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THRUST-ACTUATED PNEUMATIC ALARM SYSTEM

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The present invention relates to a pneumatic alarm system which is actuated by a downward thrust or mechanical pressure exerted on the top of a counter such as the counter in a bank which separates the customers from the tellers.

The top of the counter is divided into series of separate contiguous panels. A separate alarm actuating valve is associated with each panel. Whenever the load on any panel exceeds a predetermined maximum weight, the individual alarm valve associated with the particular panel initiates operation of a main relay valve which, in turn, causes operation of the alarm or other protective device.

Various objects, features and advantages of the invention will become apparent upon reading the following specification with reference to the accompanying drawing forming a part hereof.

Referring to the drawing:

FIGURE 1 is a fragmentary perspective view showing a bank counter comprising separate panels, an alarm actuating valve being associated with each panel.

FIGURE 2 is a schematic diagram of the pneumatic system.

FIGURE 3 is an enlarged sectional view of a double check valve illustrated in FIG. 2.

FIGURE 4 is an enlarged sectional view of a check valve illustrated in FIG. 2, the valve being provided with an adjustable by-pass.

The counter 3 shown in FIG. 1 comprises a top 4 formed by a suitable number of panels such as 4', 5, 6. Under each of the panels 4', 5, 6 there is positioned a pushbutton pneumatic alarm actuating valve 7 or 7' or 7'' which is actuated mechanically when the associated top counter panel 4', 5 or 6 is depressed by a weight exceeding a predetermined magnitude, and operates the pneumatic alarm equipment shown in FIG. 2.

As shown in FIG. 2 the pressure fluid, feeding the system is supplied by a conduit 8 which is connected to a tank (not shown) filled with compressed air at an appropriate pressure.

The feed conduit 8 is connected to a primary relay valve 9 and a branch 8' feeds a manually controlled lever reset valve 11.

In addition a conduit 12 starting from the relay valve 9 is connected through a check valve 14 to a tank 15. A branch 12' of the conduit 12 leads to another tank 17 through a second check valve 16. Another branch 12'' of the conduit 12 is connected to a conduit 13 through a check valve 18 having a by-pass passage 13' with a manually adjustable aperture.

The pressure fluid arrives through another branch 12'', upstream of the check valve 18 at one end of a double check valve 10, the opposite end of this valve being connected to the reset valve 11 by the conduit 20, 20'.

The conduit 13 is connected in its turn through the respective branches 13', 13'', 13''' to each of the button valves 7, 7', 7''.

The central union of the double check valve 10, is connected to the control space of the relay valve 9 by a conduit 28. The function of the double check valve 10 is to separate the action of the pressure supplied by the conduit 20, 20' from the pressure of the conduit 12''.

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A branch 12^{iv} of the branch 12'' leads to the control space of a second relay valve 19.

A conduit 21 branching off from the conduit 20 leads to the space controlling the resetting of the button valve 7' and through branches 21' and 21'' respectively to the similar valves 7 and 7''.

The valve 19 is connected by a conduit 22 to the tank 15 and through the conduit 23 and its associated branches to two actuating cylinders 24 having pistons mechanically connected to suitable safety and/or protection devices, not shown in the drawing. The pistons are normally at the right as shown by dotted lines in FIG. 2. The relay valve 9 is moreover connected by a conduit 25 to an alarm siren 26 and by another conduit 27 to the tank 17. The above described equipment operates as follows:

Loading and Reset of the System

Let it be assumed that the alarm device is inactive and that the fluid pressure in the feed conduits 8, 8' is at the pre-established operational value.

It is to be noted that under these conditions the pressure arrives at the valve 9 and the resetting valve 11.

In order to set the alarm system in the automatic operational position, it is required firstly manually to lower the operating piston 11' of the valve 11, thus establishing communication between the feed conduit 8' and the conduit 20 which previously discharged into atmosphere through the vent SC of said valve.

The pressurised fluid will thus arrive at one inlet 10b of the double check valve 10 via conduits 20, 20', then through the associated central outlet 10' and the conduit 28, will pass into the control interior of the relay valve 9. Piston 9' of valve 9 is thus actuated to establish a direct communication between the feed conduit 8 and the conduit 12, cutting off the conduit 27 and connecting the conduit 25 of the alarm siren 26 through the associated port SC1 to the atmosphere. Conduit 12 thus feeds fluid to the tank 15 through the check valve 14. Simultaneously the pressurised fluid also fills the other tank 17 through the branch 12' and the check valve 16.

