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GASEOUS COMPRESSING SYSTEM

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Fig. 1.

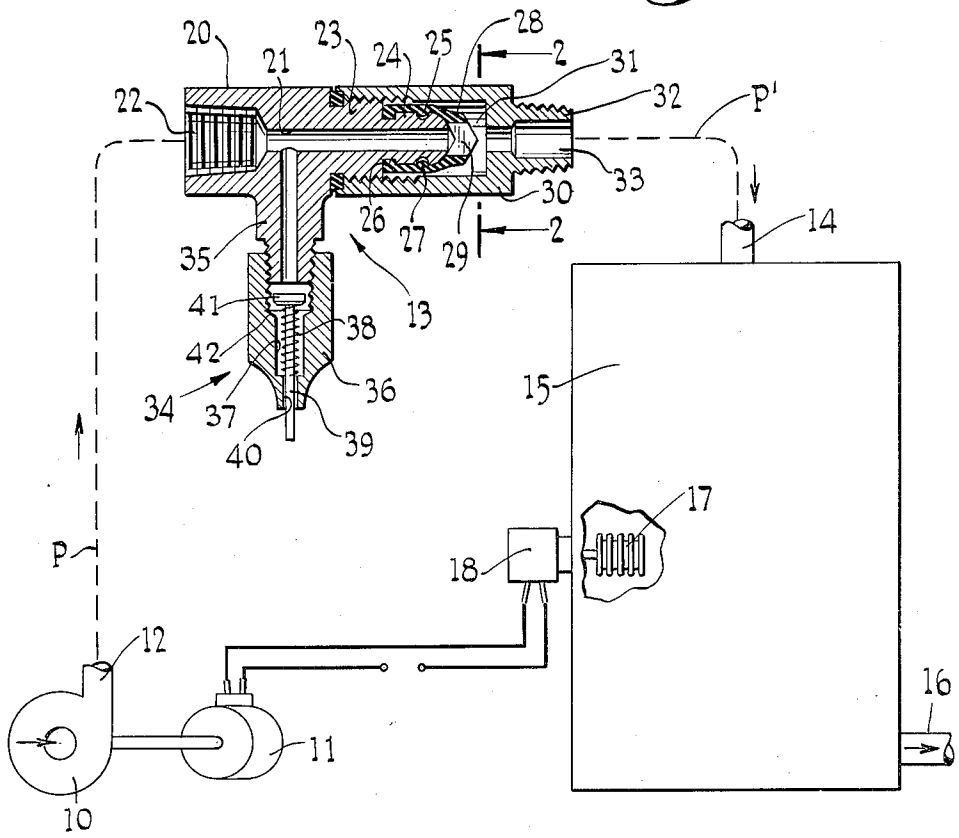


Fig. 2.

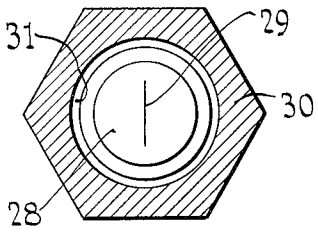
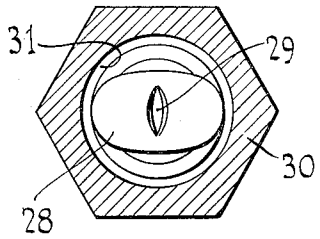


Fig. 3.



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GASEOUS COMPRESSING SYSTEM

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5 Claims. (Cl. 230—18)

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The present invention relates to gaseous compressing systems, and more particularly, is concerned with a gaseous compressing system having an intermittently operated compressor which is controlled by the pressure of the gas, e. g., air, in a storage tank.

Heretofore, a gaseous compressing system of the character described comprised a motor driven compressor whose outlet was connected to a storage tank wherein air under pressure was accumulated. The tank, or line between the tank and compressor, had a pressure controlled mechanism for stopping the motor when the pressure in the tank rose above a predetermined value and for starting the motor when the tank pressure fell below a predetermined value.

In such a compressing system the gas at the discharge side of the compressor was always under the full system pressure. As a result, the compressor always had to start against a high standing back pressure, placing a strain on the compressor and on its driving motor which necessitated the use of an oversize motor and compressor. Furthermore, the presence of the high back pressure at the compressor, even when the same was idle, caused leaks therein which, though possibly small, were continuous and their effects cumulative, bringing about loss of high pressure gas over a period of time. In addition, during starting, the motor, if electric, drew an abnormally high current which under certain conditions required special wiring and overload devices.

