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AIR COMPRESSOR PLANT

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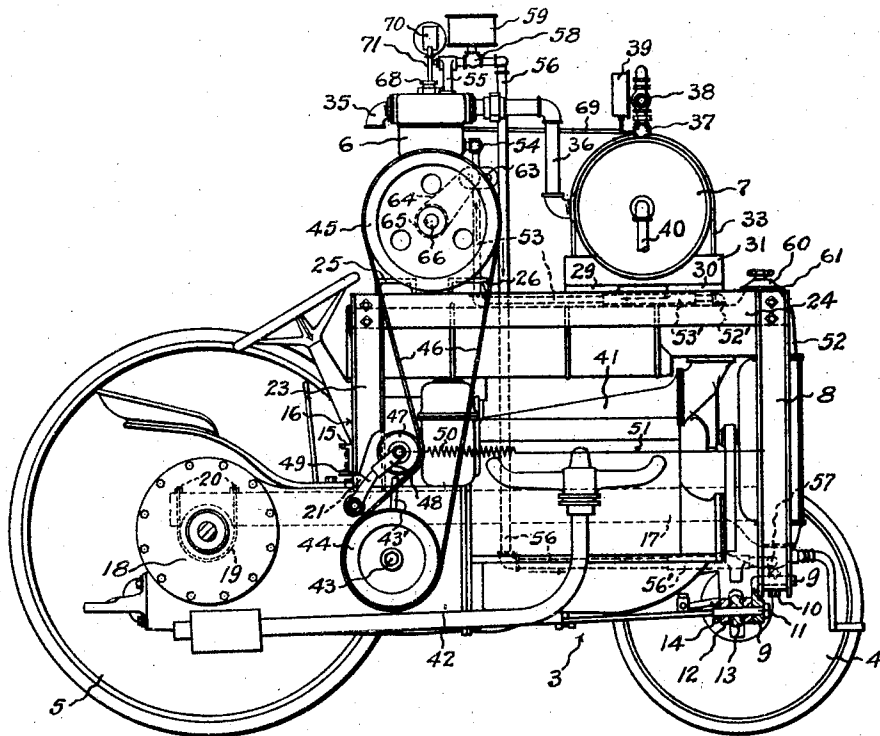


FIG-1

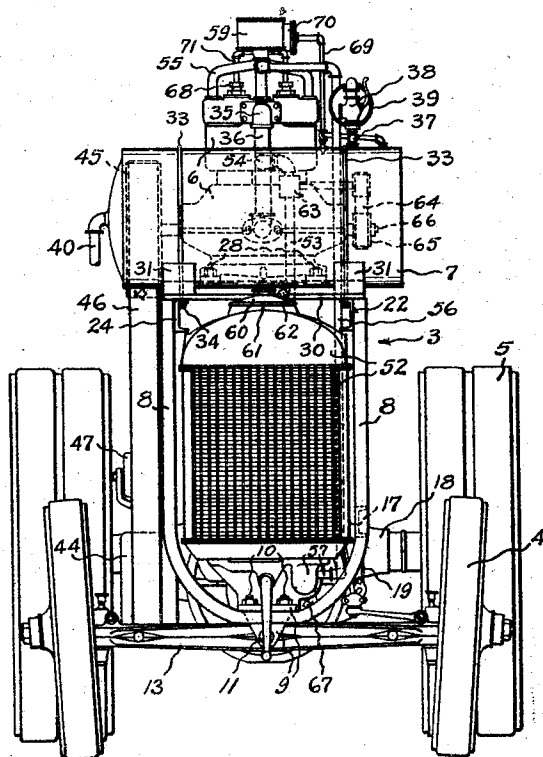


FIG-2

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AIR COMPRESSOR PLANT

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My invention relates to improvements in air compressor plants of the portable type adapted to be moved under its own power from place to place wherever compressed air may be needed.

It has been customary heretofore to make the air compressor plant portable by mounting the air compressor, receiver, and a source of motive power on a suitable truck-like frame provided with wheels, the front wheels being so mounted that they may be turned by means of a tongue or other suitable means. This arrangement enables the compressor equipment to be moved manually over short distances to new work, but usually requires the services of several men while this is being done; and necessitates the use of a truck or other substantial means of transportation for this purpose in case it is to be moved a considerable distance. A truck with a portable air compressor plant of this type in tow is obviously unwieldy and difficult to handle where the traffic is heavy, and can be taken only where there is a street, road, or firm soil. The expense of moving the equipment in this manner is often increased by the time lost by the air compressor and its crew of workmen while waiting for the truck and while placing the equipment at a new location.