The two check valves 14 and 16 prevent any leakage of compressed air from the respective tanks in the event of breakdown of the associated feed conduits, upstream of said valves.

The pressurised fluid passes through the branch 12'' of the conduit 12, the by pass 18' of the check valve 18, the branch 12''' connected to the other inlet end 10a of the double check valve 10 and the conduit 28 and again feeds the control interior of the valve 9 to hold piston 9' in the previously actuated position.

Through the branch 12^{iv} the pressurised fluid also passes into the control space of the valve 19 which is thus actuated. Piston 19' cuts off conduit 22, coming from the tank 15 and effects discharge into the atmosphere or draining through the port SC2 of the conduit 23 leading to the operating cylinders 24.

Through the branches 13, 13', 13'', 13''' of the conduit 12'', the supply pressure also reaches the button valves 7, 7', 7''. The piston 7a of the valves 7, 7', 7'' are raised through branches 21, 21', 21'' of conduit 20 on actuation of valve 11. When the pistons are raised branches 13', 13'' and 13''' are cut off from drain ports SC3, SC4 and SC5.

It is to be noted that in the described reset stage of the system, the tank 15 applies pressure through the conduit 22 to the relay valve 19. Conduit 22 is, however, cut off by piston 19' and the operational cylinders 24 are open to atmosphere. This arrangement is effected due to the lowered position of piston 19' caused by the pressure introduced into the associated control space through the conduit 12^{iv}.

The tank 17 applies pressure through the conduit 27 to

the relay valve 9. Piston 9', however, has blocked conduit 27 as a result of the pressure simultaneously introduced into the associated control interior or space through the conduit 28.

It is necessary here to note that in the aforesaid loading conditions of the equipment, the control button of the reset valve 11 may be released so that piston 11' will consequently again take up the position illustrated in FIG. 2, in which the conduit 20 and the connected branches 21, 21', 21'' discharge through valve 11 and port SC to atmosphere.

This will not produce any change in the system, as the relay valve 9 is kept in the described feed position of the conduit 12 and connected branches 12'', 12''', by the auxiliary self-energising pneumatic circuit above described, through the restricted aperture in by-pass 18' of the check valve 18, the conduit 12''' and the connected end of the double check valve 10 opposite the end of the conduit 20. Conduit 20 is now being discharged or drained and is separated from conduit 12''' at valve 10.

The alarm pneumatic equipment is thus completely reset and arranged for the operation of the acoustic signals and protective devices provided, as will hereinafter appear.

Activation and Automatic Operation of the Alarm System

Let it now be assumed that with the pre-loaded system set up as described, a thief attempts to jump over the counter 3.

It is apparent that on jumping over the counter, the thief will necessarily exert some force on one or other of the panels 4', 5 or 6 which form the spring loaded top of the counter.

This force is materially greater than the normal weight applied to the counter during normal use. The counter top will be automatically lowered and will cause movement of a piston 7a in an associated button valve 7, 7' or 7'' with the consequent opening of conduit 13 and the branches 13', 13'', 13''' to atmosphere through the associated draining port SC3, SC4 or SC5.

The discharge of pressure or draining of the conduit 13 consequently produces the discharge of the conduit 12 and connected branches 12'', 12''', 12'''.

This effects the immediate discharge of pressure or draining of the fluid in the control space or interior of each of the valves 9 and 19, through the conduit 28 and the end of the check valve 10 connected to the conduit 12''' associated with the valve 9, and the conduit 12''' associated with the valve 19.

The discharge of these control spaces or interiors occurs notwithstanding that the conduit 8 feeds the conduits in discharge, as a pressure difference is created, upstream and downstream of the check valve 18. The by-pass 18' of valve 18 has a restricted aperture and does not re-feed the control interiors or spaces of valves 9 and 19 quickly enough relatively to the discharge to atmosphere in the aforesaid described manner, because the escapement ports SC3, SC4 and SC5 of the button valves 7, 7', 7'', which has or have been actuated are much larger than the aperture in by-pass 18'.

It should be noted that the fluid under pressure contained in the tanks 15 and 17 is prevented from escaping into atmosphere through the conduits 12 or 12' at their inlets by the respective one-way check valves 14 and 16.

