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(54) **Safety curtain means.**

(57) There is disclosed safety curtain means deployable between stowed condition and operative condition are biased to deploy to operative condition, comprise fluid pressure operated, stowed condition holding means adapted to hold said curtain means in stowed condition and to release said curtain means on release of fluid pressure to be deployed to said operative condition under the bias.

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SAFETY CURTAIN MEANS

This invention relates to safety curtain means such for example as smoke or fire curtains as might be used for partitioning areas in the event of fire to contain the fire or smoke from it.

Such curtains are normally held in a stowed condition, as by being wound up on a roller in the manner of window blinds, and deployed when necessary to an operative condition. The deployment might be under a bias, as for example a gravitational bias, with the bottom of a roller-mounted curtain being weighted. Such curtains are in known construction held in the stowed condition, for automatic release in the event of fire or smoke being detected, by an electrical arrangement, for example, electromagnetic clutch. This has the disadvantage that if electrical power to a building or area containing the curtain means is interrupted for any reason, the curtain means will deploy unless special measures are taken to maintain an emergency power supply to the electrical arrangement. Such special measures might comprise a local battery backup kept recharged from the mains supply. This is complicated and expensive and in any event requires an electric power supply to the arrangement and battery charge means to be permanently connected, even when the building or area is unsupervised, which gives rise to its own hazards.

The invention provides safety curtain means which need not depend upon electric power for operation and which are thus less complicated, less expensive and less hazardous.

The invention comprises safety curtain means deployable between stowed condition and operative condition and biased to deploy to operative condition, and fluid pressure operated stowed condition holding means adapted to hold said curtain means in stowed condition and to release said curtain means on release of fluid pressure to be deployed to said operative condition under the bias.

Said stowed condition holding means may comprise fluid pressure lock means in which a lock member biased to a release position is held in an operative position by fluid pressure. Such fluid pressure lock means may be resiliently biased to said release position.

Said lock means may comprise ratchet and pawl means or plate-type clutch or brake means, or a dog clutch or a pin engageable in a recess.

Said stowed condition holding means may comprise fluid motor means which may be operative to deploy safety curtain means to the stowed condition. Such motor means may also be operative to deploy the safety curtain means to the operative condition.

The fluid pressure operated means may be pneumatic.

One advantage of the use of pneumatic means is that safety curtain means are primarily used in conjunction with roof ventilators and these are in any event operated pneumatically, so that there is already a supply of pressure air. This may already be sufficient to cope with both roof ventilators and safety curtains, but it is in any event a simple matter to substitute a higher capacity air supply unit.

Said motor means may be rotary or linear, the latter for example comprising a piston-in-cylinder arrangement, which may be connected to the safety curtain means by a pulley arrangement. The piston-in-cylinder arrangement may be disposed vertically to one side of the safety curtain means or horizontally along the upper edge thereof.

The safety curtain means may comprise rate control means operative to control the rate of deployment of the safety curtain means to its operative position, such, for example, as a restriction controlling rate of pressure fluid release.

The said curtain means may be biased gravitationally to deploy to operative condition.

The safety curtain means may comprise heat-actuated fluid pressure release means, such, for example, as a bimetal strip or bellows-type valve arrangement or a fusible arrangement. One or more heat-actuated fluid pressure release means may be arranged in a fluid pressure supply line for said stowed condition holding means, which line is arranged to pass through a region in which a fire should trigger the deployment of the safety curtain means to its operative position.

Such heat-actuated fluid pressure release means may also be normally maintained closed by being maintained at elevated temperature by an electric current but opened to release fluid pressure holding the safety curtain means in its stowed condition on loss of current permitting the release means to cool to ambient. It may be arranged that the release means is maintained closed only within a restricted temperature band so that it releases pressure in the event it cools through loss of heating current or reaches an excessive temperature because of a local fire. Such heat-actuated fluid release means may be useful in connection with the operation of other fire safety measures such as roof ventilators and sprinkler systems and may comprise an invention independent of safety curtain means.

The curtain means may be stowed on a roller.

The invention also comprises safety curtain means deployable between stowed condition and

operative condition, having control means adapted automatically from time to time to deploy said curtain means as a routine check on and/or exercise of their operation.

If the safety curtain means are not called into operation, parts may seize or have their movement restricted by foreign bodies. Since safety curtains usually protect spaces which have periods (eg nighttime) when they are regularly not in use, it is possible to arrange, for example, a clock timer to deploy the curtain on a regular basis during such dead time. With a pneumatic operating system this can be combined with regular lubrication by introducing a lubricant mist.