It is an object of the present invention to avoid the foregoing drawbacks and provide a more efficient and economical gaseous compressing system of the character described in which the high standing back pressure on the compressor is eliminated, thus reducing the starting strain on the compressor and motor and doing away with continuous leakage and pressure loss through the compressor. In general, this phase of my invention is achieved by interposing a one-way or check valve intermediate the compressor and the storage tank and disposing a bleeder valve on the compressor side of the check valve.

It is another object of my invention to provide an improved one-way or check valve particularly adapted for use in a gaseous compressing system such as hereinabove described whereby to enhance the efficient operation thereof.

An ancillary object of my invention is to provide an improved check valve capable of general use as well as the specific use of the present invention.

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It is a further object of the present invention to provide a combination check and bleeder valve structure which enables an existing system to be quickly and inexpensively changed over to my improved system.

Other objects of this invention will in part be obvious and in part hereinafter pointed out.

The invention accordingly consists in the features of construction, combinations of elements, and arrangement of parts which will be exemplified in the construction hereinafter described, and of which the scope of application will be indicated in the claims.

In the accompanying drawings, in which is shown one of the various possible embodiments of this invention, and wherein like numbers refer to like parts throughout,

Fig. 1 is a schematic view of one form of an air compressing system embodying the improvements of the present invention, and with the actual construction of the improved valve shown in longitudinal section;

Fig. 2 is a cross-sectional view taken substantially along the line 2—2 of Fig. 1, and showing the check valve in closed position; and

Fig. 3 is a view similar to Fig. 2, but with the check valve shown in open position.

Referring now to the drawings, the compressed air system of the present invention includes a compressor 10 which is operatively coupled to a driving means, such as an electric motor 11. The outlet 12 of the compressor is connected by a pipe P to the inlet of a combined check and bleeder valve 13, the structural details of which will be more fully described hereinafter. The outlet end of the valve 13 is connected by a pipe P' to the inlet 14 of a compressed air storage tank 15, provided with an outlet 16 and containing an air pressure responsive mechanism, such as a bellows 17 for intermittently opening and closing a motor switch 18, as the pressure within the reservoir falls below or rises above a predetermined range of values.

The valve 13 comprises an elongated base 20 having a narrow, longitudinally disposed passageway 21 therethrough which terminates at one end in an enlarged, internally threaded opening 22, affording suitable means for connection to a conduit such, for example, as the pipe P. The other end of the base 20 is reduced in diameter to receive a thread 23 and then further reduced to form a nipple 24.

A resilient sleeve 25 of an elastomeric (rubber-

like) material such as rubber or synthetic rubber, e. g., a butadiene copolymer, an isobutene-diolefin copolymer, a chloroprene copolymer, or an organic polysulfide, is fitted closely over the nipple 24. The airtight fit between the cap and sleeve may be enhanced by annular grooves 26 formed on the nipple and matching internal ribs 27 provided in the sleeve. Said sleeve carries the operative element of the check valve. This element, which is preferably formed integrally with the sleeve, comprises a closure of elastomeric material having a passageway therethrough. The walls of the passageway are flexible and normally are disposed in abutting relationship. Furthermore, said element is so constructed that air pressure from within the sleeve will open the passageway and air pressure from outside the sleeve will press together the walls of the passageway. This may be brought about by having the portion of the element containing the passageway project into the region where the pressure is highest when the valve is closed. Such construction permits high pressure air to force together the walls of the passageway.

In the illustrated embodiment of my invention, the operative element of the check valve is in the form of a conical cap 28 whose apex points away from the sleeve and has a through slit 29 extending in a direction axially of the sleeve. Said slit lies directly over the end of the passageway 21, thereby enchancing the checking action of the valve since the entire inner area of the cap can be flexed outwardly when the valve is to pass air, whereas when checking air, the cap can be flexed inwardly only over the region of the end of the passageway. If desired, the walls of the cap may be made thicker than the walls of the sleeves, as shown, whereby to increase the life of the valve and render it usable to check very high back pressures.

