(12) UK Patent Application (19) GB (11) 2 391 047 (13) A

(43) Date of A Publication 28.01.2004

(21) Application No: 0314287.4

(22) Date of Filing: 19.06.2003

(30) Priority Data:
(31) 0214045 (32) 19.06.2002 (33) GB

(71) Applicant(s):
Kevin Smith
Ynys Fawr, Conway Road, Glan Conwy,
CONWYN BAY, LL28 5LG, United Kingdom

(72) Inventor(s):
Kevin Smith

(74) Agent and/or Address for Service:
Roystons
Tower Building, Water Street, LIVERPOOL,
L3 1BA, United Kingdom

(51) INT CL[7]:
E03B 9/08 // F16J 15/02

(52) UK CL (Edition W):
F2B B1B
U1S S1782 S1885

(56) Documents Cited:
AU 000751891 A **FR 002742206 A**
US 4221233 A

(58) Field of Search:
UK CL (Edition V) **F2B**
INT CL[7] **E03B, F16J, F16K**
Other: **Online: WPI; EPODOC; JAPIO**

(54) Abstract Title: **A sealing means for a hydrant**

(57) A sealing means for a hydrant (20 in Fig. 2) having an outlet pipe (28 in Fig. 2) comprises a cap 60 disposed at least partially in the outlet pipe for sealing the outlet pipe, the cap comprising an aperture 64 which is sealed by a tapered plug 70. The plug 70 is pulled tightly into the aperture 64 of the cap 60 to form a seal by the tension provided by a spring 94 acting on a lower ferrule 92 and an anchor bar 88. An upper ferrule 84 of retainer 80 is secured to the tapered plug 70 using a split pin 86 through aperture 85.

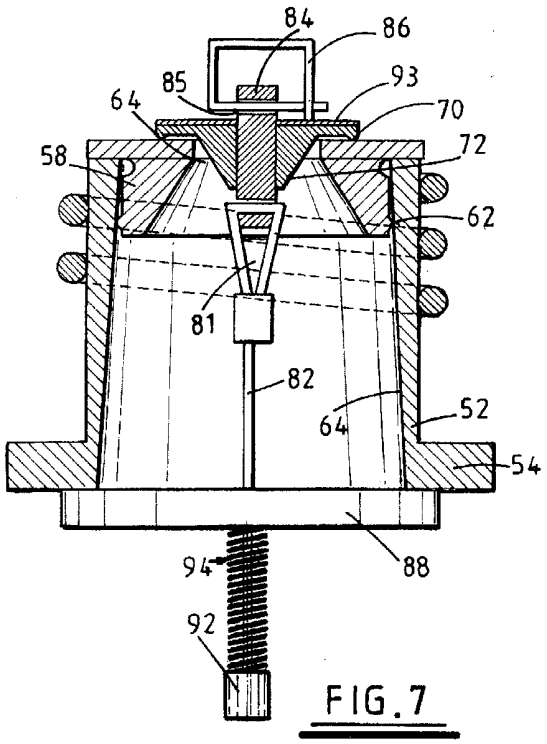


FIG.7

GB 2 391 047 A

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

This print takes account of replacement documents submitted after the date of filing to enable the application to comply with the formal requirements of the Patents Rules 1995