Embodiments of safety curtain means according to the invention will now be described with reference to the accompanying drawings, in which :-

Figure 1 is a side view with a diagrammatic illustration of a control arrangement;

Figure 2 is a side view of a detail of one embodiment;

Figure 3 is a front view of a detail of another embodiment;

Figure 4 is a front view of a detail of a further embodiment;

Figure 5 is a side view of a further embodiment;

Figure 6 is a front elevation of another embodiment;

Figure 7 is a front elevation of another embodiment;

Figure 8 is a sectional elevation of a heat controlled pressure release valve;

and Figure 9 is a plan view of a possible operating system.

The drawings illustrate safety curtain means 11 deployable between stowed condition (full line) and operative condition (broken line) and biased to deploy to operative condition and fluid pressure operated, stowed condition holding means 12 adapted to hold said curtain means 11 in stowed condition and to release said curtain means 11 on release of fluid pressure to be deployed to said operative condition under the bias.

Figures 2 and 3 illustrate stowed condition holding means 12 comprising fluid pressure lock means in which a lock member 13 biased to a release position is held in an operative position by fluid pressure. Said lock member 13 is in each case resiliently biased to said release position by spring means 14.

The lock means illustrated in Figure 2 comprise ratchet 15 and pawl 16 means, the lock means also comprising a fluid pressure actuator 17 having a piston 18 biased by pressure spring 14, the pawl 16 being on the piston 18 rod.

The lock means illustrated in Figure 3 com-

prise fluid pressure actuated plate-type clutch or brake means 19 having caliper-type outer plates or pads 21 and an inner plate 22 gripped between the plates or pads 21 when fluid pressure is on piston-in-cylinder actuators 23.

Figure 4 illustrates lock means comprising a fluid pressure motor 31 which drives a gear box 32 and has pressure fluid connections 33 and manually operated valve means 34 to connect either one of said connections 33 to the pressure fluid supply and the other to exhaust or return whereby to drive the motor in either direction, and to disconnect both connections 33 from both exhaust or return and supply so as to hold the motor 31 against rotation, whereby it acts as a lock. The output shaft 35 from the gearbox 32 connects with a roller 36, as indeed do the ratchet 15 of Figure 2 and the inner plate 22 of the clutch or brake means 19 of Figure 3, on which the curtain means 11 are wound up.

The curtain means 11 are biased gravitationally to deploy to operative i.e. in this case, dropped position, from the stowed position in which the curtain means are wound up on the roller 36 which is situated in an enclosure 37 at or near roof level. The roller 36 is mounted on free running bearings (not shown) so as to offer no resistance, or substantially no resistance to motion under the influence of a weight 38 attached to the free end 39 of the curtain 11.

In addition to the valve means 34 of Figure 4, further valve means 39 are provided which are operable to release both connections 33 to atmosphere so as to release any holding force on the roller 36 and allow the curtain 11 to deploy when necessary. The release may be implemented by manually operating the valve means 39 or by connecting the valve means 39 for actuation by smoke or fire detector means 41 which may trigger an energising current to an electric valve actuator 42.

Figure 1 shows a rudimentary schematic operating arrangement in which a pressure fluid supply is maintained to said safety curtain means 11 from a compressor 43 or plenum or other supply of e.g. compressed air.

Figure 5 illustrates a different arrangement in which the safety curtain 11 is not rolled up but rather is a bottom-weighted curtain of the pleated or folding type. In substitution for the motor 31 acting on the roller 36, it could act instead on wires or cords 51 which pass through each pleat or fold and which when pulled serve to haul up the entire curtain, pleat on pleat.

Clearly, also, so-called festoon-type curtains could be used.

Figures 6 and 7 illustrate a linear pneumatic motor arrangement comprising a piston-in-cylinder arrangement 61 connected to the safety curtain 11

by a pulley arrangement 62. In each case, the piston rod 61A is extended when the curtain 11 is lowered, as illustrated, and to raise the curtain, pressure is applied above the piston at a pressure air inlet 63 to drive the piston into the cylinder 61B.

The pulley arrangement 62 comprises a pulley 64 on the end of the piston rod 61A, fixed pulleys 65,66 and a winding drum 67 to which one end of a wire 68 is fixed, the other end being fixed near the pulley 65.

In Figure 6 the piston-in-cylinder arrangement 61 is located in vertical orientation to one side of the curtain 11, which runs in tracks 69. In Figure 7, the arrangement 61 is located horizontally, above the curtain 11.

When pressure on the piston is released, the air therein escapes allowing the piston to extend out of the cylinder 61B and the curtain 11 drops under the weight 38.

The rate of fall of the curtain 11 when pressure is released can be controlled by a pre-settable restriction 71 in the supply conduit 72 to the cylinder 61B. Such restriction 71 will be preset to control the rate of fall to a safe value such that it will not cause injury should it happen to fall when somebody is standing beneath it. The restriction 71 can be a one-way restriction, i.e. allowing air to be released at a low, safe rate, yet allowing pressure air readily to the piston-in-cylinder arrangement to raise the curtain 11.