Broadly the object of my invention is to provide improved means for the operation and transportation of portable air compressor plants.

A specific object is to provide means for the adaptation of an air compressor and auxiliary apparatus to a tractor to form a portable air compressor plant whereby the same can be moved under its own power over all sorts of streets, roads and soil to hitherto relatively inaccessible points where compressed air is needed.

An additional object is to provide improved means for automatically governing the speed and unloading the compressor of a portable air compressor plant formed by the adaptation of an air compressor to a tractor.

A further object is to provide improved means for circulating and cooling the cooling water for the cylinders of the engine and

for the cylinders of the air compressor of tractor mounted, air compressor plants.

Other objects of the invention will be apparent from the following description and the accompanying drawing, and will be particularly pointed out in the appended claims.

A preferred embodiment of my invention is illustrated in the drawing, throughout which like reference numerals are used to indicate like parts.

Figure 1 of the drawing is a side elevation of the combination constituting my invention, the front and rear wheels of the rear side of the tractor element being omitted for the sake of clearness.

Fig. 2 is a front elevation of the combination which illustrates more clearly certain details of the invention.

In the drawing, a Fordson tractor 3 is shown provided with disc-type, solid-rubber-tired wheels 4 and 5 for the front and rear respectively of the machine, the same being standard equipment for use on paved streets, hard roads and firm soil.

As a means of mounting the air compressor 6 and air tank 7, I prefer to build up a substantial supporting frame by means of standard structural steel shapes. The drawing shows the front end element of this supporting frame consisting of a U-shaped channel 8 to which a bracket pivotal casting 9 is fixedly attached at its lower extremity by means of bolts 10, which casting is pivotally supported by a pin 11 of high grade steel passing through bracket casting 9, lugs 12, projecting downward from the body of the tractor, and front axle 13. Pin 11 is secured against longitudinal displacement by means of a substantial cotter pin 14. A horizontally disposed channel 15 is securely fastened to the cast steel dash 16 by means of bolts and welding and forms the main rearward support for the frame.

Main support members 8 and 15 are preferably augmented by a third channel 17 which has its forward end securely welded to the right hand leg of channel 8 as seen in Fig. 2. Its rearward end is notched to fit and bears on rear axle housing 18 to which it is

fastened by means of a large U-shaped bolt 19 and nuts 20.

A vertically disposed channel 21 is bolted and welded to channels 15 and 17 and supports the rearward end of top side channel 22, the forward end of which is supported by the right hand leg of channel 8 to which it is bolted and welded near its upper extremity. A second vertically disposed channel 23 is fixedly attached to the left hand end of channel 15 by welding and supports the rearward end of top side channel 24, the forward end of which is supported by the left hand leg of channel 8 near its upper extremity, both the front and rear ends of channel 24 being secured to the respective vertical members by bolts and welding.

Two cross member channels 25 and 26 are disposed across top side channels 22 and 24 near the rear ends thereof, with their web side uppermost and secured thereto by welding to form a foundation or base for air compressor 6, which is secured in position on said channels by means of suitable foundation bolts 28.

Near the forward ends of side channels 22 and 24, two flat bar cross members 29 and 30 are securely welded in position to serve as a tie for the upper forward end of the framework and also to serve as supports for cradle blocks 31 which in turn support the compressed air receiver tank 7, which preferably, has a capacity of about 4 cu. ft. The tank 7 is secured in position by means of U shaped rods 33 and nuts 34 as clearly shown in Fig. 2, of the drawing.

I find that a supporting frame built up in this manner is light, strong and rigid, and serves admirably to support the air compressor and auxiliary equipment without unduly increasing the burden on the main frame of the Fordson tractor, and without interfering with the operation of the controls or other parts of the machine. This also forms a three-point type of attachment which compensates for whatever warp there may be in either the supporting frame or in the main frame of the tractor, thus eliminating the stresses that such warping would produce, in case a four-point or more rigid type of attachment were used. It will be noted that the engine and related parts are readily accessible from the side near the observer as shown in Fig. 1, of the drawing.

I have found that a two cylinder air compressor having cylinders 5 inches in diameter and a stroke of $4\frac{1}{2}$ inches, weighing about 500 pounds and requiring approximately 15 horse power for its operation at 125 pounds of air pressure, is suitable for the portable plant of my invention. The maximum and minimum speeds are respectively 800 and 300 revolutions per minute, the displacement being 82 cu. ft. per min. for the maximum

speed and 31 cu. ft. per min. for the minimum speed.