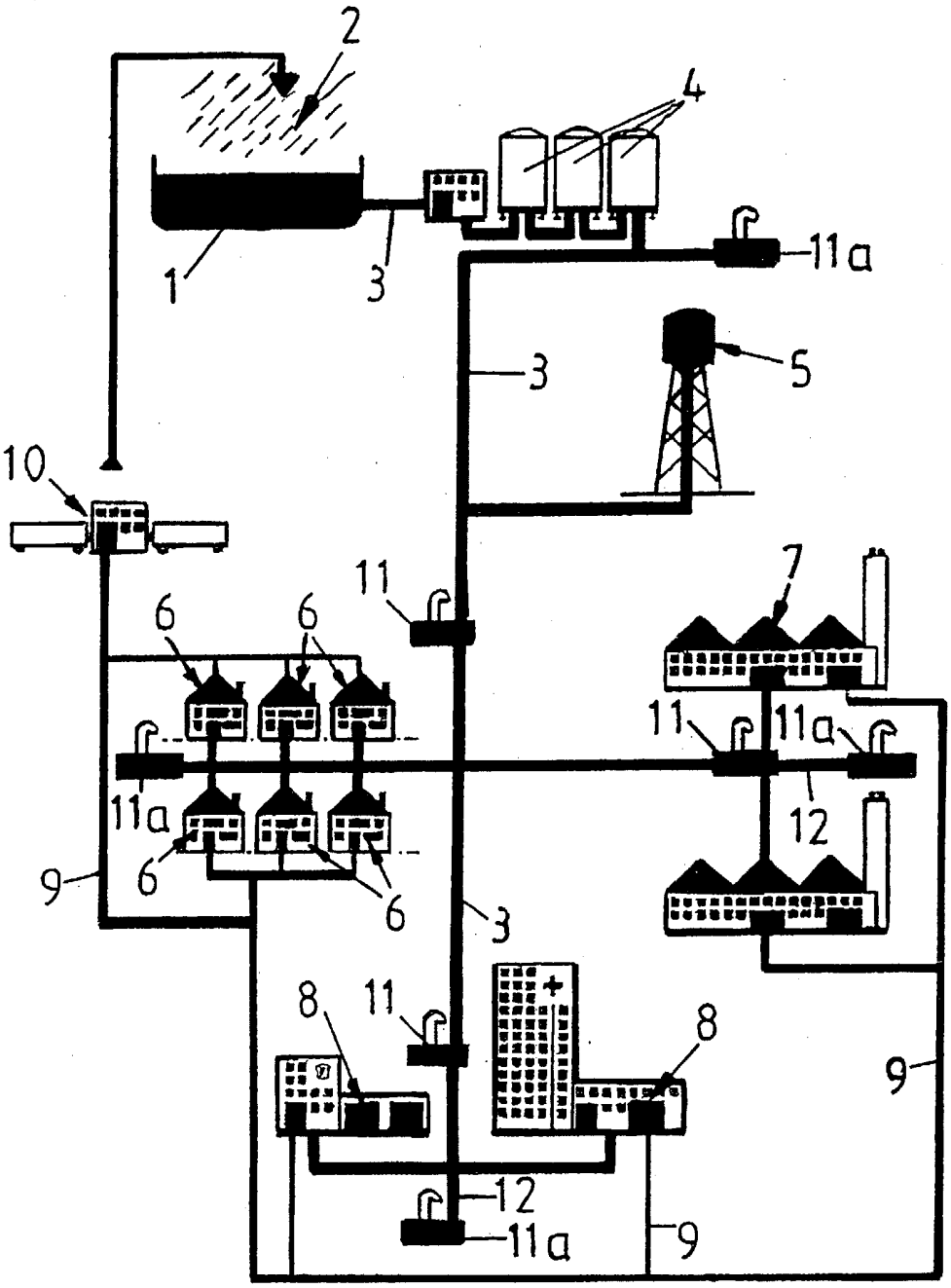


FIG.1

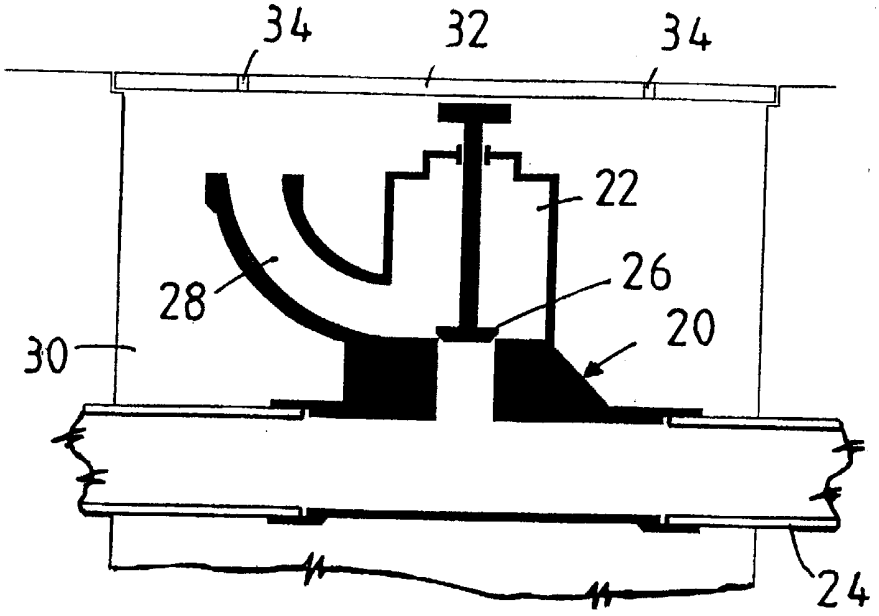
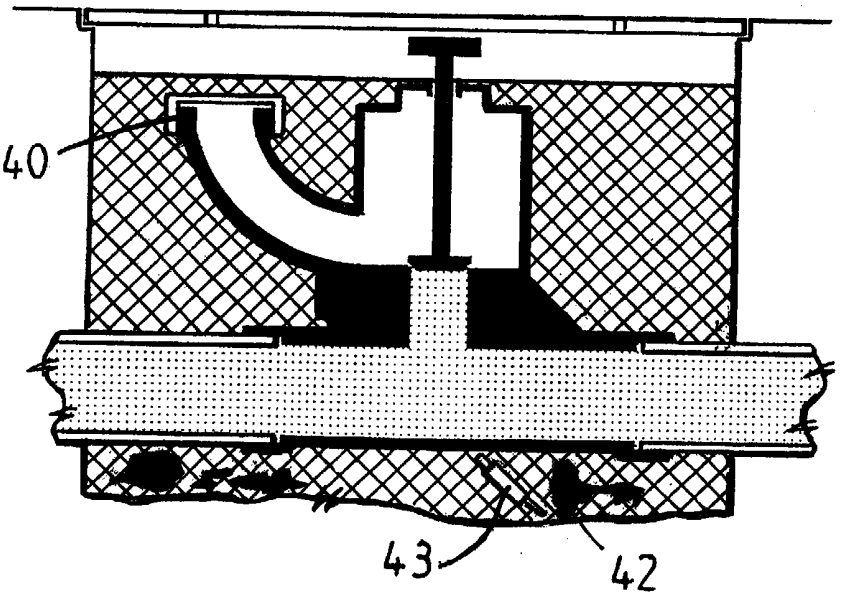


