively. Coil M then maintains the circuit until it is opened either by means of the stop switch, the overload action or the grounding detecting relay action. (But, if the grounding has not been properly effected by the loading rack operator, it is clear that the signal light cannot operate and the pump cannot be operated. Further, if improper grounding conditions develop once the pump has started, the light will go out and the relay 63 contacts lying between point iii and point iv will open to halt the flow of current to coil M and, as a result, the contacts of relays M₀, M₁, M₂ and M₃ will open to stop the pump motor.) Pump 2 thereupon forces oil up loading line 1 to the loading arm assembly. However, the fact that pump 2 is running does not by itself make it possible for the operator to load truck 7 for two reasons. The operator must first be able to lower the loading arm assembly into the hatch 8 of truck 7 and then he must open loading valve 29 which, presumably, was previously closed to avoid oil spillage from loading nozzle 31. And the only way that the operator can lower the loading arm assembly is to allow pump 2 to build up a sufficient hydraulic pressure, e.g., 50 pounds, in the loading arm assembly and, more especially, in pipe section 28 thereof, so that the oil flowing through oil tube 40 from pipe section 28 into piston cylinder 39 will push against cup gasket 52 and helical spring 55, thereby retracting locking bar 38 into the cylinder and out of lock 42 of cam 43. In other words, then, the operator cannot load truck 7 until grounding detector 5 allows pump 2 to start and until the running pump 2 at the behest of grounding detector 5 effects the opening of my hydraulic locking device and makes

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possible the lowering of the loading rack arm assembly spout.

What is claimed is:

In a light oil loading station rack including an oil loading line, an oil loading line pump and an electric motor driving the pump, a system for preventing the transfer of the oil to a truck to be loaded until there is established a proper electrical connection between the truck and a ground, the system comprising an electrical connecting means between the truck and the ground, an electronic grounding detecting means, energizing means between the electronic grounding detecting means and the electric motor driving the pump, a generally horizontally disposed loading rack arm assembly including a normally vertically inclined loading rack spout and a pipe connecting means connecting the oil loading line and the loading rack arm assembly and a vertically swivelling pipe connecting means connecting the loading rack spout to the remainder of the loading rack arm assembly, a receiving means positioned on the vertically swivelling pipe connecting means to receive a piston rod which locks the loading rack spout in the normally vertically inclined position, a piston cylinder positioned on the loading rack arm assembly having fluid inlet means and containing the piston rod, compressible spring means for holding the piston rod in the receiving means, piston head means connected to the piston rod and disposed

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between the fluid inlet means and the compressible spring means, and a fluid connecting means between the loading rack arm assembly and the fluid inlet means of the piston cylinder, whereby the electronic grounding detecting means detects the establishment of a proper electrical connection by the electrical connecting means between the truck and the ground and operates the energizing means between the electronic grounding detecting means and the electric motor driving the pump, the pump draws the oil from the oil loading line into the loading rack arm assembly and the fluid connecting means between the loading rack arm assembly and the fluid inlet means of the piston cylinder, the oil in the piston cylinder compresses the compressible spring means, the piston rod is withdrawn from the receiving means, and the loading rack spout in the normally vertically inclined position is unlocked.

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