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(54) **Powder type fire extinguisher.**

(57) A powder fire extinguisher contains powder which will be expelled, through an outlet passage (16) by a compressed gas. The gas is contained in a cylinder which is punctured to operate the extinguisher. A valve (31,32) is positioned in the outlet passage, and when the gas cylinder is punctured, the gas pressure immediately acts on the valve (31,32) to hold it closed until pressure has built up in the main body of the extinguisher and the powder is completely fluidized. Once the pressures on opposite sides of the valve are equal, the valve will open since the areas exposed to pressure on the two sides are different.

Powder type fire extinguisher

This invention relates to a powder type fire extinguisher. In such extinguishers, a dry powder contained in a chamber in the extinguisher is driven out of the chamber by compressed gas when a cylinder
5 containing the gas is opened.

To achieve a satisfactory output, it is necessary to ensure that the compressed gas does not escape directly through the outlet without entraining the powder, and thus that the powder is fully fluidized inside the
10 chamber before any output from the chamber occurs.

According to the invention, there is provided a fire extinguisher of the powder type, having a chamber for holding the powder, a container for compressed gas, a powder outlet from the chamber and means for opening the
15 gas container to allow compressed gas to enter the chamber and drive the powder out of the outlet, wherein a valve is provided in the outlet, the valve having a valve member movable, by pressure on opposed faces of the member, onto and off a seat in a valve housing, to close
20 or open the outlet, the area of the valve member face exposed to pressure from the chamber being greater than the area of the other face, and wherein a passage is provided from the gas container to the valve housing to allow compressed gas to act on said other face of the
25 valve member directly the container is opened.

In this way, the valve is held closed while the compressed gas brings the powder into a fluidized state and while the pressure in the chamber builds up. Once the pressure in the chamber is equal to the pressure acting
30 on said other face of the valve member, the difference in areas of the valve member faces exposed to pressure will cause the valve to open fully to allow the fluidized

powder to pass out.

Preferably, the extinguisher has a head fitting which includes an outlet passage and which supports a cylinder containing the compressed gas and a mechanism for
5 puncturing the cylinder to allow the gas to escape into the chamber and which also contains passages for directing the escaping gas through a tube to the bottom of the mass of powder in the chamber and to said other face of the valve member.

10 The valve is preferably mounted in the outlet passage in the head fitting.

The valve may be a poppet valve and said other face may be formed by the end of the valve stem. The valve stem may be arranged above the head and the head itself may be
15 acted upon by the pressure in the chamber.

The valve head may present a rounded face to the chamber, to offer minimal resistance to the flow of powder when the valve is open.

The outlet passage may be continued upstream of the
20 valve, into the chamber, by an elongate tube.

The invention also provides a method of controlling the output from a powder type fire extinguisher, wherein a valve is placed in the powder outlet from the extinguisher, and, on opening of a source of compressed
25 gas to expel the powder, the gas is introduced to a space where it exerts a force on the valve to hold the valve closed while the pressure in the powder chamber builds up to a level at which satisfactory output can take place, and when this level has been reached, the pressure in the
30 chamber exerts a force on the valve which opens the valve to allow the powder to be expelled.

The invention will now be further described, by way of example, with reference to the accompanying drawings, in which:

5 Figure 1 is a cross-sectional view through a head fitting for a fire extinguisher according to the invention, taken on the line I-I from Figure 2;

Figure 2 is an underneath view of the head fitting of Figure 1;

10 Figure 3 is a cross-section, on a larger scale, through a valve for fitting to the head fitting of Figures 1 and 2; and

Figure 4 is a section through the valve of Figure 3 on the line IV-IV.

15 The head fitting 10 shown in Figure 1 is for fitting into the neck of a cylindrical powder container in a conventional manner. The container itself is not shown, and can be conventional. Any suitable method of fastening the fitting into the container neck can be used. In Figure 1, a flange 12 limits the insertion of the fitting
20 into the container neck.

The fitting has a socket 14 for receiving a cylinder of compressed gas. A conventional firing mechanism (not shown) will be provided on the outside of the fitting to allow the cylinder to be punctured when the extinguisher
25 is to be used.

An outlet passage 16 extends through the fitting. A conventional nozzle to direct the flow can be attached to the outer end 18 of the passage.

30 The valve shown in Figures 3 and 4 fits into the lower end 20 of the passage.

Looking now at Figure 2, the socket 14 for the cylinder and the lower end of the outlet passage can be seen. Also visible is a socket 22 for a tube (not shown) which extends from the head fitting to near the bottom of the chamber. A passage 24 for compressed gas leads from the socket 14 to the socket 22, and another passage 26 leads from socket 22 to the lower end 20 of the outlet passage 16.