FIG. 2



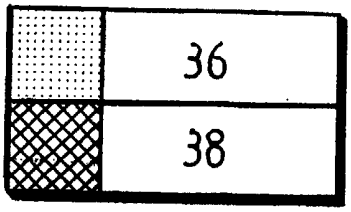


FIG. 3

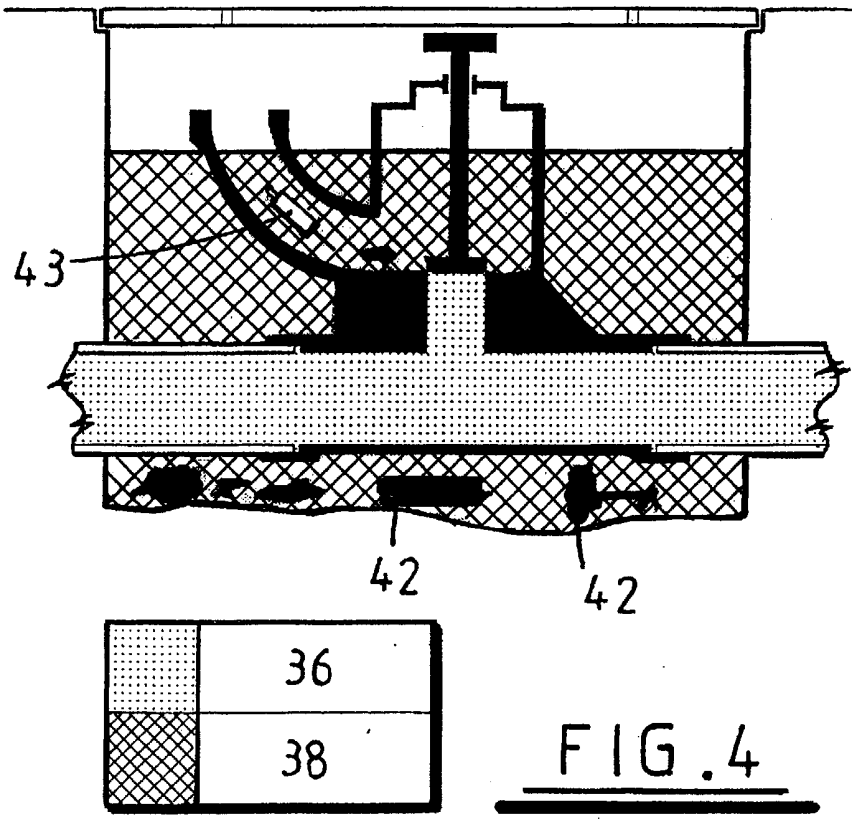


FIG.4

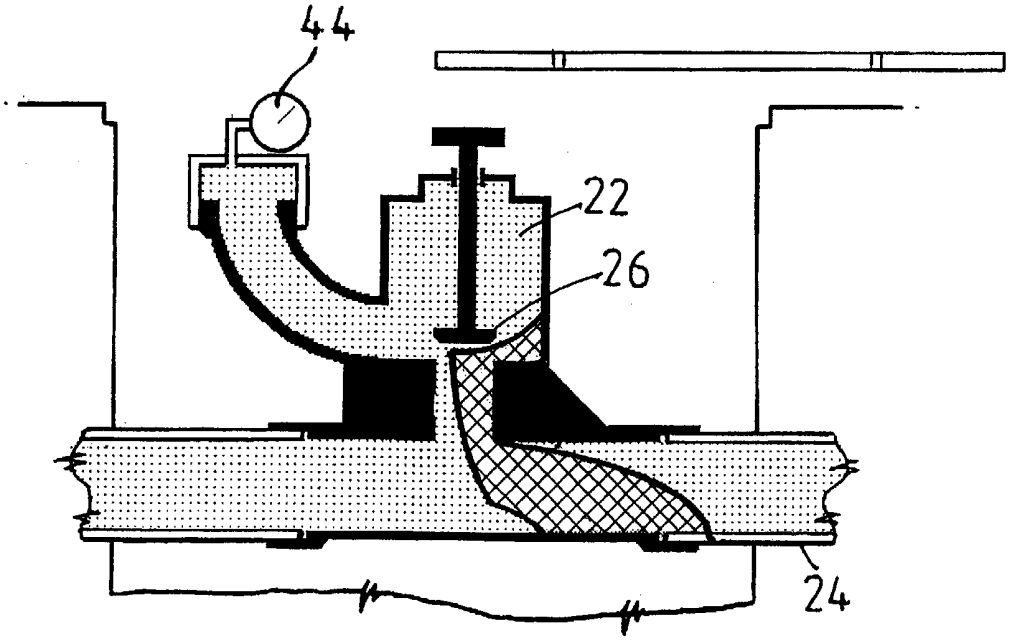


FIG.5

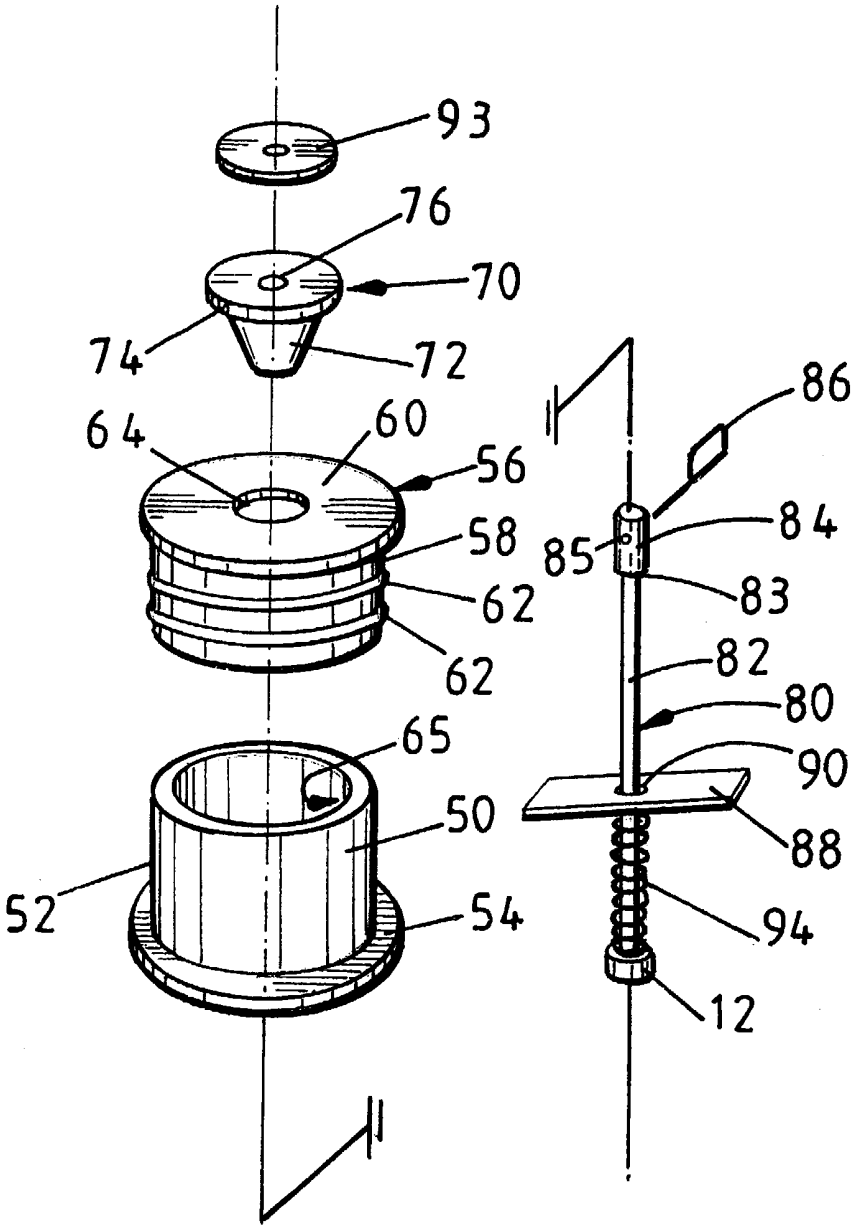

93
76
70
74
72
64
60
56
58
62
62
65
50
52
54
86
84
85
83
82
80
90
88
94
12

FIG. 6

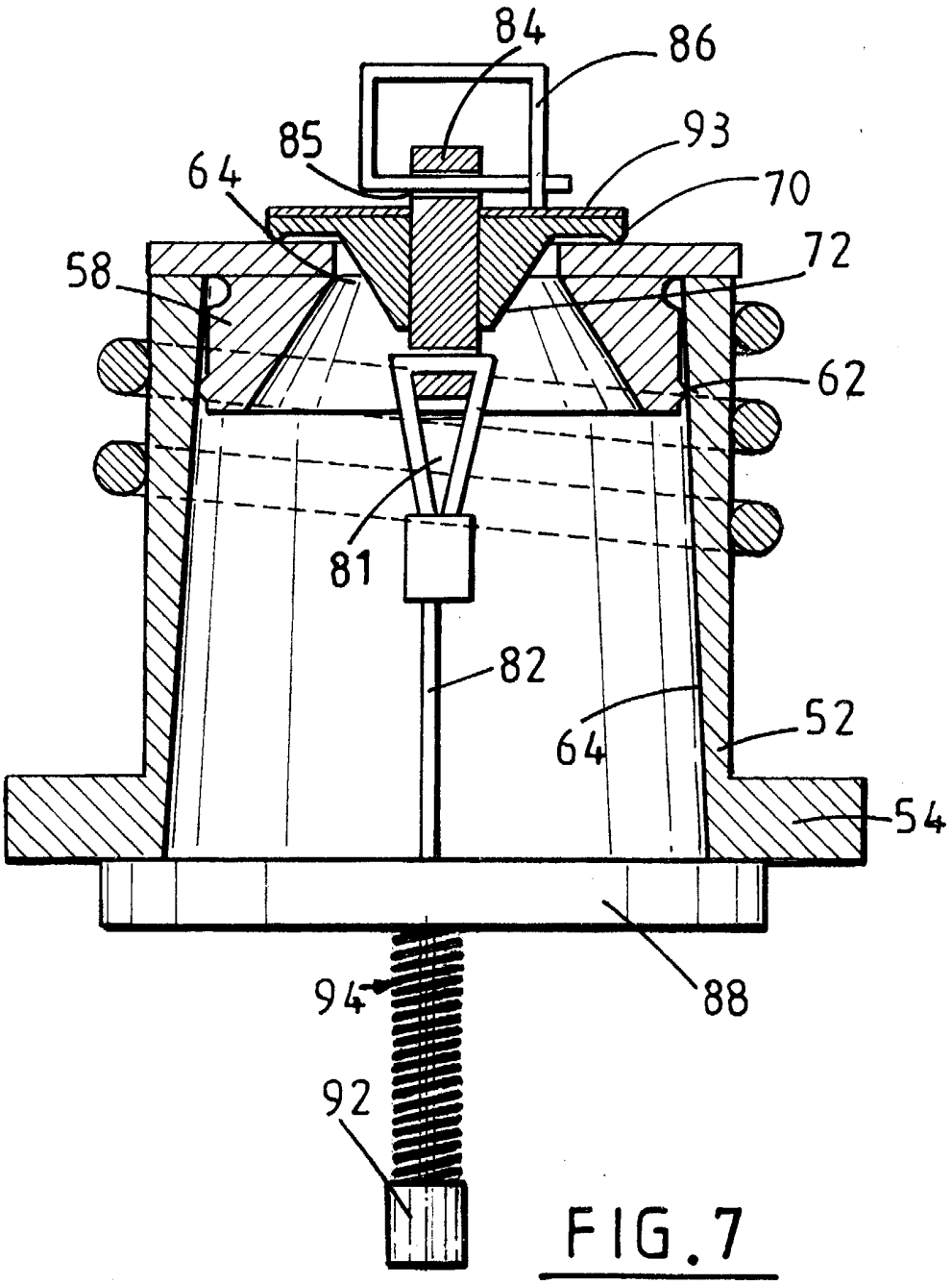


FIG. 7

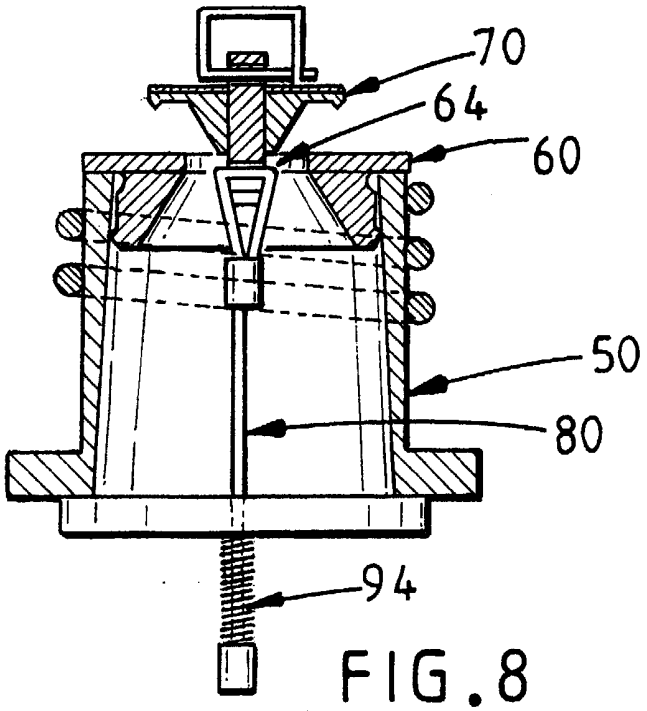


FIG.8

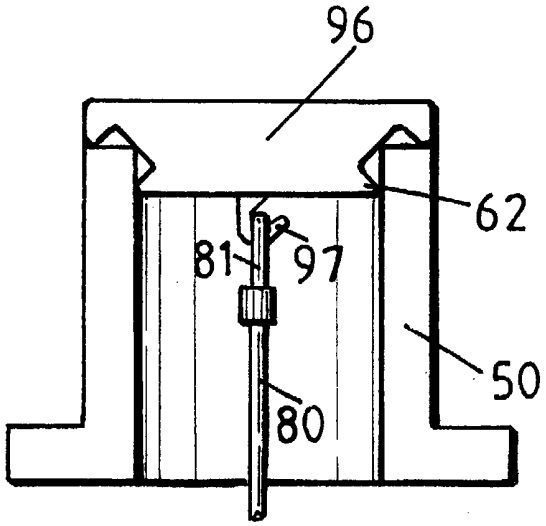


FIG.9

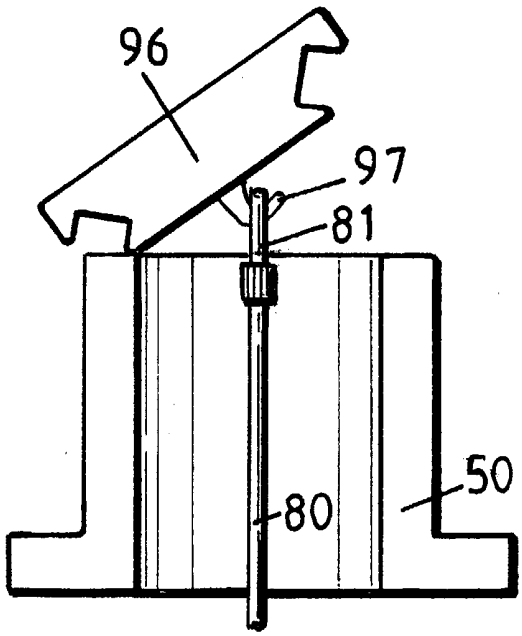


FIG.9a

TITLE: Hydrant sealing means

DESCRIPTION:

The present invention relates to hydrants and in particular to sealing means therefor.

Water networks generally comprise; water collection, storage, and treatment facilities; and a network of pipes for transporting water from the various facilities to homes, public services and businesses. A schematic representation of a typical water network is shown in Figure 1 of the accompanying drawings in which;

a reservoir 1 is used to collect rainwater 2;

the rainwater is transported via pipes 3 to a water cleaning plant 4 for removal of contamination;

more pipes 3 distribute the clean water from the water cleaning plant 4 to water storage towers 5 and to homes 6, businesses 7 and public facilities 8, such as schools and hospitals;

waste water is then transported in waste water pipes and sewers 9 to a waste water treatment plant 10;