Figure 8 illustrates a heat-actuated fluid pressure release means comprising a thermostatic valve 81 in which a piston 80 on spindle 82 in a threaded collar 83 is attached to an adjusting knob 84 so as to be adjustable for height inside a sleeve 85 having a valve aperture 86. The sleeve 86 telescopes on an inlet spigot 87 and moves up and down thereover attached to a bimetal strip 88. The strip 88 bends (dashed lines) according to its temperature to raise and lower the aperture 86 in relation to the piston 80 to open or close the valve. Such a valve 81 is mounted on a T-piece 89a in the supply line 89 from the pressure source to a fluid pressure operated stowed condition holding means, such as the rotary motor 31 of Figure 4 or the piston-in-cylinder arrangements 61 of Figures 6 and 7. The valve 81 opens to release fluid e.g. air pressure from the line 89 in the event of excessive temperature as from a local fire.

Such valves 81 may be distributed along a line 89 from an air supply 91 to the curtain 11 as shown in Figure 9 as local fire detectors.

One at least of such valves may also incorporate another safety feature, namely being held at above ambient temperature by an electric heating element 92 which may be fitted with a thermostatic cutoff 93. A fail-safe negative signal, i.e. cutting-off of power to the valve 81 allows the temperature to

drop so that the valve member 85 moves to expose the aperture 86 oppositely to the direction it moves in, to do, however, the same thing, namely expose the aperture 86, in the event of overheating as by a fire.

Another safety feature is illustrated in Figure 9. A clock timer 94 actuates valve means 95,96 to seal off a plenum 97 maintained under pressure by a motor driven pump 98 and release pressure from the line 89 to allow the curtain 11 to drop on a periodic basis as a check to see if everything is working as it should. After a suitable time, the valving is reversed to seal off the escape of pressure air by valve 95 and open valve 96 to re-pressure the system thereby raising the curtain. That the curtain falls as it should can be checked manually by e.g. observing the same or, if the test is arranged for a period when there is nobody about, some automatic sensing arrangement may be used. As illustrated, a limit switch 98 actuated when the curtain reaches the bottom of its descent operates to change an indicator 99 from red (initiated by the timer at the start of the test) back to green, to indicate that the test has been carried out successfully. The same limit switch can also be used to reverse the valves 95,96 instead of the timer, so that in the event the curtain 11 does not reach the limit switch at least it remains at the level to which it descended, as a fail safe measure and also to indicate to maintenance staff the extent of the shortfall. Figure 9 also illustrates a lubricating arrangement in which a valve 101 is actuated also by the timer 94 to introduce a lubricant mist into the air line 89 when pressure air is restored thereto after a test. The lubricant is kept in a bottle 102 which is pressurised from the air line 89. The lubricant mist is carried around the system to lubricate valves, motor, clutch or whatever moving parts require it.

When no fluid pressure motor is supplied to wind up the curtain means, an electric motor or a hand-pulley arrangement could be used instead.

Instead of the bimetal strip-type valves 81, or some of them, valves having a fusible element can be used in the line 89 of Figure 9 as local fire detectors. Bellows-type valves can also be used wherever the bimetal strip-type valves are used.

Claims

1. Safety curtain means deployable between stowed condition and operative condition and biased to deploy to operative condition, characterised by fluid pressure operated, stowed condition holding means adapted to hold said curtain means

in stowed condition and to release said curtain means on release of fluid pressure to be deployed to said operative condition under the bias.

2. Safety curtain means according to claim 1, in which said stowed condition holding means comprise fluid pressure lock means in which a lock member biased to a release position is held in an operative position by fluid pressure.

3. Safety curtain means according to claim 2, in which said fluid pressure lock means are resiliently biased to said release position.

4. Safety curtain means according to claim 2 or claim 3, in which said lock means comprise ratchet and pawl means.

5. Safety curtain means according to claim 2 or claim 3, in which said lock means comprise plate-type clutch or brake means.

6. Safety curtain means according to any one of claims 1 to 5, in which said stowed condition holding means comprise fluid motor means.

7. Safety curtain means according to claim 6, in which said fluid motor means are operative to deploy said safety curtain means to the stowed condition.

8. Safety curtain means according to claim 6, in which said fluid motor means are operative to deploy said safety curtain means to the operative condition.

9. Safety curtain means according to any one of claims 1 to 8, in which said fluid pressure operated means are pneumatic.

10. Safety curtain means according to any one of claims 6 to 9, in which said motor means are rotary.

11. Safety curtain means according to any one of claims 6 to 9, in which said motor means are linear.

12. Safety curtain means according to claim 11, in which the said motor means comprise a piston-in-cylinder arrangement.

13. Safety curtain means according to claim 12, in which the piston-in-cylinder arrangement is connected to said safety curtain means by a pulley arrangement.

14. Safety curtain means according to claim 12 or claim 13, in which the piston-in-cylinder arrangement is disposed vertically to one side of the safety curtain means.

