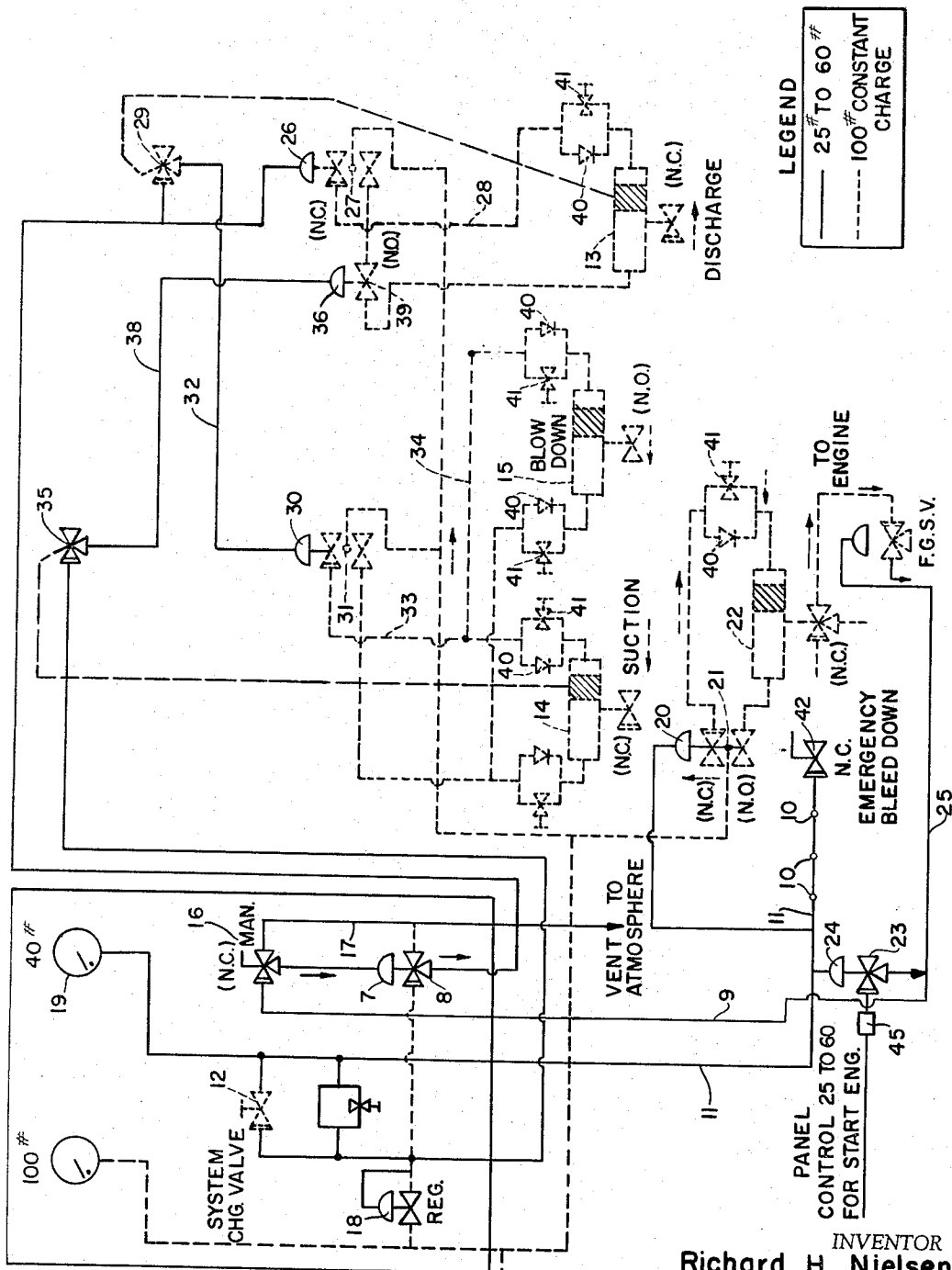


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PROTECTION TO COMPRESSORS PUMPING
COMBUSTIBLE FLUIDS
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SYSTEM AND APPARATUS FOR AFFORDING FIRE PROTECTION TO COMPRESSORS PUMPING COMBUSTIBLE FLUIDS

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ABSTRACT OF THE DISCLOSURE

The present invention is directed to a fire prevention system for use on compressors pumping combustible fluids in which the compressor has a supply, discharge, and blowdown valve. The three valves are under the control of a pneumatic monitoring system which can be vented to atmosphere upon a predetermined temperature rise, such as the melting of a fusible plug to cause sequential shut down of the supply, discharge, and blowdown valves to purge the compressor of combustible fluids.