after having been treated, the water is released into the environment and eventually falls as rain 2 to renter the water cycle elsewhere.

Located on the network are a series of hydrants 11, which serve three main purposes namely;

1 Network maintenance and pressure testing.

2 Temporary or public service water supplies.

3 For use in fire fighting.

The incorrect use of hydrants can lead to contamination of the drinking water supply, which has serious public health consequences.

Water is classified as being potable after having been purified at a water treatment facility. Potable (or "category 1") water however, can easily be contaminated by dangerous "category 5" water which contains high levels of contaminants. The five water classifications are briefly as follows:

Category 1 – Wholesome water, which is suitable for domestic or food production purposes

Category 2 – Water, which could be classed as fluid category 1 except it has undergone a change in taste, odour, appearance or temperature. These changes in water quality are aesthetic changes only and the water is considered to present no human health hazard.

Category 3 - Fluids in this category represent a slight health hazard and are not suitable for drinking or other domestic purposes.

Category 4 - Fluids in this category represent a significant health hazard and are not suitable for drinking or other domestic purposes i.e. may contain carcinogenic substances that may cause cancer.

Category 5 - Fluid in this category represent a serious health hazard and is the most polluting category listed contains pathogenic organisms.

A mains water supply can only withstand being contaminated by a small amount of "category 2" water before it is considered risky to drink.

The main cause of mains water contamination is the illegal use of small bore standpipes which are attached to the hydrants 11 by the general public (mainly builders or road contractors). Such illegal use may inadvertently cause a "balanced pressure situation", which is explained below. Additionally, a balanced pressure situation may also be caused whilst performing routine network maintenance such as for example "pressure testing" and "'washing out or flushing". An example of balanced pressure contamination is shown in Figure 5, in which a pressure gauge 44 has been fitted.

(Water can be drawn at any hydrant by screwing a standpipe to the outlet and opening the stop valve. Water pressure tests can be carried out at any hydrant 11 by screwing a pressure gauge to the water outlet and opening the stop valve; flushing out of stagnant water, is usually carried out at hydrants 11 located at the end of a branch 12, sometimes referred to as "wash-outs" 11a).

