Aug. 26, 1941. B. W. MANTLE 2,253,859

DUAL CAPACITY COMPRESSOR SYSTEM

Filed April 12, 1940 2 Sheets-Sheet 1

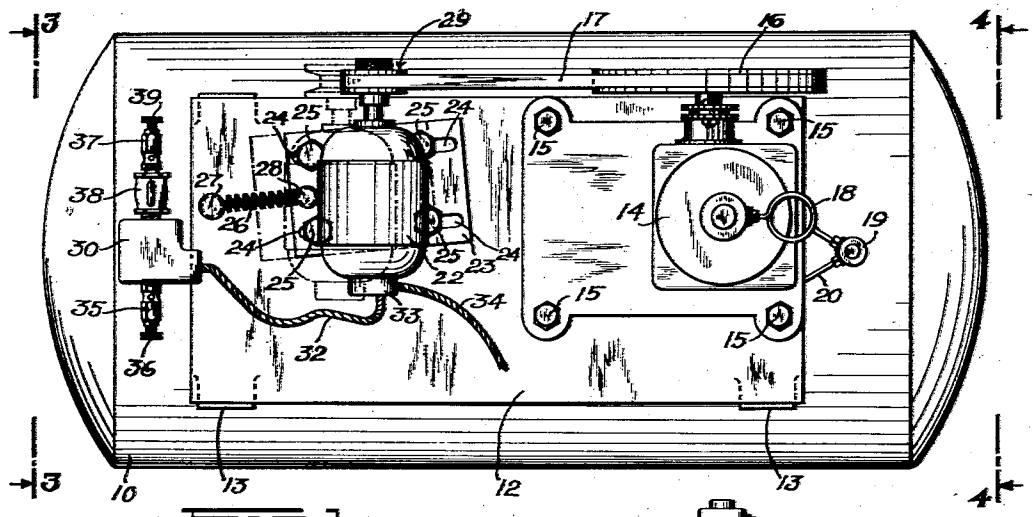



Fig. 1

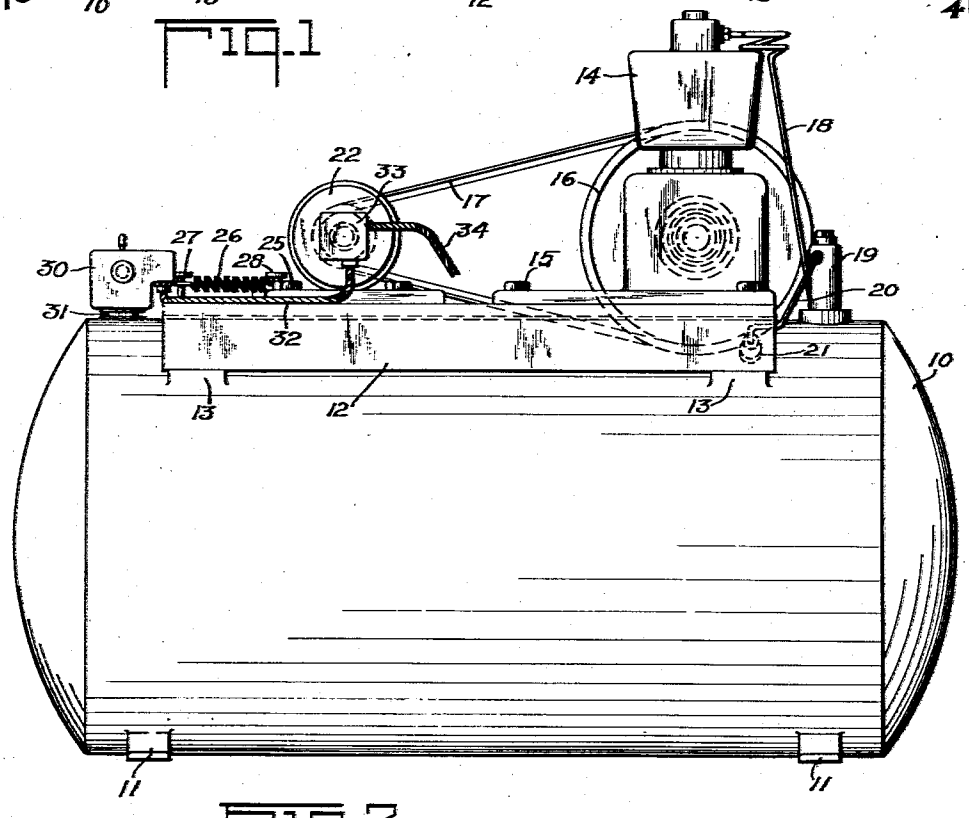



Fig. 2

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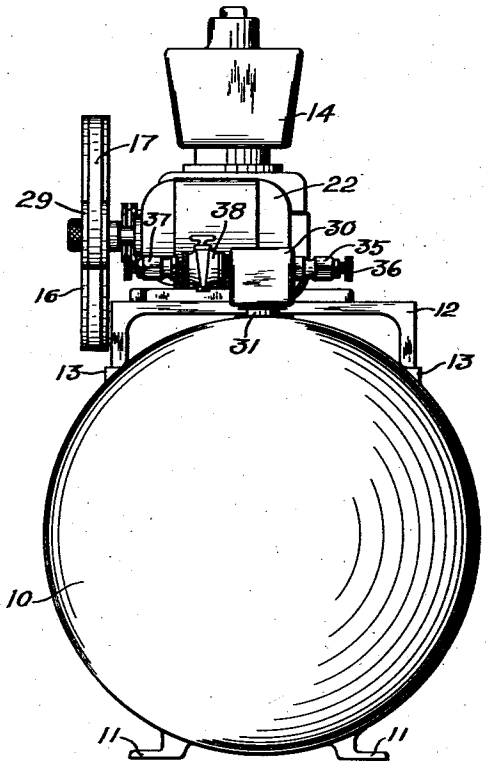



FIG. 3

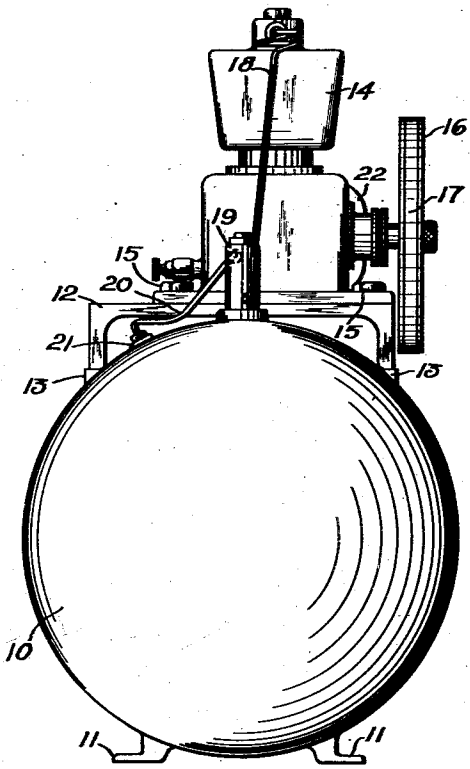



FIG. 4

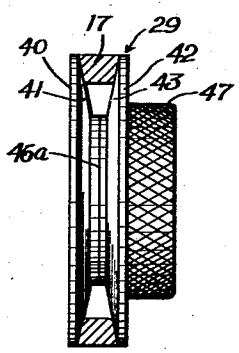



FIG. 5

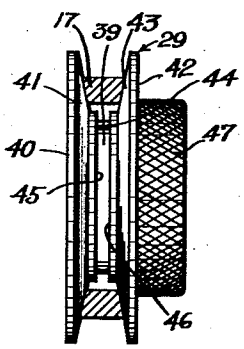



FIG. 6

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# UNITED STATES PATENT OFFICE

2,253,859

## DUAL CAPACITY COMPRESSOR SYSTEM

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Application April 12, 1940, Serial No. 329,251

2 Claims. (Cl. 230—58)

This invention relates to improvements in dual capacity compressor systems, and has for an object the provision of a compressor system adapted to deliver air at high pressure with a low capacity for one type of work, and at low pressure with a high capacity for another type of work.