The valve shown in Figures 3 and 4 has a housing 30 with a valve seat 31 and a valve member 32 movable in the housing. The valve member has a head 34 and a stem 36 and the stem is guided in a bore 38 in the housing. The top of the housing 30 is a tight fit in the lower end 20 of the outlet passage, and a key portion 40 fits in a keyway 42 in the head fitting. The engagement between the key 40 and the keyway 42 ensures that the passage 26 lines up with a passage 44 in the valve housing, so that gas pressure can pass from the cylinder socket 14 to the bore 38 in which the valve stem 36 slides.

O-ring seals 46 and 48 respectively seal the valve housing in the outlet passage 16 and the valve stem 36 in the bore 38.

In operation, puncturing of the compressed gas cylinder by the firing mechanism causes gas to be forced through passages 24 and 26, typically at a pressure of 50-75 bar (750-1000 psi). Gas passes down a tube fitted in socket 22 to fluidise the powder and to build up the pressure inside the chamber. Gas also passes into passage 44 to act on the top of the valve stem 36. As a result, the valve member 32 is forced downwards against the seat 31 to close the valve. The pressure acting on the lower side of the valve head 34 is gradually building up as the powder is becoming fully fluidized, but initially is substantially lower than the pressure above the valve.

At a certain stage, once the powder is fully fluidized, and is ready to be driven out of the chamber, the pressure on the bottom of the valve will become equal to that above. Since the area of the valve head presented to pressure from below is greater than the area of the stem presented to pressure from above there will be a net opening force acting on the valve member, and the valve will open to allow the fluidized powder to flow through the pipe 50 and out. This stage is typically reached about 2 seconds after operation of the firing mechanism.

Figure 4 shows that the cross-sectional area occupied by the part of the housing containing the bore 38 is kept small, so as not to unduly reduce the cross-sectional area of the outlet passage in this region.

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CLAIMS

1. A fire extinguisher of the powder type, having a chamber for holding the powder, a container for compressing gas, a powder outlet from the chamber and means for opening the gas container to allow compressed
5 gas to enter the chamber and drive the powder out of the outlet, wherein a valve is provided in the outlet, the valve having a valve member movable, by pressure on opposed faces of the member, onto and off a seat in a valve housing, to close or open the outlet, the area of
10 the valve member face exposed to pressure from the chamber being greater than the area of the other face, and wherein a passage is provided from the gas container to the valve housing to allow compressed gas to act on said other face of the valve member directly the container is opened.
- 15 2. A fire extinguisher as claimed in Claim 1, which has a head fitting which includes an outlet passage, the head fitting supporting a cylinder containing the compressed gas and a mechanism for puncturing the cylinder to allow the gas to escape into the chamber and also containing
20 passages for directing the escaping gas through a tube to the bottom of the mass of powder in the chamber and to said other face of the valve member.
3. A fire extinguisher as claimed in Claim 2, wherein the valve is mounted in the outlet passage in the head
25 fitting.
4. A fire extinguisher as claimed in any preceding claim, wherein the valve is a poppet valve and said other face is

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formed by the end of a valve stem of the valve.

5 5. A fire extinguisher as claimed in Claim 4, wherein the valve stem is arranged above a valve head and the head itself is, in use, acted upon by the pressure in the chamber.

6. A fire extinguisher as claimed in Claim 5, wherein the valve head presents a rounded face to the chamber, to offer minimal resistance to the flow of powder when the valve is open.

10 7. A fire extinguisher as claimed in any one of Claims 2 to 6, wherein the outlet passage is continued upstream of the valve, into the chamber, by an elongate tube.

15 8. A method of controlling the output from a powder type fire extinguisher, wherein a valve is placed in the powder outlet from the extinguisher, and, on opening of a source of compressed gas to expel the powder, the gas is introduced to a space where it exerts a force on the valve to hold the valve closed while the pressure in the powder chamber builds up to a level at which satisfactory output can take place, and when this level has been reached, the
20 pressure in the chamber exerts a force on the valve which opens the valve to allow the powder to be expelled.

25 9. A method of controlling the output from a powder-type fire extinguisher wherein a valve is provided in the powder outlet having a valve member movable by pressure on opposed surfaces onto and off a seat in a valve housing to close or open the outlet, the area of the valve member face exposed to pressure from the chamber being greater than the area of the other face, and wherein compressed