15. Safety curtain means according to claim 12 or claim 13, in which the piston-in-cylinder arrangement is disposed horizontally along the upper edge of the safety curtain means.

16. Safety curtain means according to any one of claims 1 to 15, comprising rate control means operative to control the rate of deployment of said safety curtain means to its operative position.

17. Safety curtain means according to claim 16, in which said rate control means comprise a restriction controlling rate of pressure fluid release.

18. Safety curtain means according to any one of claims 1 to 17, in which said curtain means are biased gravitationally to deploy to operative condition.

19. Safety curtain means according to any one of claims 1 to 18, comprising heat-actuated fluid pressure release means.

20. Safety curtain means according to claim 18, in which said heat-actuated fluid pressure release means comprise a bimetal strip valve arrangement.

21. Safety curtain means according to claim 19 or claim 20, comprising one or more heat-actuated fluid pressure release means arranged in a fluid pressure supply line for said stowed condition holding means, which line is arranged to pass through a region in which a fire should trigger the deployment of the safety curtain means to its operative condition.

22. Safety curtain means according to any one of claims 1 to 21, in which said curtain means are stowed on a roller.

23. Safety curtain means according to any one of claims 19 to 22, in which said heat-actuated fluid pressure release means are maintained closed only within a restricted temperature band so as to release pressure in the event it cools through loss of heating current or reaches an excessive temperature because of a local fire.

24. Safety curtain means deployable between stowed condition and operative condition, having control means adapted automatically from time to time to deploy said curtain means as a routine check on and/or exercise of their operation.

25. Safety curtain means according to claim 24, in which the arrangement is lubricated automatically during such automatic deployment.

26. Safety curtain means according to any one of claims 1 to 25, operated pneumatically, in which a lubricant mist is introduced into the pressure gas.