The discharge of the pressure in the control space or interior of each of the two relay valves 9 and 19, thus allows these two valves to be brought into the alarm position illustrated in FIG. 2 in which the valve 9 establishes communication between the conduit 27 fed by the tank 17 and the conduit 25 thus actuating the alarm siren 26.

The arrival of the pressure fluid through the conduit 8 is cut off by piston 9', while the conduit 12 and its associated branches are connected to the escapement port SC1 of valve 9.

The valve 19 establishes communication between the

associated feed tank 15 to which it is connected by the conduit 22 and the operational cylinders 24 which are thus actuated to move the pistons 24' to the left as shown in FIG. 2 to control suitable protection devices connected thereto, which devices are not shown in the drawing. These devices may be fitted on a cashier's desk which desk is automatically closed by the action of the pistons in cylinders 24. Alternatively the devices may be electrically connected to a central police station for signalling the attempt at robbery, or the devices may comprise fog and tear gas bombs, or any other appropriate defence means.

The invention obviously is not intended to be restricted to the embodiment illustrated diagrammatically in the drawings which can be modified in many ways without departing from the scope of the appended claims.

For example, the invention may employ a vacuum actuated system instead of a system actuated by pressure as described herein.

What I claim is:

1. A pneumatic alarm system comprising a movable counter panel, a first valve having an operating piston in contact with and supporting said panel in an elevated position, a reset valve, a first conduit connected between the reset valve and first valve, said reset valve having a first position for discharging air from the first conduit and a second position for supplying air under pressure to the first conduit, a source of compressed air connected to the reset valve for supplying air thereto under pressure, a first relay valve, a double check valve having two inlets and a common outlet, said common outlet being connected to the first relay valve, one of the two inlets being connected to said first conduit for supplying air under pressure to the relay valve, a second conduit connected to the first relay valve and receiving air under pressure from said source through the relay valve when the relay valve is actuated under pressure applied via the first conduit, a storage tank for air connected to the second conduit and supplied with air under pressure thereby via a one-way check valve, an actuating cylinder for an alarm device, a second relay valve, a pipe connected between the second relay valve and said cylinder, another pipe connected between the second relay valve and said storage tank, said cylinder being normally open to the atmosphere through said second relay valve when air pressure is applied to the second relay valve, another check valve having a by-pass connected to the second conduit, a third conduit connected between the by-pass and said second relay valve to apply air pressure thereto, a branch conduit connecting said third conduit to the atmosphere through the first valve when the counter panel is depressed to actuate the first valve, and another branch conduit connected between the other inlet of the double check valve and said second conduit via said by-pass, whereby lowering of said counter panel causes release of air pressure in said third conduit so that said tank discharges air under pressure to said cylinder through the second relay valve for actuating said alarm device.

2. A pneumatic alarm system according to claim 1, further comprising a pneumatically operated siren, another storage tank for air under pressure, a fourth conduit connected between said second conduit and said other storage tank via another one-way check valve for applying compressed air to the other storage tank, and a fifth conduit connected between said other storage tank and the first relay valve, said siren being connected to said first relay valve in communication with said fifth conduit when air pressure applied to the first relay valve via the outlet of the double check valve is released upon lowering of said counter panel, whereby said siren is sounded by application of air applied under pressure thereto from said second storage tank.

3. A pneumatic alarm system comprising a movable counter panel, a first valve having an operating piston

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in contact with and supporting said panel in an elevated position, a reset valve, a first conduit connected between the reset valve and first valve, said reset valve having a first position for discharging air from the first conduit and a second position for supplying air under pressure to the first conduit, a source of compressed air connected to the reset valve for supplying air thereto under pressure, a first relay valve, a double check valve having two inlets and a common outlet, said common outlet being connected to the first relay valve, one of the two inlets being connected to said first conduit for supplying air under pressure to the relay valve, a second conduit connected to the first relay valve and receiving air under pressure from said source through the relay valve when the relay valve is actuated under pressure applied via the first conduit, a storage tank for air connected to the second conduit and supplied with air under pressure thereby via a one-way check valve, a pneumatic alarm

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device, a pipe connected between said tank and relay valve, said alarm device being connected to the tank via the relay valve when the relay valve is under pressure applied via the outlet of the double check valve, said alarm device being connected to atmosphere via the relay valve when the air pressure in the relay valve is released while said pipe is closed at the relay valve, whereby said alarm device is sounded upon lowering of said counter panel and release of air pressure in the relay valve.

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