Another object of the invention is the provision in a motor driven air compressor system, of means for selectively adapting said system to deliver air under a plurality of pressure and volume conditions and maintaining the motor at full load under all of said conditions.

Still another object of the invention is the provision of a compressor system including a motor for belt driving the compressor and means for adjusting the pulley on the motor to cause the compressor to run at a comparatively slow speed for one condition of volume and pressure, and to cause the compressor to run at a high speed for another volume and pressure condition.

Yet another object of the invention is the provision of a motor compressor system for selectively supplying air at high pressure or at low pressure, and including safety valves for both said high and low pressures, and means for removing the low pressure safety valve from the influence of the pressure in the system when said system is operated at high pressure.

Other objects will be apparent to those skilled in the art.

Referring to the drawings:

Figure 1 is a plan view of a motor compressor system illustrating one embodiment of the invention;

Figure 2 is a side elevation of the system shown in Figure 1;

Figure 3 is an end elevation of the system shown in Figure 1 as viewed along the line 3—3;

Figure 4 is an end elevation of the system as viewed along the line 4—4 of Figure 1;

Figure 5 is a side elevation of the motor pulley when the same is adjusted to run the compressor at high speed; and

Figure 6 is a side elevation of the pulley shown in Figure 5 when adjusted to run the compressor at a lower speed.

In garages, small work shops and in many service stations, an air compressor system capable of delivering pressure at 150 pounds per square inch is necessary for greasing, dusting, etc., and yet for spray paint work a pressure of approximately 40 pounds per square inch is necessary. It has been customary to use a system which has a large enough capacity for the spray paint work and at the same time set to deliver a pressure of 150 pounds, a reducing valve being employed to reduce the pressure for the spray paint operations. It can readily be appreciated that a system capable of delivering pressure of 150 pounds and having a volume capacity sufficient for the spray paint operations will require a larger, more costly outfit than one arranged to deliver the large volume required for this spray paint work at a lower pressure.

According to the present invention, I provide a system which employs a compressor, tank and motor capable of delivering a high pressure, for example 150 pounds, at a low volume rate. The motor operates under full load conditions, which are most ideal. Now by making a slight adjustment, with the same elements the same system is adapted to deliver a large volume of air at a low pressure, say 40 pounds, for spray paint work with the motor also operating under full load conditions. The motor is provided with a pulley employing a V belt. This pulley may be quickly adjusted to a large or a small effective diameter. When operating at 150 pounds pressure, for example, the effective diameter or pitch of the pulley is set to the small effective diameter so that the compressor is driven at a slower constant speed and runs at a certain R. P. M. giving a full motor load. Now when a larger volume of air is required at a lower pressure for spray paint work, the motor pulley is adjusted to the larger effective pitch diameter, causing the compressor to run at a higher speed, and since the motor operates at a constant speed a larger displacement of air is effected at a lower pressure (40 pounds) with the same full load on the motor.

The system may comprise a tank 10 provided with feet 11 which prevent the tank from rolling. A base 12 is mounted on the tank and located thereon by lugs 13. A compressor 14 is mounted on the base 12 preferably at one end thereof and is secured thereon by means of bolts 15. The compressor carries a flywheel 16, having a groove formed therein to accommodate a V belt 17.

A pipe 18 has one end connected to receive the discharge from the compressor and its other end connected to a check valve 19. A pipe 20 leading from the check valve 19 is connected to and delivers air into the tank through the fitting 21.

A motor 22 has a base portion 23 angularly disposed relative to the axis of the motor and provided with slots 24. Bolts 25 hold the base portion 23 in slidable relation to the main base 12.

A spring 26 has one end thereof connected to a stud 27 carried on the base 12 and its other end connected to a stud 28 carried on the motor base

23. The angular relation of the slots 24 with respect to the alignment of the belt 17 is such that when the motor pulley, generally designated by the numeral 29, which will presently be described, is set to have an effectively large pitch diameter, the motor base 23 is advanced to the right as viewed in Figure 1, and the left ends of the slots 24 are adjacent to the shanks of the bolts 25. The belt is held taut due to the action of the spring 26.