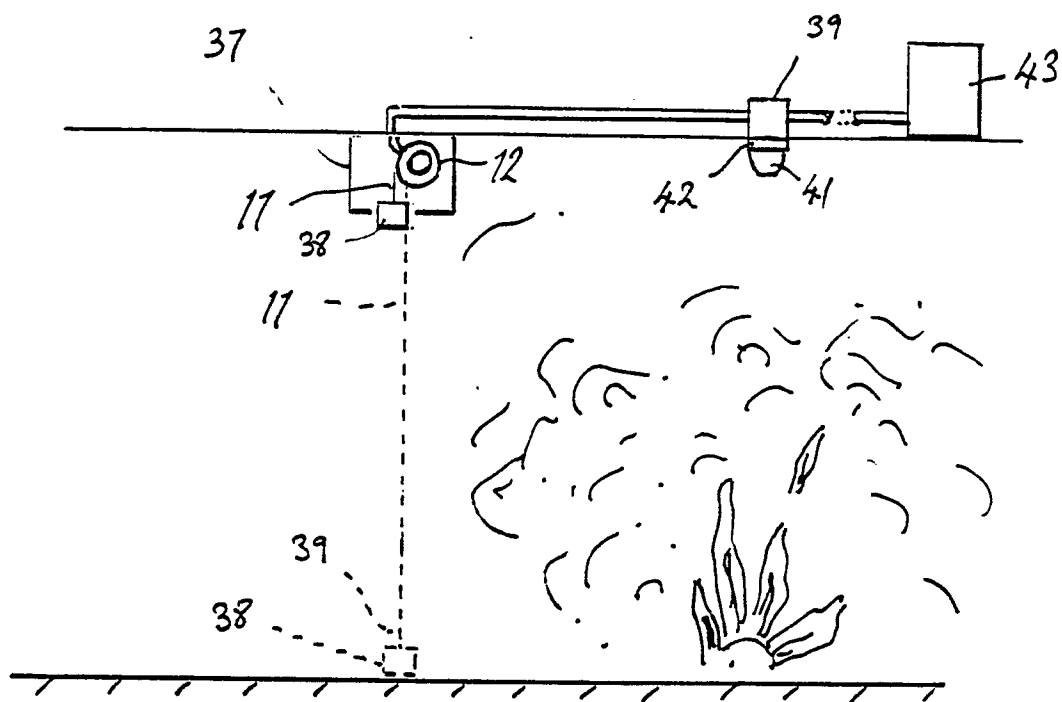


Fig 1

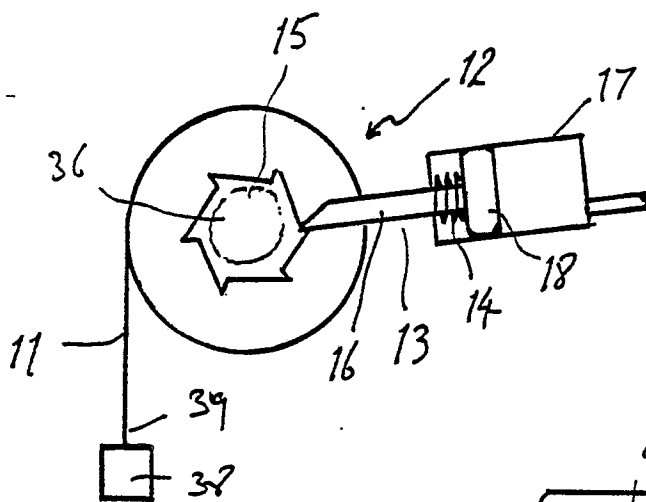


Fig 2

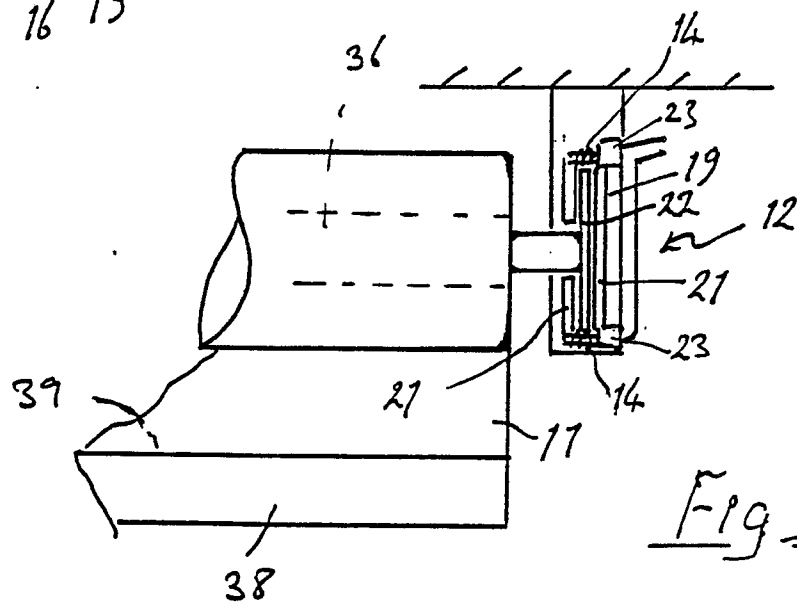
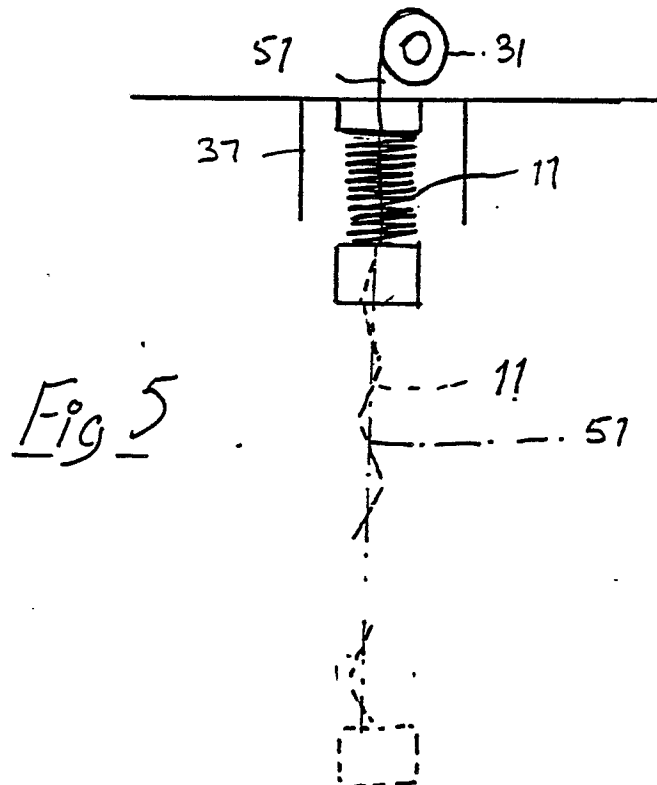
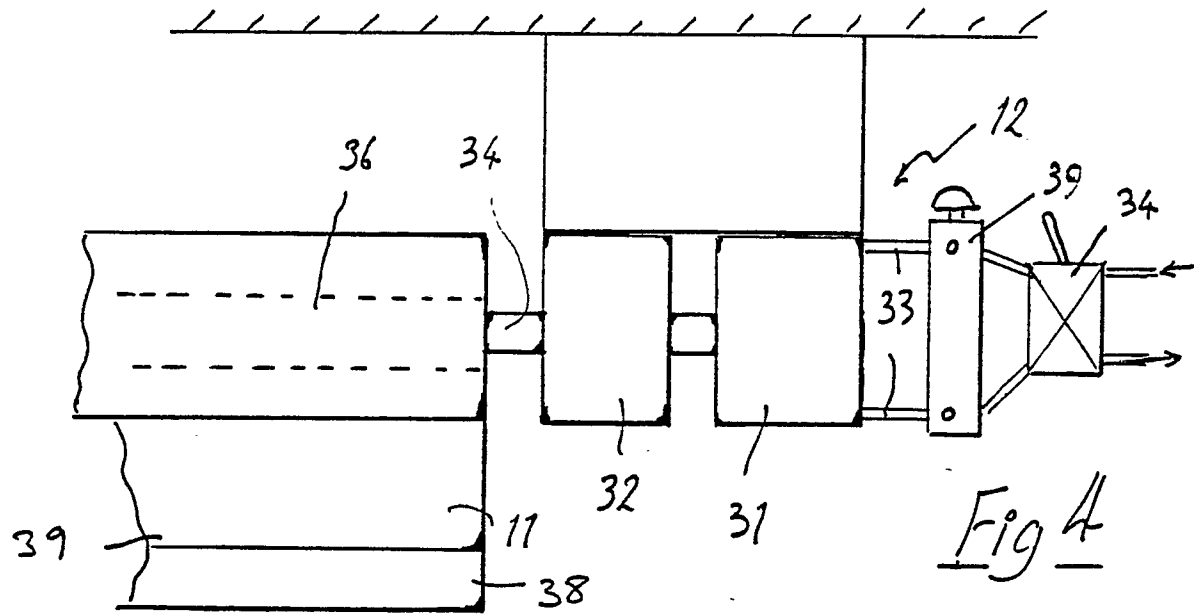
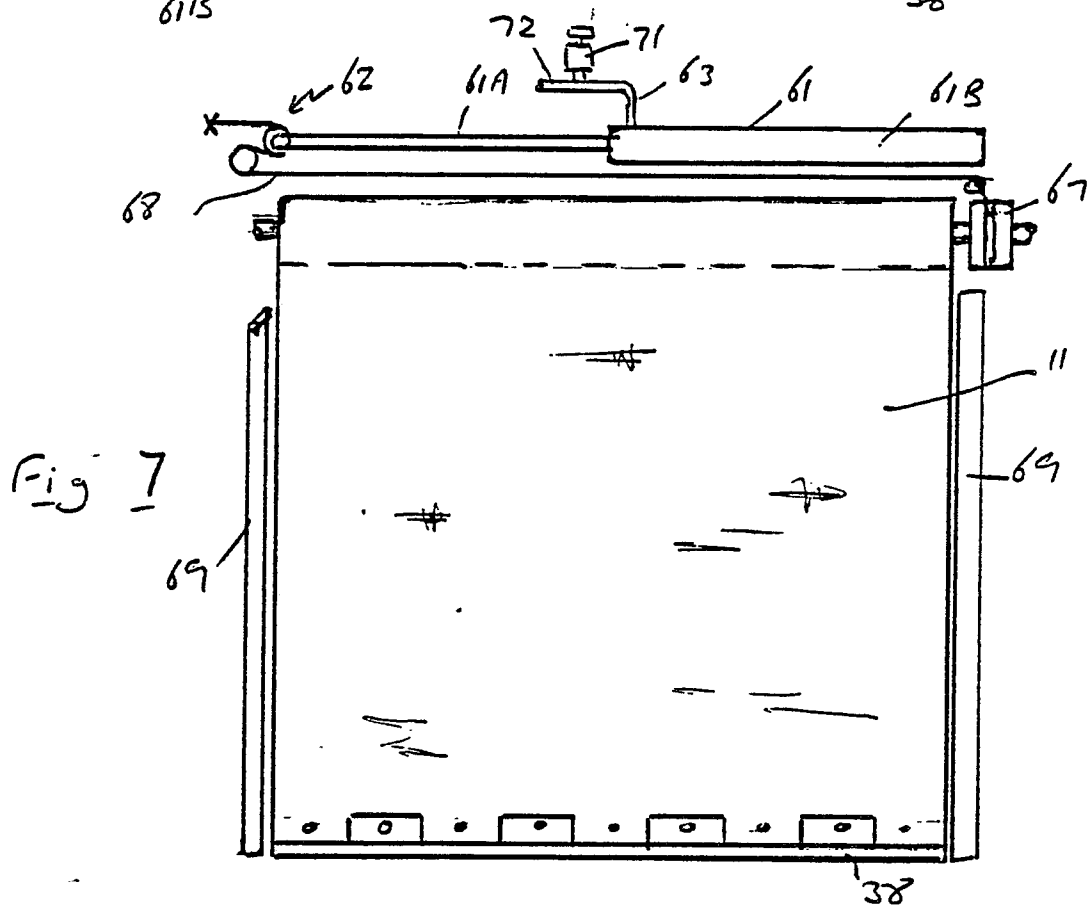
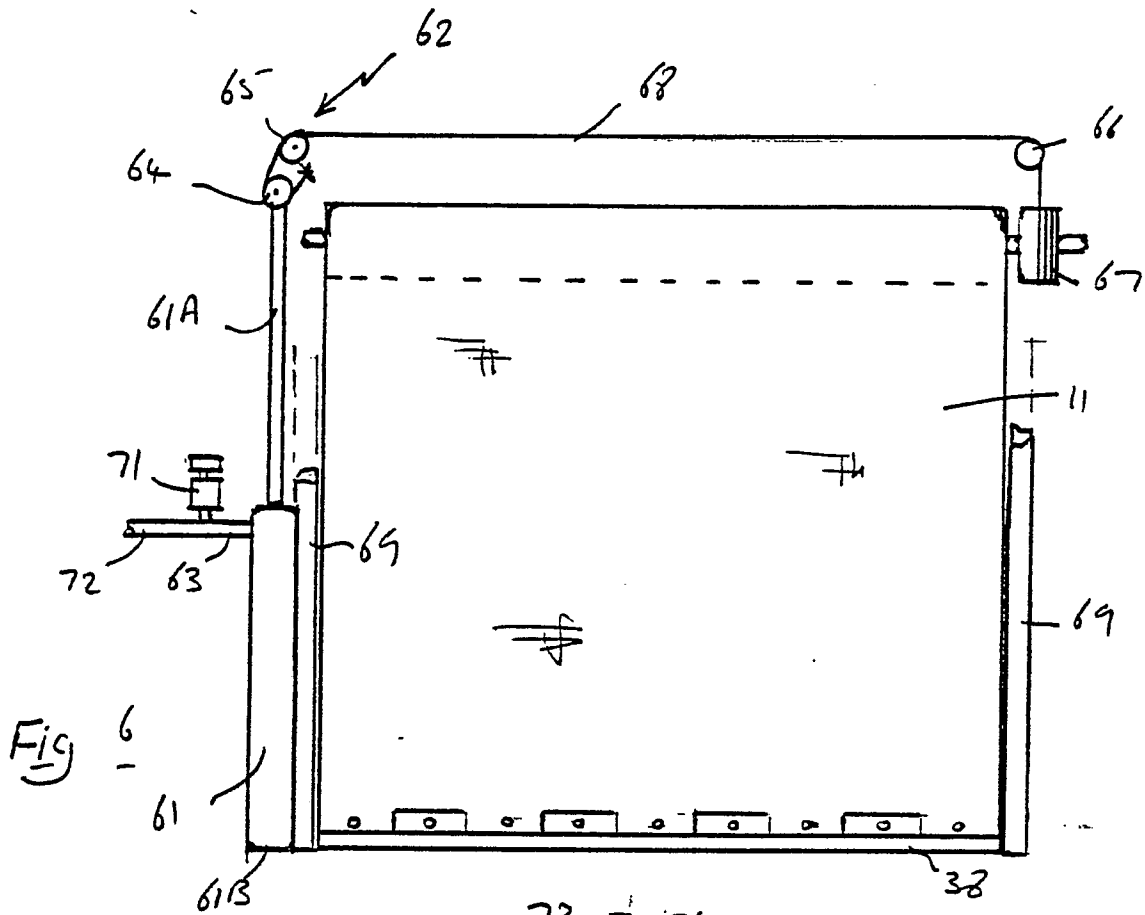