The air inlet of compressor 6 is preferably provided with a street elbow 35 with the female opening turned downward, thus effectively preventing entrance to the cylinders by the elements, and to which an air cleaner may be connected if desired.

The exhaust or delivery opening of the compressor is connected to air receiver tank 7 by a run of suitable piping 36. A T pipe fitting 37 is used to connect the receiver with a spring type safety valve 38 and air pressure gauge 39. The air line piping 40 connecting with the end of the receiver is provided with a valve, not shown, to control the flow of compressed air to the tools or apparatus to be used.

The necessary motive power for the operation of air compressor 27 is supplied by tractor engine 41 through the standard Fordson power take-off and clutch. This mechanism is enclosed within the main body housing 42 of the tractor, from which the power take-off shaft 43 and clutch operating lever 43' project. On shaft 43 is fixedly mounted a pulley 44 which is in alignment with air compressor pulley 45, and of such diameter and face dimensions as to properly transmit the required power by means of belt 46 for the operation of compressor 27 at its rated speed. A belt tightener pulley 47, rotatably mounted between the forks 48 of tightener arm 49 pivotally fastened to body housing 42, is forced against the slack side of belt 46 by means of tension spring 50 and wires 51, one end of which is adjustably secured to U-shaped channel 8. This pulley 47 keeps belt 46 tight at all times and increases its wrap around pulleys 44 and 45, thus reducing the slippage and strain on the belt.

The air compressor previously described is preferably provided with a pulley about 17 inches in diameter. In order to operate the engine and compressor at their proper speeds pulley 45 should have a diameter of about 12 inches and belt 46 should be about 4 inches wide. I prefer to use heavy, single ply, water-proof endless belt for this purpose, although other kinds of belting may be used.

The necessary cylinder jacket water for compressor 6, circulates from the top of radiator 52 through street elbow 52' and a run of hose 53' and piping 53 of suitable size to the water inlet connection 54 to compressor 6 and after flowing around the cylinder walls of the compressor, is discharged from the top of the cylinder castings through a water discharge manifold 55. Another run of piping 56 and hose 56' conducts the water to the lower extremity of radiator 52 at 57.

The lengths of hose 53' and 56' prevent the vibration etc. due to the operation of the compressor from being transmitted to radiator connections 52' and 57 which otherwise would

be loosened or broken. A T 58 in the second run of piping makes connection to a tank 59 which is open at the top to permit the ready addition of water to the circulating system which must be kept full while the compressor is operating. Radiator cap 60 is sealed tight by means of a gasket 61, and a pet cock 62 is placed in the cap to permit the escape of air which tends to trap at this point when the cooling water system is filled through tank 59.

The cooling water is circulated through the air compressor water jacket, radiator 52 and pipe and hose runs 53,—53', 56, and 56' in the direction indicated by the arrows, by means of a water circulating pump 63 which is driven by means of belt 64 and pulley 65 mounted on shaft 66 projecting from the compressor. Tests have shown that the average temperature of the cooling water in the radiator is less than both the air compressor and tractor engine are working than when the tractor engine alone is operating, due to the increased circulation of the cooling water by pump 63. The water may be drained from the cooling system by opening pet cock 67 located at the lowest point in the system.

The compressor is preferably provided with a suction valve unloader which is standard equipment for the compressor illustrated in the drawing. This apparatus is contained within each cylinder of the compressor, only the upper extremity being visible as indicated at 68, and operates in connection with the compressor intake valves which are located near the top of the cylinders.

The compressor equipment is placed in operation by reducing the speed of the tractor engine 41 until the power take off clutch may be engaged by moving power take-off clutch lever 43' toward the observer as viewed in Fig. 1, of the drawing. The engine speed is then increased to the speed found to be best for the operation of the compressor.

With the valve closed in air line piping 40, the pressure in receiver 7 will increase and will be indicated by air pressure gauge 39.

The unloader is usually adjusted to operate at about 10 pounds below the pressure at which safety valve 38 is set. When the pressure in air receiver 7 becomes greater than that at which the unloader is set to operate, the pressure is transmitted by means of piping 69 to the unloader control 70 which automatically allows the air to flow from the receiver through piping 69, and the valve of control 70, and thence through piping 71 connected to the intake valve mechanism within the air compressor cylinders, where the air pressure is exerted against a small plunger, which in turn pushes the inlet valves from their seats, thus allowing air to be swept back and forth through the valves at each revolution of the compressor, so that no air is compressed and the machine oper-

ates completely "unloaded", as the discharge valve, not shown, prevents the receiver air from returning to the cylinders.