When the motor pulley 29 is set for an effectively small pitch diameter, the motor, under the urge of the spring 26, is urged to the left, as viewed in Figure 1, and due to the slots 24 it is moved angularly, with the result that the expanded pulley 29 is in proper alignment with the flywheel 16 so that the belt runs true. The spring 26 also functions to keep the belt taut. In this instance, the motor is in the position shown in dot-dash lines.

A pressure switch 30 is mounted on a nipple 31 communicating with the interior of the tank. A cable 32 leads from the pressure switch 30 to a junction box 33 on the motor. The junction box 33 may also contain the motor switch and thermal overload device for protecting the motor. A lead-in cable 34 is provided for connection to a source of current. The cables and switch in the junction box 33 are connected up in the usual manner so that the switch controls the supply of current to the motor from a source via the cable 34, and the pressure switch via the cable 32 is connected into one side of the line so that the motor can be controlled in accordance with the pressure.

Mounted on the pressure switch 30 is a safety valve 35 which by means of the adjusting nut 36 is set to pop off at a predetermined high pressure. A second safety valve 37 is mounted on the pressure switch 30 with a shutoff valve 38 therebetween. The safety valve 37 may, by means of its adjusting nut 39, be set to pop off at a pressure a little above the desired low pressure so that for low pressure and high volume operation when the pressure in the tank is built up to the predetermined setting of the low pressure safety valve, said valve will pop off and release air to the atmosphere, providing the consumption of the paint spray guns or other low pressure equipment is not sufficient to equal that of the delivery of the compressor.

With this type of setting for paint spray work, the compressor does not stop. It operates continuously and the low pressure safety valve pops off as above described. The pressure switch also has no effect on the low pressure setting. If the operator neglects to open the valve 38, the safety valve 37 is not subjected to the tank pressure and the tank pressure builds up to a point where the motor is overloaded, with the result that the thermal overload on the motor protects the motor.

When operating the system for high pressure, the valve 38 is closed and thereby the safety valve 37 is prevented from being influenced by the high pressure air. When the system is operating at high pressure, the pressure switch 30 starts the motor when the pressure falls a predetermined amount and shuts the motor off when the pressure rises to a predetermined amount in the usual manner. If for some reason the motor does not shut off when a desired high pressure is reached, the safety valve 35 will operate.

Referring now to Figures 5 and 6, which show the two adjustments for the motor pulley 29, said pulley consists of a hub portion 39 preferably formed integral with a flange portion 40 having a slanting active face 41. The hub portion 39 has mounted thereon an annular or flanged portion 42 having a slanting face 43 opposed to the slanting face 41 of the other member. Locating pins, one of which is designated by the numeral 44 in Figure 6, are carried by one of the flange members and engage through-holes formed in the other member, in which event the surfaces 45 of the flange member 40, and 46 of the flange member 42 are brought together on the line 46a of Figure 5, and the knurled nut 47 which engages threads on the shank 39 may be tightened to retain the flanges 40 and 42 in close relation. As a result of this, the V shaped groove formed by the surfaces 41 and 43 is narrowed so that the belt 17 operates on the pulley on a pitch circle adjacent to the outer diameter of the pulley and operates the compressor 14 at high speed, thereby producing a large volume of air at a low pressure. When operating under these conditions as pointed out above, the valve 38 is opened so that the safety valve 37 is subjected to the tank pressure.

Now in order to change the system for high pressure operation at low volume, the nut 47 is loosened to permit the operator to separate the flanges 40 and 42 to a point where the pins 44 engage bottomed holes of such depth that the flanges are held apart in the manner shown in Figure 6. The nut 47 is then tightened and the belt 17 operates on a smaller pitch diameter and drives the compressor at a slower speed which will permit a higher pressure to be built up in the system, for example 150 pounds.

In this event, valve 38 must be closed to remove the pressure from the safety valve 37.

Under each of these conditions the motor operates at its full load capacity and there is no loss through reducing the valves and other paraphernalia and therefore a smaller outfit such as is shown and described herein may be quickly set for both types of service in the manner herein shown and described.