The present invention relates to a system and apparatus for affording fire protection to compressors pumping combustible fluids and has for an object to provide a system which will protect large compressor installations pumping gas, distillates or other combustible fluids from the hazards of fire and from large economic loss attendant therewith.

If, for any reason, a fire should start around a compressor installation, which in many instances is a building area in which the compressors and their driving engines are housed, it is not uncommon that a total loss of the compressors will result. In each installation it is important that fusible plugs sense a temperature rise in the event of a station fire or a signal is given by a gas analyzer which would signal its presence and such system, while pumping these fluids, must be immediately shut down, that is, the supply to the compressor unit, the discharge from the compressor itself must be purged of any combustible fluids inside same since a rise in temperature outside may result in an explosion within the compressor of any trapped combustible gases when the fluid reaches its flash point.

Another object of the present invention is the provision of a fully automatic system which will automatically in sequence open or close the supply and discharge valves to the fluid transmission line and simultaneously open or close the compressor blowdown.

A still further object of the present invention is the provision of a system for carrying out the objects of the above paragraph in which the engine which drives the compressor cannot be started unless the sensing and protective system is properly charged to function in the above described sequence of programming and which will open a closed system, that is, it opens the discharge in the supply lines, opens the main compressor suction and closes the blowdown valves automatically.

A still further object of the present invention is to provide a temperature sensing system or monitoring of explosive level, for sequential interlock programming of the above main three or more compressor installation valves incident to a rise in temperature causing the fusible plugs to melt or monitoring of explosive level, which permits the loading of the valve actuators to take over, bringing about the appropriate position of the main compressor installation valves dependent upon the cycle of operation.

A still further object of the present invention is provided where it is impossible for automatic programming interlock sequence to be initiated or to load system until control panel has monitored all safety functions provided

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for engine, and command signal to fuel gas shutdown and vent valve has been communicated to valve diaphragm to open and engine start. This interlocks operation of sequence until engine is started, and system can be initiated at this time in regard to engine temperature or other conditions pertaining to load requirements.

Unloading of system can be initiated while engine compressor is still running by venting command signal which permits the spring loaded valves to communicate pressure to actuator cylinder, closing suction, opening blowdown, and closing discharge valves in a sequential interlocked program.

With the foregoing and other objects in view, the invention will be more fully described hereinafter, and will be more particularly pointed out in the claims appended hereto.

In the drawing, wherein like symbols refer to like or corresponding parts:

The figure is a schematic showing a compressor installation, installed in accordance with the system of the present invention wherein the system main actuating valves and their high pressure actuating system are shown in dash lines while the sensing and monitoring system controlling their sequential operation is shown in solid lines.

Referring now to the drawing in which one embodiment of the invention is shown under the protection of fusible plugs 10, in a pressurized line 11, 12 designates a system charging valve which charges the sensing or protective low pressure system shown in solid lines and operating at a low pressure of the order of 25 to 60 p.s.i. The high pressure or valve actuating system is shown in dash line and operates at a pressure of 100 p.s.i. or more.

In a pumping system transmitting combustible fluids, especially of the gaseous type, an engine (not shown) drives a compressor having a discharge valve 13 which discharges the fluid being pumped into a transmission line, a suction valve 14 in a fluid communication with a pipe line to the fluid source, and a compressor blowdown valve 15.

When the compressor is shut down, the engine which drives it is also shut down, the suction valve 14 and discharge valve 13 are closed, and the blowdown valve 15 is open venting the compressor to atmosphere.

To start the engine, it is necessary to charge the low pressure protection system by pushing valve 12 to line 11 which charges the protection system downstream of regulator valve 18 indicating pressure on the protective system at gage 19 and pressurizing the diaphragm 20, opens valve body 21, which directs high pressure air to normally closed operation cylinder 22 causing it to open and supply fuel to the engine panel controlled fuel gas shutdown and vent valve.

Normally closed valve 23 is opened from charging line to diaphragm 24, opens line 45 to line 25 through valve 23 to communicate signal to diaphragm of engine fuel gas shutdown and vent valve from engine control panel.

To load system open, normally closed valve 16 controls pressure from engine control system communicated to diaphragm 7, body of normally closed valve 8 is opened to signal diaphragm 26, opens valve body 27, which permits the high pressure fluid to pass through line 28 to operating cylinder on the main discharge valve 13, causing the valve to slowly shift to open position, at which time, only when it is fully open, will it actuate valve 29, communicating signal air (low pressure) to diaphragm 30 of valve 31. This positions valve 31 to supply high pressure air to suction valve 14 over line 33 and to simultaneously supply high pressure air over line 34, to blowdown valve 15, to close same so that the compressor will normally operate with the suction valve 14 open, and blowdown valve 15 closed and discharge valve 13 open.