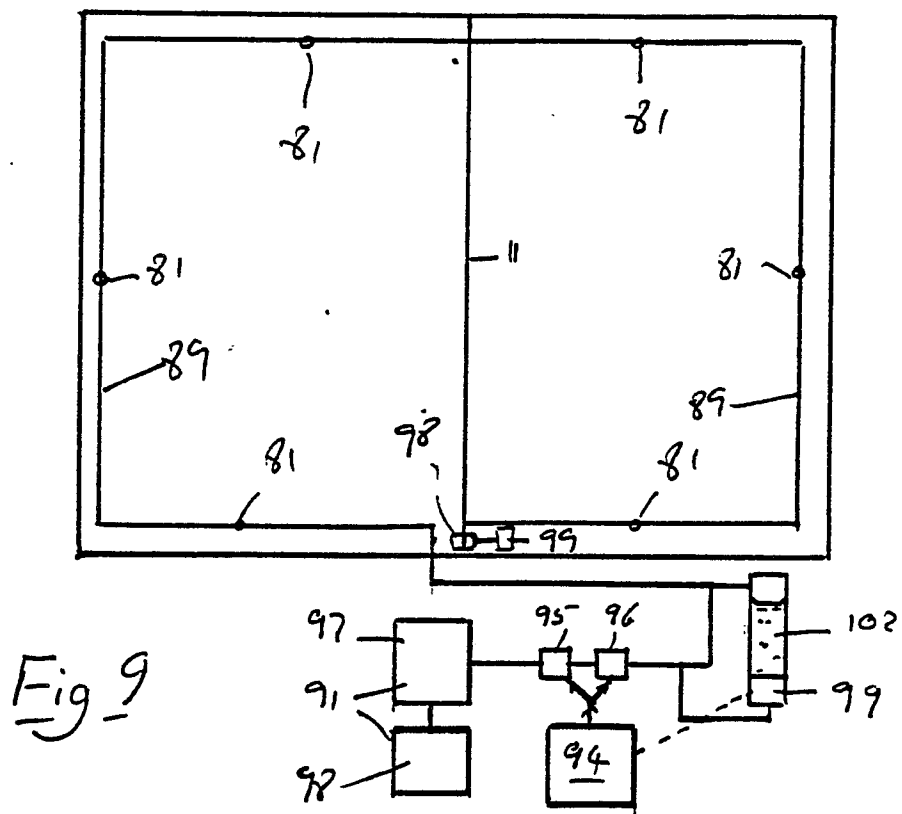
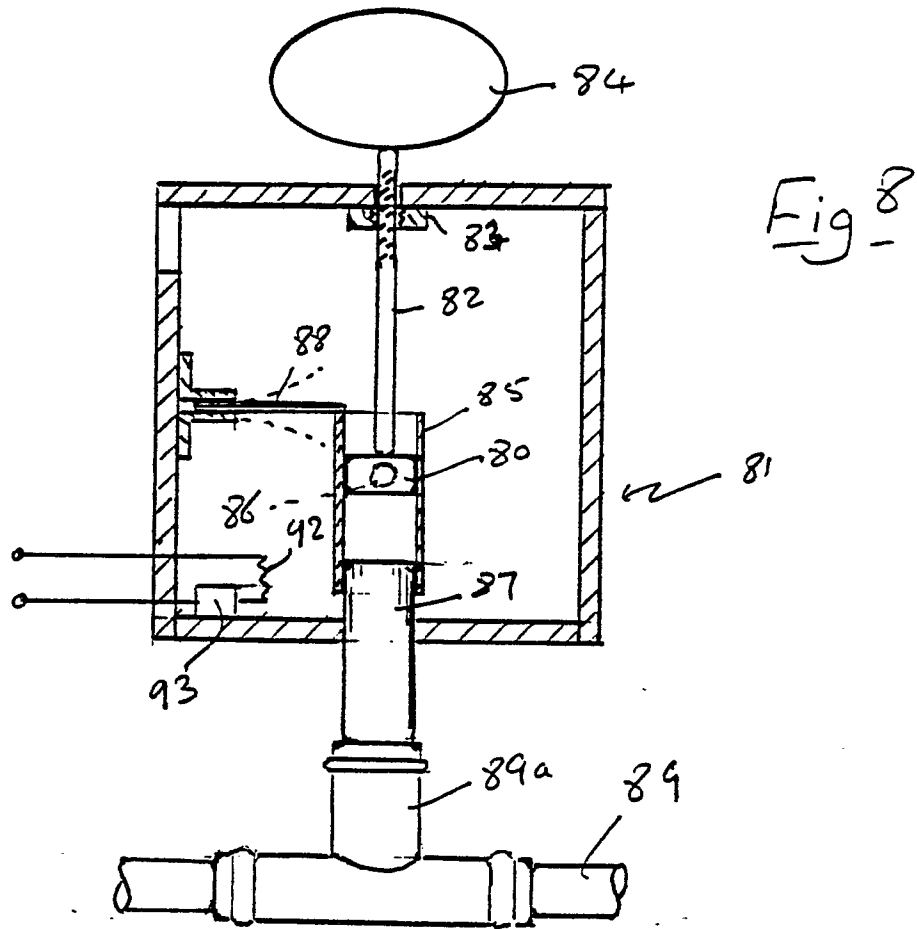


Fig 3









DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
X	US-A-3 687 185 (I. SINGER) * Column 3, line 55 - column 4, line 21; figures 1-6,7; column 5, line 46 - column 6, line 24 *	1-3,6,8 ,9,11- 14,18, 19,21	A 62 C 2/02
A	FR-A-1 009 783 (M.M.J. LEPREVOST) * Page 4, left-hand column, line 21 - right-hand column, line 16; page 3, right-hand column, lines 10-44; figure 3 *	5,10,16 -18,22	
A	FR-A- 561 289 (ETABLISSEMENTS JAQUEMET & MESNET) * Page 2; figures 1,3,6 *	16,24	
A	US-A-4 130 156 (R. WARDLAW) * Page 3, lines 1-25; figure 1 *	4	
A	FR-A-2 300 582 (T. HATTORI)		
			TECHNICAL FIELDS SEARCHED (Int. Cl.4)
			A 62 C
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 05-12-1988	Examiner WOHLRAPP R.G.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			