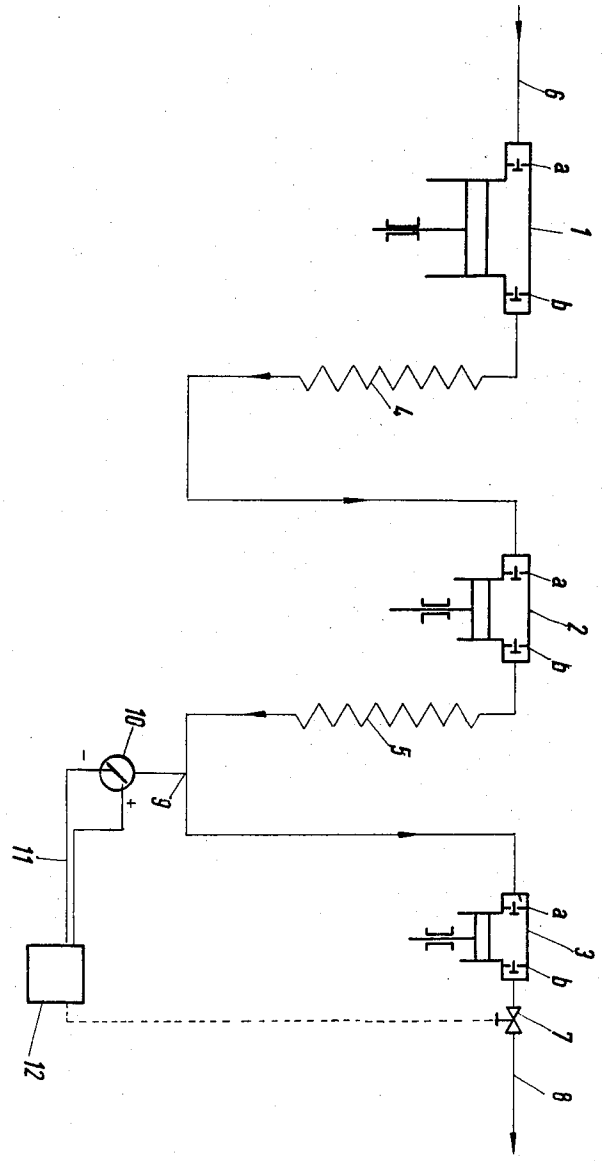
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PROCESS AND APPARATUS FOR THE PREVENTION OF FIRES IN OXYGEN HIGH-PRESSURE COMPRESSORS

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PROCESS AND APPARATUS FOR THE PREVENTION OF FIRES IN OXYGEN HIGH-PRESSURE COMPRESSORS

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Fires occur in oxygen high-pressure compressors, both those lubricated with water and those which are sealed dry and are provided with graphite rings and labyrinthine packings. In many cases, besides the piston or cylinder parts, the compression stage suction valve is damaged by fire attack. Fires occur even when the presence of lubricating oil, particles of iron rust, combustible packing materials, etc., recognized as common causes of fire, is strictly excluded, and when the oxygen to be compressed comes in contact only with the approved construction materials, such as steel, bronze, and wear-resistant natural graphite.

An object of the present invention consists in the provision of an operating process and an apparatus for the compression of oxygen by which such fires will be prevented.

This invention is a process for guarding against fires in plural-stage oxygen compressors, which is distinguished by the fact that the pressure of the oxygen between the pressure valve of one compression stage and the suction valve of the successive compression stage is constantly measured and the compressor, on exceeding the normal pressure in that place, immediately comes to a stop.

The pressure is measured by means of a manometer (in itself conventional) in which, on reaching a maximum pressure for the compression stage (which maximum pressure can be pre-selected), an electric current circuit is closed thereby stopping the compressor through a relay. Such a manometer is arranged preferably between the second and third stages of the plural-stage compressor.

This invention is based on the following knowledge of the cause of fires: For some reason, for example, the fatigue breaking or deformation of a valve plate, wedging of a small solid particle between valve plate and valve seating, the operation of the suction valve of a compressor stage, for example, the third stage, is hindered, so that at the end of the apparatus lift of this third stage the compressed oxygen flows through the suction valve of this stage, which is no longer closing completely, back in the direction of the pressure valve of the second compression stage. On the next lift of the piston, the third stage of the compressor receives hotter oxygen than before, so that the final temperature after the compression is higher than before. Of this oxygen which has become hotter, a part, in turn, flows through the no longer completely closing suction valve of this stage back in the direction of the pressure valve of the second stage. When this precess is repeated in very rapid succession for a few minutes, the oxygen in the valve zone can become so hot that, augmented by some adiabatic heating in the vortex space, a microscopic part of the valve surface is heated to the kindling temperature for the substance present there, such as bits of steel or the very hard-to-ignite piston ring material. This initial ignition is followed by fire which, spreading, attacks the various parts of the compressor.

It is a matter, therefore, of preventing the flowing back and forth of oxygen between the compression stages, especially between the third and second stages. The back flow of oxygen brings a higher pressure between

the suction valve of the higher (third) stage and the pressure valve of the lower (second) stage. This increase in pressure is taken as an advance sign of a subsequent fire, and according to this invention is used as a means for stopping the compressor.

Besides this stopping of the compressor through the action of the manometer by an electric impulse on exceeding a certain pressure, it is advantageous to shut the valve lying after the compressor on the high pressure side, in order to prevent a back-flow of oxygen. After stopping the compressor, the suction valve and perhaps also the piston and cylinder are reamed out, cleaned and repaired or replaced.

In the single FIGURE of the attached drawing there is diagrammatically represented an apparatus for carrying out the precess according to this invention, by way of example. The individual successive compression cylinders of the compressors are marked 1, 2 and 3, the respective suction valves at the entrance as "*a*," the pressure valves at the outlet of the stage as "*b*"; 4 and 5 are two coolers. The oxygen flows at 6 into the compressor and arrives, through the suction valve 1*a*, in the first compression cylinder 1, and then flows in the arrow direction through the cooler 4 and to the suction valve 2*a* of the second compression stage 2. After further compression in this stage, the oxygen flows through the cooler 5 and into and through the third compression stage 3, and leaves the compressor through the trap valve 7 at 8.

At the position marked 9 of the conduit leading from the second to the third stage, the pressure is measured with a manometer 10. This lies in the relay current circuit 11 of an electric safety switch 12, which on reaching a predetermined maximum pressure which can be set on the manometer 10, shuts off the compressor and closes the switch valve 7.

The safety switch 12 can be activated in another way, for example, mechanically or pneumatically.

I claim:

1. Process for preventing fires during the compression of substantially pure oxygen in a compressor with at least two stages, each stage thereof having a pressure valve and a suction valve, which comprises continuously measuring the pressure of the substantially pure oxygen between the pressure valve of one compressor stage and the suction valve of the next succeeding compressor stage, and automatically stopping the compressor when said pressure exceeds a predetermined value.

2. Process for preventing fires during the compression of substantially pure oxygen in compressors with at least three stages, each stage thereof having a pressure valve and a suction valve, which comprises continuously measuring the pressure of the substantially pure oxygen between the pressure valve of the second compressor stage and the suction valve of the third compressor stage, and automatically stopping the compressor when said pressure exceeds a predetermined value.

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