As indicated above, it is necessary to provide a region of high pressure surrounding the conical cap and to this end I employ a hollow valve housing 30 which is fitted over the capped sleeve, the lower portion of the housing being internally threaded to engage the thread 23 on the valve base. Said housing and base cooperate to define a high pressure air chamber 31 around the cap and sleeve, which chamber functions to bring about checking action of the valve in one direction, as already explained, and to permit sufficient space for the cap to dilate when air is to pass therethrough in the opposite direction.

The housing 30 has suitable means for connection to a conduit. Said means includes a male threaded nipple 32 integrally formed with the housing and communicating with a passageway 33 which runs into the high pressure chamber 31.

The valve 13, as indicated above, includes a bleeder valve 34 which is disposed on the non-return side of the check valve. Said bleeder valve may be of any suitable construction, being here illustrated as including a boss 35 integrally formed on the base 20 and having a through passageway which runs into the passageway 21 within base 20. The boss is male threaded to receive an internally threaded bleeder valve cap 36 having an axial bore 37 in which a light helical compression spring 38 is nested. A valve stem 39 is loosely disposed within said spring and is freely axially guided through a reduced opening 40 at the end of the cap, constituting an extension of the axial bore 37. The inner end of the valve stem terminates in a valve head 41 which

is adapted to be seated upon a valve seat 42 formed in the valve cap 36. The fit between the valve head and its seat designedly is poor so that when the valve is closed against the spring 38 upon the occurrence of pressure in the conduit P, there will be a constant but slight leakage of air through the bleeder valve. This leakage is very small, not being even as much as ordinarily occurs in the compressor glands.

The system above shown and described operates as follows:

When the motor is first started, the pump operates to build up pressure between itself and the valve 13, closing the bleeder valve 34 and opening the slit 29, the compressed air entering the storage tank 15 and building up pressure therein to a predetermined point, whereupon the bellows 17 opens the switch 18 and stops the motor and compressor. When the compressor stops, pressure inside the valve 13 is equalized, permitting the slit 29 to close and prevent backward passage of compressed air. Thereafter, air leaks out of the bleeder valve 34, thus relieving pressure in the portion of the system immediately adjacent the compressor outlet and in the compressor itself. When the pressure drops to near atmospheric, the spring 38 will open the bleeder valve wide, causing the pressure to fall all the way to atmospheric. The compressor when it next starts now will not have to operate against any back pressure; yet, very little air is lost through the bleeder valve.

It will thus be seen that there is provided a gaseous compressing system in which the several objects of this invention are achieved, and which are well adapted to meet the conditions of practical use.

As various possible embodiments might be made of the above invention, and as various changes might be made in the embodiments above set forth, it is to be understood that all matter herein set forth or shown in the accompanying drawings is to be interpreted as illustrative and not in a limiting sense.

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

1. A gaseous compressing system, including a compressor, a storage tank, means automatically controlled by the pressure in said tank for intermittently operating the compressor to maintain the gas in the tank within a predetermined range of pressure, a check valve interposed between said compressor and tank, the inlet end of said valve being connected to said compressor and the outlet end thereof to said tank, and a valve disposed between said compressor and said check valve, one end of said last-named valve being exposed permanently to the gas pressure in said system between said compressor and said check valve, and the other end of said last-named valve being exposed permanently to atmospheric pressure, said last-named valve including a valve head, a valve seat, and a light spring forcing said head away from said seat, said head being forced against said seat by the pressure in said system when said compressor is operating and said spring being adapted to force said head off said seat when the pressure in said system between said compressor and said check valve is near atmospheric, the fit between said valve seat and said valve head being poor so that when the valve is closed there will be a constant slight leakage of compressed gas therethrough whereby said last-named valve serves as a leaky bleeder valve.

2. A gaseous compressing system, including a

compressor, a storage tank, means automatically controlled by the pressure in said tank for intermittently operating the compressor to maintain the gas in the tank within a predetermined range of pressure, a check valve interposed between said compressor and tank, the inlet end of said valve being connected to said compressor and the outlet end thereof to said tank, said check valve constituting a housing into which an element of a rubberlike material projects, said element having a passageway therethrough, said housing being disposed at the outlet end of the check valve, and a valve disposed between said compressor and said check valve, one end of said last-named valve being exposed permanently to the gas pressure in said system between said compressor and said check valve, and the other end of said last-named valve being exposed permanently to atmospheric pressure, said last-named valve including a valve head, a valve seat, and a light spring forcing said head away from said seat, said head being forced against said seat by the pressure in said system when said compressor is operating and said spring being adapted to force said head off said seat when the pressure in said system between said compressor and said check valve is near atmospheric, the fit between said valve seat and said valve head being poor so that when the valve is closed there will be a constant slight leakage of compressed gas therethrough whereby said last-named valve serves as a leaky bleeder valve.