The motor pulley herein shown and described is the subject of copending application Serial Number 330,860, filed April 22, 1940, now Patent No. 2,245,695, of June 17, 1941.

From actual tests it has been found that the time required to change the device from one pressure condition of operation to another is in the neighborhood of 30 seconds. In making the changeover, it has been found that it can be more quickly done by first removing the belt, making the adjustment and then running the belt back on the pulley at which time of course the motor brings the belt under the proper tension and into the proper alignment through the action of the spring 26 as hereinbefore described.

In operating the system at low pressures as hereinbefore described, it was stated that the safety valve 37 would pop off and let air discharge from the system to the atmosphere if the spray paint guns and other equipment did not use air at a high enough rate. Another option contemplates the application of an automatic unloader to the compressor. Such an unloader when a predetermined pressure is built up in the system, unseats the inlet valve of the compressor, thereby preventing the latter from pumping air until the pressure in the system is reduced to a point where the unloader permits the inlet valve to become seated again. An example of such unloader is shown and described in copending application Serial No. 324,902, filed March 20, 1940.

Although examples have herein been given of operating the compressor system at 150 pounds per square inch high pressure and low volume, and approximately 40 pounds for low pressure and high volume, it is obvious that other settings than those specifically mentioned may be made, without departing from the spirit of the invention.

Although in the example of the invention herein illustrated and described, the motor and compressor are shown as mounted on the tank, it is obvious that the system can operate in the manner described whether the motor and compressor are mounted directly on the tank or not. It is also obvious instead of an electric motor for operating the compressor, other equivalents may be substituted. For example, I contemplate operating some systems with gasoline engines either with or without throttling control.

In some form of the invention I may dispense with the tank entirely, utilizing the pipes for delivery of air to the spray guns or the like controlled by said air.

It is also obvious that although the examples herein given are described in connection with compressed air systems, the device herein shown and described may be used with other fluid mediums than air.

It is obvious that many changes may be made in the construction, arrangement and combination of parts within the scope of the appended claims without departing from the spirit of the present invention, and such changes are contemplated.

What is claimed is:

1. In a compressed air supply system in combination, a compressor for compressing said air, a grooved pulley on said compressor, a base supporting said compressor, a horizontal tank for receiving said compressed air, means securing said base to said tank, an electric motor slidably carried on said base and guided along a line angular with respect to the plane of the pulley on said compressor, a pulley for driving said compressor, a pulley on said motor having a V shaped groove selectively settable to one effective pitch diameter for driving said compressor at a comparatively low speed when the system is to be operated at a high pressure and a low volume rate with said motor operating under full load conditions, and settable to a second effective pitch diameter for driving said compressor at a comparatively high speed when the system is to be operated at a low pressure and a high volume rate with said motor operating under full load conditions, and spring means connected to said base and to said motor for urging said motor along said line in a direction away from said compressor, thereby aligning the V shaped groove in the pulley on said motor with the pulley on said compressor and at the same time keeping the belt taut for each type of operation.

2. In a compressed air supply system in combination, a compressor for compressing said air, a grooved pulley on said compressor, a main base supporting said compressor, a horizontal tank for receiving said compressed air, means securing said base to said tank, an electric motor, a base for said motor having slots formed therein angular with respect to a line at right angles to the axis of said motor, means on said base engaging said slots and slidably retaining said motor on said main base for permitting said motor to move along a path angular with respect to the plane of the pulley on said compressor, a pulley for driving said compressor, a pulley on said motor having a V shaped groove selectively settable to one effective pitch diameter for driving said compressor at a comparatively low speed when the system is to be operated at a high pressure and a low volume rate with said motor operating under full load conditions, and settable to a second effective pitch diameter for driving said compressor at a comparatively high speed when the system is to be operated at a low pressure and a high volume rate with said motor operating under full load conditions, and spring means connected to said base and to said motor for urging said motor along said path in a direction away from said compressor, thereby aligning the V shaped groove in the pulley on said motor with the pulley on said compressor and at the same time keeping the belt taut for each type of operation.

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