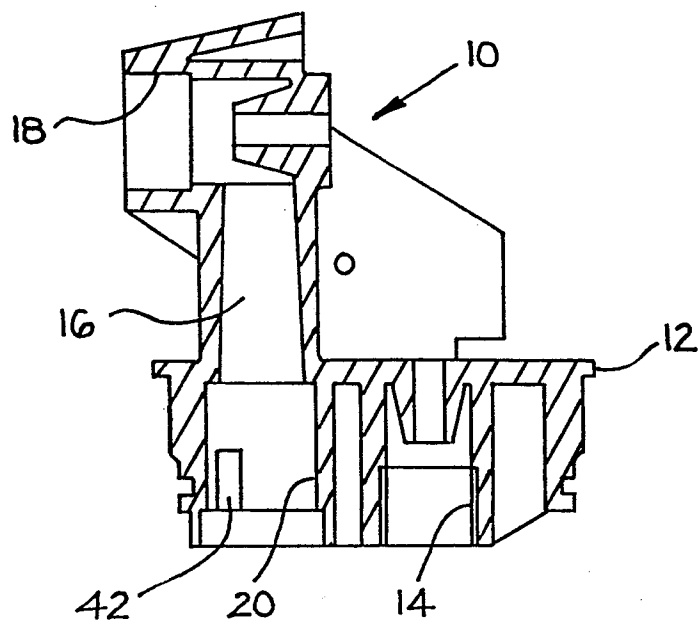
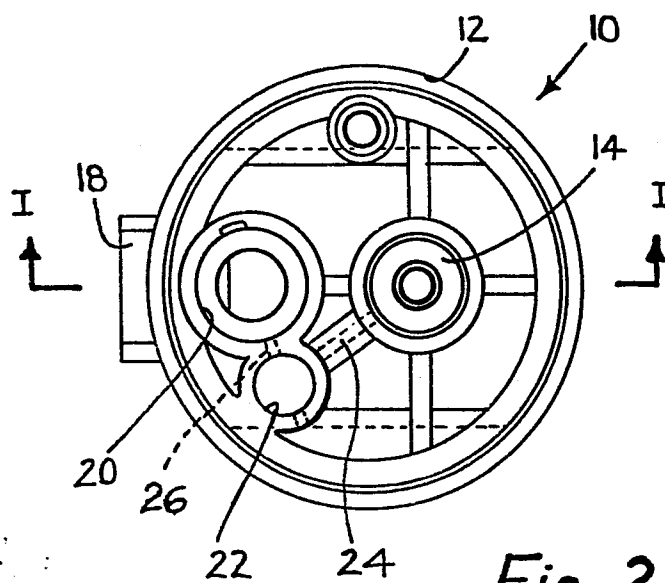
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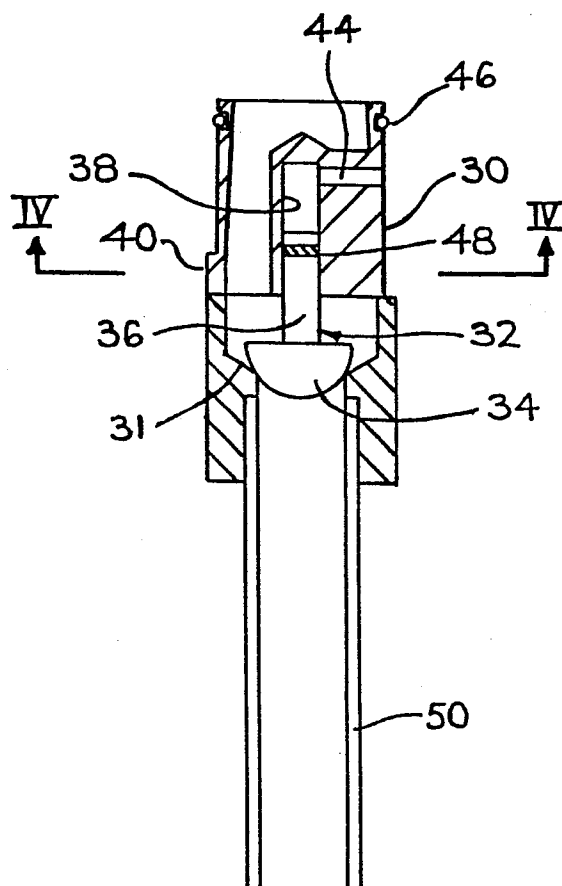
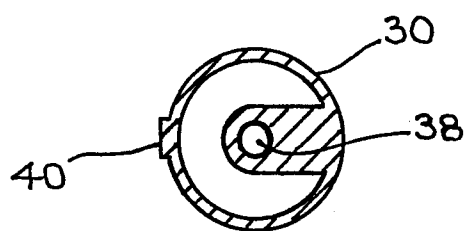
gas is applied to the said other face of the valve member directly the container is opened to hold the valve closed while the pressure in the powder chamber builds up to a satisfactory level.

5 10. A fire extinguisher substantially as herein described with reference to the accompanying drawings.

11. A method of controlling the output from a powder type fire extinguisher substantially as herein described with reference to the accompanying drawings.

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*Fig. 1**Fig. 2*

*Fig. 3**Fig. 4*