When the suction valve 14 is fully open it actuates valve 35 which passes signal air through line 38 to diaphragm 36 of normally open valve 39, to interlock discharge valve 13 by closing valve 39 which remains closed until the system is unloaded.

Each valve 13, 14 and 15 has a slow close or opening control unit having a reverse check valve 40 and a variable valve 41 which may be regulated to close the valves either quickly or slowly depending upon the degree of opening of valve 41.

While pumping combustible gases should a fire occur or an abnormal temperature rise be occasioned, the compressor installation would be protected by the fusible plugs 10 in line 11 melting and dropping the pressure on the 40 p.s.i. monitoring system which would cause the loading on the diaphragms to fall causing the spring loading of the valve 21 to take over applying high pressure to the cylinder on valve 22 blocking incoming fuel and venting downstream fluids to engine causing a completed shut down of engine compressor.

Control panel sensing engine being down immediately, venting command signal from diaphragm of fuel gas shut down and vent valve, also venting control pressure through valve 16 of diaphragm 7, spring loaded valve 8 which would cause complete venting of pressure on the diaphragm spring load valves 31 and 27 to take over sending high pressure to actuate cylinders closing suction valve and simultaneously slowly opening blowdown when suction valve 14 has closed and only fully closed will actuate valve 35, venting pressure from diaphragm 36, interlock valve 39 causing high pressure to be communicated to discharge cylinder closing valve 13, purging all combustible fluids between suction valve 14 and discharge valve 13 through now fully open blowdown valve 15.

The low pressure system also is provided with an emergency bleeddown valve 42 which during normal operation will be closed.

The system illustrated and described receives its air supply from a high pressure source 43 having a regulator valve 44 which regulates the main valve operating pressure at about 100 p.s.i. or more. The low pressure control circuit is controlled by regulator 13 which takes its supply from the high pressure system.

The engine which drives the compressor has conventional protective systems which electro-pneumatically control the fuel gas to shut down the unit in the event of lube oil pressure failure, engine cooling failure or ignition failure, or other malfunctions of the engine. A pneumatic or electrical valve 45 upon engine failure will open normally venting signal through valve 23 to effect shut down of the engine.

Although we have disclosed herein the best form of the invention known to us at this time, we reserve the right to all such modifications and changes as may come within the scope of the following claims.

What we claim is:

1. For use with an engine driven compressor installation having a main suction in communication with a source of compressible fluid, a line discharge valve at the compressor output side and a compressor blowdown valve; a fire prevention system comprising a high pressure pneumatic system for actuating the main suction, line dis-

charge and blowdown valves, a low pressure pneumatic system connected to actuate each of the valves in said high pressure system, temperature rise detection means or monitoring of explosive level in fluid circuit with said low pressure system which upon sensing the temperature rise will vent off the low pressure system causing the low pressure system to actuate the compressor valves to sequentially close the suction valve, and discharge valve and open the blowdown valve to purge the compressor of combustible fluids.

2. The system of claim 1 further comprising placing the fuel gas shut-off valve of the engine in pneumatic circuitry with the low pressure system so that the engine cannot be started unless the low pressure system is charged and the main compressor valves programmed to place the compressor on the line.

3. The system of claim 2 further comprising a positive mechanical interlock between the compressor suction valve and discharge valve so that the suction cannot be opened unless the discharge valve has mechanically fully opened, and the discharge valve cannot be closed unless the suction valve has mechanically fully closed.

4. A pumping installation for pumping combustible fluids by an engine driven compressor comprising

- (a) compressor means having suction discharge and blowdown valves,
- (b) a source of high pressure fluid for actuating said compressor suction discharge and blowdown valves,
- (c) a low pressure fluid system in circuit with actuating devices for controlling the positions of said suction, discharge and blowdown valves, and
- (d) temperature responsive means in fluid circuit or monitoring of explosive level with said low pressure fluid system so that upon opening of the temperature responsive means or monitoring of explosive level the low pressure system will vent off causing a repositioning of the main compressor valves to close the suction and discharge valves and opening the blowdown.

5. A pumping installation as claimed in claim 4 further comprising an engine fuel gas and shut-off valve actuation of which is under the control of the low pressure system.

6. A pumping installation as claimed in claim 5 further comprising a positive mechanical interlock under physical control of said suction and discharge valves to send low pressure fluid signals to cause actuation of said valves in a predetermined sequence.

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