Hydrants *should* always be "flushed" by opening the valve and allowing water to wash away for a few seconds, before attaching fittings to the outlet pipe. However, due to the public's lack of knowledge, time pressures and the prospect of getting soaked, they do not carry out this routine.

A schematic representation of a hydrant is shown in Figure 2 of the accompanying drawings in which a hydrant 20 is shown comprising a valve chamber 22 in communication with the water main 24. A valve 26 is normally fitted between the valve chamber and the main 24 to selectively prevent or allow water to flow to an outlet pipe 28. The water from the outlet pipe can then be used via standard fittings and or pipe work for the purposes outlined above. The hydrant is usually located below floor level in a ground hole 30 and is protected by an inspection cover 32. The inspection cover 32 can be lifted using a tool inserted in one or more "key holes" 34.

Figures 3, 4 and 5 of the drawings aim to illustrate how the water main can become contaminated via hydrants.

When it rains, the ground hole 30 in which the hydrant 20 is located often fills with water from the roads and surrounding area 38, which may contain dirt, excrement and rubbish 42. Furthermore, used syringes 43 are often found in the water outlet pipe 28 of the hydrant because publicly-minded drug users tend to drop their used needles down the "key-hole" 34 provided in the inspection cover 32, rather than discarding them where they may be found, i.e. on the pavement.

In Figure 3, a capping 40 has been correctly fitted to the outlet pipe 28 of the hydrant 20 thereby preventing the contaminated water 38 and debris 42 from entering the valve chamber 22. (Modem cappings are purely dust caps and are a loose push fit i.e. they are not watertight and are easily dislodged).

Figure 4 on the other hand shows a hydrant 20 where the capping 40 has not been fitted or has become dislodged and in which the valve chamber 22 and outlet pipe 28 are filled with contaminated water 38 and debris 42.

The mechanism by which a contamination enters the drinking water supply is illustrated schematically in Figure 5 of the drawings wherein the mains water 36 is being pressure tested using a gauge 44 fitted to the outlet pipe 28 of the hydrant 20. Because the water cannot flow out through the outlet pipe 28, the water pressures in the mains pipe 24 and valve chamber 22 equalise when the valve 26 is opened, which allows the contaminated water 38 that has accumulated in the outlet pipe 28 to "drop" into the water main 24 thereby compromising the safety of the drinking water supply 36.

Thus, a solution to the hydrant contamination problem may be to ensure that cappings 40 are fitted to all hydrant outlet pipes 28, however, the cap is not usually fitted after each use of the hydrant for reasons known to those skilled in the art. Furthermore, there is a commonly held belief that if a capping were to be re-fitted after each use, it may become a dangerous projectile should a valve failure occur.

In the UK, an obstacle to developing cappings for hydrants is British Standard BS 750, which relates to the flow characteristics of the outlet pipe 28. In short, it is not possible to fit any device that will obstruct the passage of water from the hydrant. (Similar and or equivalent standards apply for other countries).

In practice, standards such as BS 750 relate to the dimensions of a manifold component fitted to the outlet pipe, which enables standardised fittings to attached to the hydrant. Normally, the manifold is affixed to the outlet pipe via a bolted flange arrangement and is designed to taper internally from the diameter of the outlet pipe to the diameter of the standardised fittings. (In the UK, these diameters are typically ~3 ½ inches and 2 ¼ inches respectively).

It is an object of the present invention to provide a sealing means to reduce the likelihood of mains water contamination via hydrants, without restricting the flow characteristics of the hydrant and whilst minimizing the possibility of the sealing means becoming a dangerous projectile in the event of hydrant valve failure.

Accordingly, the present invention provides a sealing means for a hydrant having an outlet pipe comprising; a cap disposed at least partially within the outlet pipe for sealing the outlet pipe; and means biasing the cap to a sealing position.

The shape and dimensions of the cap are designed such that it locates within the outlet pipe of the hydrant and such that it seals the outlet pipe.

Formations may be provided on the exterior surface of the cap to improve the sealing arrangement. Suitable formations may be one or more ribs or grooves that are deformable when the cap is inserted in the pipe to form an improved seal. Preferably, the cap is manufactured of a resiliently deformable plastics or elastomeric material.

Alternatively, the cap may be manufactured of a metal or ceramic material and be provided with one or more deformable parts such as, but not limited to o-rings, for sealing the cap within the outlet pipe.

Where the cap is manufactured of a plastics or elastomeric material, it is preferably fabricated by an injection moulding process.

Although it is a preferred feature of the cap that it be completely watertight, a small amount of leakage is permissible.

A preferred embodiment of the invention is a tube having an integrally formed top with one or more ribs on the exterior face of the tubular part that engage in a substantially watertight manner with the outlet pipe of a hydrant.

Additionally or alternatively, the top of the cap may be provided with an aperture therein. Where provided, the aperture is preferably circular for reasons that will become apparent later.

Where an aperture is present in the top of the cap, a plug is also provided in order to seal the outlet pipe of the hydrant and is preferably of the same general cross-section as the aperture. Preferably also, the plug is tapered such that pressure applied to the outside of the plug causes it to engage intimately with the aperture of the cap. Tapering may also be used to make the plug self-centring within the aperture. Preferred plug forms are therefore at least partly conical or hemispherical.

The plug is preferably manufactured of a plastics or elastomeric material and may be injection moulded or machined to shape.

The means for biasing cap to a sealing position may be a retainer. The retainer may be used to hold the cap, and where provided, the plug *in-situ* within the outlet pipe of the hydrant. The retainer is preferably of the form comprising an elongate body having at one end anchoring means for engaging within the outlet pipe and at the other end, formations that engage with the cap or plug of the sealing means.