The engine at once tends to speed up thus operating an automatic governor which is supplied for the purpose as standard equipment for the tractor and therefore is not illustrated in the drawing. It is evident that when the air compressor is operating "unloaded", there is a considerable saving in fuel and in wear and tear in the apparatus, hence this arrangement is particularly desirable where the compressed air is used intermittently or where the demand of air is light, as otherwise safety valve 38 would operate whenever the maximum pressure was exceeded and the excess air which had been previously compressed would escape into the atmosphere.

After the operation of the "unloader", as previously described, and when the pressure in air receiver 7 has decreased to the limiting low value as the compressed air is withdrawn, the unloader control 70 automatically disconnects the intake valve mechanism within the cylinders from pressure line 69, thus permitting the inlet valves to function and again "loading" the compressor, the necessary increase in fuel being regulated automatically by the governor.

When it is necessary to operate the compressor plant over soft ground the rubber tired wheels shown in the drawing are removed and standard Fordson cleated drive wheels and flanged guide wheels are installed. As these are manufactured as standard equipment for Fordson tractors this change may be readily made.

Where much sand or snow is encountered, the Fordson caterpillar wheels and track belts are installed in place of the wheels. This is also standard equipment for Fordson tractors. It is evident that an air compressor plant constructed as herein described and provided with the extra wheels and caterpillar track belts, constitutes a self contained unit which may be driven under its own power over all sorts and conditions of roads, soil, sand and snow with a minimum of delay and at comparatively small expense.

While I have described the invention herein to illustrate specifically one adaptation of an air compressor and its auxiliary apparatus to a Fordson tractor, it is to be understood that my invention relates also to the various other types of tractors. It is further understood that the specific mechanisms and construction herein described are illustrative merely and not restrictive, and that within their spirit and scope, the claims herein are intended broadly to cover all equivalent mechanisms and constructions.

For example it might be advantageous to make the air receiver longer and of smaller diameter and mount it lengthwise at the side

of the tractor instead of using the arrangement illustrated in the drawing. It is possible also to construct the supporting frame in a number of different ways, and to mount the compressor in several other positions on the tractor. Other modifications in the arrangement of the elemental parts may be made by those skilled in the art without departing from the spirit of the invention.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:

1. The combination with a tractor having the usual front and rear axles connected by a tractor frame and having a tractor mechanism mounted thereon, said tractor mechanism embodying an upright dash portion located forwardly of the rear axle to afford room to the rear of said dash portion for the steering and control mechanism of the tractor, of an auxiliary frame affording a platform above said tractor mechanism for the reception of tractor driven devices, suspension means pivoted to the central portion of the front axle and supporting the front end of said platform and other suspension means secured to said tractor dash and supporting the rear end of said platform.

2. The combination with a tractor having the usual front and rear axles connected with each other by a tractor frame and having tractor mechanism mounted thereon, of an auxiliary frame forming a platform above said tractor mechanism for the reception of tractor driven devices, an upright U shaped bracket having a one point pivotal connection with said front axle and supporting the front end of said platform, a cross bar secured to the rear end of said tractor frame forward from said rear axle and two rigid upright supports extending upwardly from the ends of said cross bar and supporting the rear end of said platform.

3. The combination with a tractor having the usual front and rear axles connected with each other by a tractor frame and having tractor mechanism mounted thereon, of an auxiliary frame forming a platform above said tractor mechanism, which platform terminates short of the rear axle and is adapted for the reception of an air compressor, means for driving the air compressor from the tractor, an upright U shaped bracket supporting the front end of said platform, the lower end of said bracket having a one point pivotal connection with the front axle, a cross bar secured to the rear end of said tractor mechanism forward from said rear axle, two rigid supports extending upwardly from said cross bar and supporting the rear end of said platform and a horizontal supporting and truss member secured to said front support near the lower end thereof and extending rearwardly along one side of said

tractor mechanism and having its rear end secured to said rear axle.

4. In a portable air compressor plant, the combination with a tractor having a water circulation cooling system, including a radiator, of an air compressor arranged to be water cooled, two conduits connecting the cooling system of said air compressor with points in the water circulation system of said tractor located near the top and the bottom of the radiator respectively, the motor of said tractor being independently connected with the top and bottom of said radiator and a pump arranged to propel water from the upper point of connection with said radiator through said compressor and back to the lower point of connection with said radiator.

The foregoing specification signed at Seattle, Washington, this 26th day of April, 1927.

JUSTUS F. NE PAGE.