3. A gaseous compressing system, including a compressor, a storage tank, means automatically controlled by the pressure in said tank for intermittently operating the compressor to maintain the gas in the tank within a predetermined range of pressure, a check valve interposed between said compressor and tank, the inlet end of said valve being connected to said compressor and the outlet end thereof to said tank, said check valve comprising a base having a passageway therethrough connected to the inlet end, a hollow housing secured to said base, said passageway terminating in a nipple which projects into said housing, a resilient sleeve of rubberlike material fitted over said projecting end of the nipple, one end of said sleeve extending into said housing, and having a passageway therein whose walls normally are disposed in abutting relationship to close the passageway when the compressor is idle, said housing being connected to the outlet end of the check valve, said base having a passageway branching off from the first mentioned passageway, and a valve disposed in said second-mentioned passageway, one end of said last-named valve being connected permanently to said second-mentioned passageway, and the other end of said last-named valve being exposed permanently to atmospheric pressure, said last-named valve including a valve head, a valve seat, and a light spring forcing said head away from said seat, said head being forced against said seat by the pressure in said system when said compressor is operating and said spring being adapted to force said head off said seat when the pressure in said system in said second-mentioned passageway is near atmospheric, the fit between said valve seat and said valve head being poor so that when the valve is closed there will be a constant slight leakage of compressed gas therethrough whereby said last-named valve serves as a leaky bleeder valve.

4. A check valve comprising a housing provided with an inlet end and an outlet end, means at the inlet end for connection to a conduit,

means at the outlet end for connection to a conduit, said housing having a closed chember, a first passageway leading from the inlet end of the housing into said chamber, a second passageway leading from the outlet end of said housing to said chamber, an element of rubberlike material having a third passageway therethrough, the passageway through said element being connected to the first passageway, said element projecting into said chamber, the walls of the passageway through the element being flexible and normally disposed in abutting relationship at the projecting end of said element, whereby when the pressure at the inlet end is greater than the pressure at the outlet end, the abutting walls expand and open and when the pressure at the inlet end is less than the pressure at the outlet end, said abutting walls collapse and close, a portion of said housing having a fourth passageway therethrough branching from the first passageway and a bleeder valve having a fifth passageway therethrough and disposed on said housing portion with one end of said fifth passageway communicating with the fourth passageway and the other end communicating with the atmosphere, said bleeder valve including a valve head, a valve seat, and a light spring forcing said head away from said seat, said head being adapted to be forced against said seat by pressure in said first passageway and to open when the pressure in said first passageway approaches atmospheric, the fit between said valve seat and said valve head being poor so that when the valve is closed there will be a constant slight leakage therethrough whereby said valve serves as a leaky bleeder valve.

5. A check valve comprising an elongated base having a first passageway therethrough, means associated with said passageway at one end thereof for connection to a conduit, said means constituting the inlet end of the valve, a hollow housing, means to detachably secure said housing to said base, a portion of said base projecting into said housing, a resilient sleeve fitted over said portion, said sleeve having a closed end which branches into said housing, the closed end of said sleeve having a second, normally closed, passageway running therethrough which communicates with the first passageway in the base, means on said housing for connection to a conduit, said last-named means constituting the outlet end of the valve and being in connection with the interior of the housing, the interior of the housing being sufficiently large to permit the closed end of the sleeve to dilate and open the normally closed second passageway, a portion of said base having a third passageway branching from the first passageway and a bleeder valve having a fourth passageway therethrough and disposed on said base portion with one end of said fourth passageway communicating with the third passageway and the other end communicating with the atmosphere, said bleeder valve including a valve head, a valve seat, and a light spring forcing said head away from said seat, said head being adapted to be forced against said seat by pressure in said first passageway and to open when the pressure in said first passageway approaches atmospheric, the fit between said valve seat and said valve head being poor so that when the valve is closed there will be a constant slight leakage therethrough whereby said valve serves as a leaky bleeder valve.

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