The cross-sectional area of the retainer is preferably as small as possible so as to minimise interference of the water flow when the hydrant is in use. Accordingly, the body of the retainer is preferably manufactured from a wire, cord or slender rod.

The biasing means is capable of providing a force that encourages the cap to a sealing position and where provided, the plug to engage with the aperture of the cap. To this end, the retainer may be manufactured of a resiliently deformable material, or may comprise a sprung component. Suitable resiliently deformable materials include amongst others, elastomeric polymers and metals, for example, spring steel. Where the retainer comprises a spring component, the spring may be a coil spring.

A yet further preferable feature of the resiliently deformable retainer is that when the cap is removed, it is able to retract within the outlet pipe to such an extent that; it lies at a position where the cross-sectional area of the pipe minus the cross-sectional area of the retainer is greater than the cross sectional area of the outlet pipe at its narrowest point. Thus, the disturbance in the flow characteristics of the water as a result of the retainer being present is

preferably of less significance than the effects caused by already present restrictions in the outlet pipe.

Located at a first end of the retainer is preferably an anchor means for securing the end of the retainer internally within the outlet pipe of the hydrant. In a preferred embodiment of the invention, the anchor means is a bar that passes through an eye, loop or other suitable fitting at the end of the retainer and that locates in one or more formations of the outlet pipe. Formations of the outlet pipe in which the bar may locate include, without being limited to; the taper of the pipe; the interface where a permanent fitting joins the outlet pipe; and drilled or machined features inside the hydrant or associated parts thereof. Additionally or alternatively, the outlet pipe, or a manifold attached thereto may be drilled to accept ends of the bar.

Located at the second end of the retainer is a fastener for securing the retainer to the cap or plug where provided. In a most preferred embodiment of the invention, the fastener takes the form of a boss and is drilled to accept a split-pin. Accordingly, the cap or plug may have an aperture or other suitable formation therein to receive a boss and split-pin arrangement. Additionally or alternatively, the fastener may be a hook that engages with an eye located on the underside of the cap or plug.

A preferred embodiment of the invention shall now be described, by way of example only, with reference to the accompanying drawings in which;

Figure 1 shows a schematic representation of a water network;

Figure 2 is a sectional representation of a hydrant;

Figure 3 shows a capped hydrant in a filled ground hole;

Figure 4 shows an uncapped hydrant in a filled ground hole;

Figure 5 shows a water main being pressure tested through a hydrant;

Figure 6 shows an exploded view of the various components of a preferred embodiment of the invention;

Figure 7 shows a cross-section through the invention when correctly assembled;

Figure 8 shows a cross-section through the invention with the plug lifted as would happen in the event of a hydrant valve failure; and

Figures 9 and 9a show an alternative embodiment of the invention where cap is not apertured and the plug is redundant.

Referring now to Figure 6, a hydrant manifold 50 is shown comprising a body portion 52 and a flange 54, which is used for bolting the manifold 50 to a hydrant 20. The cap 56 of the invention comprises a tubular part 58 with an integral top 60. The tubular part 58 has integrally formed ribs 62 for sealing against the inside surface 65 of the manifold body 52. The top 60 of the cap 56 has a circular aperture 64 formed therein.

The plug 70 comprises a generally conical part 72 and has an integrally formed lip 74. There is also present, an aperture 76 that passes all the way through the plug 70.

The retainer 80 comprises a wire body 82 and has a ferrule 84 at its upper end. The ferrule 84 may be swaged to the body 82 of the retainer 80 as shown in Figure 6 or it may be connected via a loop 81 as illustrated in

Figures 7 and 8. The diameter of the ferrule 84 is designed to be an interference fit with the aperture 76 of the plug 70. The ferrule 84 has a hole 85 drilled in it to accept a split pin 86. The length of the ferrule from its lower face 83 to the aperture 85 is slightly longer than the height of the plug 70 for reasons that shall become apparent later.

There is a bar 88 with an aperture 90 therein through which, the body 82 of the retainer 80 passes. The bar 88 is designed to be clamped between the flange 54 of the manifold 50 and a corresponding flange of the hydrant 20. (A seal - not shown - is usually fitted between the respective flanges).

At the lower end of the body 82 of the retainer 80 is a further ferrule 92. Between the lower ferrule 92 and the bar 88, is a coil spring 94, through which the body 82 of the retainer 80 passes.

Turning now to Figure 7 of the drawings, where the invention has been installed on a hydrant 20:

The bar 88 is clamped by the flange 54 of the manifold 50 which has been sealed by the cap 60. Furthermore, the aperture 64 of the cap 60 has been sealed using the tapered plug 70. The plug 70 is pulled tightly into the aperture 64 of the cap 60 to form a seal by the tension provided by the spring 94 acting on the lower ferrule 92 and the anchor bar 88. The upper ferule 84 of the retainer 80 has been secured to the plug 70 using a split pin 86 through the aperture 85. The plug 70 is protected from the sharp edges of the split pin 86 by the optional washer 93.

Figure 8 shows the plug 70 raising and allowing water to flow through aperture 64 in the event of a valve 26 failure, by virtue of the spring 94 deforming. If the valve 26 failure is catastrophic, the cap 60 is free to disengage from the manifold, but cannot become a projectile by virtue of the retainer 80. Moreover the automatic plug-lifting feature of the invention allows network maintenance procedures, such as washing-out and pressure testing, to be carried out without removing the invention and risking ingress of contaminated water and or debris.

Finally, Figure 9 shows an alternative embodiment of the invention in which the cap 96 is not apertured and the plug is redundant. A loop 81 provided in the upper end of the retainer 80 is connected to a hook feature 97 formed in the underside of the cap 96. The cap 96 is fitted by pulling on the retainer 80, hooking the loop 81 over the hook 97 and allowing the cap 96 to spring back and engage internally with the hydrant outlet pipe 50. Figure 9a is equivalent to Figure 8 for this alternative embodiment of the invention where the cap 96 is allowed to come away from the rim of the outlet pipe 50 by virtue of the extendable nature of the retainer 80.

CLAIMS:

1. A sealing means for a hydrant having an outlet pipe comprising a cap disposed at least partially within the outlet pipe for sealing the outlet pipe and means for biasing the cap to a sealing position.
2. A sealing means for a hydrant as claimed in claim 1, wherein resiliently deformable formations are provided on the exterior surface of the cap.
3. A sealing means for a hydrant as claimed in claim 1, wherein the resiliently deformable formations are ribs or grooves.
4. A sealing means for a hydrant as claimed in claim 1, 2 or 3, wherein the cap is manufactured of a resiliently deformable material.
5. A sealing means for a hydrant as claimed in claim 4, wherein the resiliently deformable material is a plastics or elastomeric material.
6. A sealing means for a hydrant as claimed in claim 5, wherein the cap is fabricated by an injection moulding process.
7. A sealing means for a hydrant as claimed in claim 1, wherein the cap is manufactured of a metal or ceramic material and is provided with one or more O-rings for sealing the cap within the outlet pipe.
8. A sealing means for a hydrant as claimed in any of claims 1 to 7, wherein the cap is in the form of a tube having an integrally formed top with one or more ribs on the exterior face of the tubular part that

engage in a substantially watertight manner with the outlet pipe of a hydrant.

9. A sealing means for a hydrant as claimed in any of claims 1 to 8, wherein the top of the cap has an aperture therein.

10. A sealing means for a hydrant as claimed in claim 9, wherein the aperture is circular.

11. A sealing means for a hydrant as claimed in claim 8 or claim 9, further comprising a plug locatable at least partially within the aperture.

12. A sealing means for a hydrant as claimed in claim 11, wherein the plug is tapered.

13. A sealing means for a hydrant as claimed in claim 11 or claim 12, wherein the plug is manufactured of a plastics or elastomeric material.

14. A sealing means for a hydrant as claimed in claim 13, wherein the plug is manufactured via an injection moulding process.

15. A sealing means for a hydrant as claimed in any of claims 1 to 14, wherein the means for biasing the cap to a sealing position is a retainer comprising an elongate body having at one end anchoring means for engaging within the outlet pipe and at the other end, formations that engage with the cap or plug of the sealing means.

16. A sealing means for a hydrant as claimed in claim 15, wherein the retainer is adapted to retain the cap at least partially within the outlet pipe of the hydrant.

17. A sealing means for a hydrant as claimed in claim 15 or claim 16, wherein the retainer is adapted to hold the plug at least partially within the aperture of the cap.

18. A sealing means for a hydrant as claimed in any of claims 19, 20 or 21, wherein the body of the retainer is manufactured from a wire, cord or slender rod.

19. A sealing means for a hydrant as claimed in any of claims 1 to 22, wherein the means for biasing the cap to a sealing position is arranged to provide a force that encourages the cap to a sealing position.

20. A sealing means for a hydrant as claimed in any of claims 11 to 20, wherein the means for biasing the cap to a sealing position is arranged to provide a force that encourages the plug to engage with the aperture of the cap.

21. A sealing means for a hydrant as claimed in any of claims 15 to 20, wherein the retainer is at least partially manufactured of a resiliently deformable material.

22. A sealing means for a hydrant as claimed in claim 21, wherein the resiliently deformable material is an elastomeric polymer.

23. A sealing means for a hydrant as claimed in claim 21, wherein the resiliently deformable material is spring steel.

24. A sealing means for a hydrant as claimed in any of claims 14 to 20, wherein the retainer comprises a spring component.

25. A sealing means for a hydrant as claimed in claim 24, wherein the spring component is a coil spring.

26. A sealing means for a hydrant as claimed in any of claims 21 to 25, wherein the retainer is adapted to retract within the outlet pipe to such an extent that it lies at a position where the cross-sectional area of the pipe minus the cross-sectional area of the retainer is greater than the cross sectional area of the outlet pipe at its narrowest point when the cap is removed.

27. A sealing means for a hydrant as claimed in any of claims 15 to 26, wherein the first end of the retainer comprises an anchor means for securing the end of the retainer internally within the outlet pipe of the hydrant.

28. A sealing means for a hydrant as claimed in claim 27, wherein the anchor means is a bar that passes through an eye, loop or other suitable fitting at the end of the retainer and that engages with one or more formations of the outlet pipe of the hydrant.

29. A sealing means for a hydrant as claimed in claim 28, wherein the anchor means is adapted to engage with a taper of the outlet pipe.

30. A sealing means for a hydrant as claimed in claim 28 or claim 29, wherein the anchor means is adapted to engage with an interface between parts of the outlet pipe.

31. A sealing means for a hydrant as claimed in any of claims 28, 29 or 30, wherein the anchor means is adapted to engage with drilled or machined features inside the hydrant or associated parts thereof.

32. A sealing means for a hydrant as claimed in any of claims 15 to 31, wherein a fastener is located at the second end of the retainer for securing the retainer to the cap or plug.

33. A sealing means for a hydrant as claimed in claim 32, wherein the fastener takes the form of a boss that is drilled to accept a split-pin and the cap or plug has an aperture therein to receive the boss, whereby the cap or plug is retained using a split pin located through the aperture of the boss.

34. A sealing means for a hydrant as claimed in claim 32, wherein the fastener is a hook that engages with an eye located on the underside of the cap or plug.

35. A sealing means for a hydrant substantially as hereinbefore described, with reference to and as illustrated in Figures 6, 7, 8, 9 and 9a of the accompanying drawings.

INVESTOR IN PEOPLE

Application No:	GB 0314287.4	18	**Examiner:**	Kevin Hewitt
Claims searched:	1 to 35		**Date of search:**	14 November 2003

Patents Act 1977 : Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance	
A	-	US 4221233 A	(BOTNICK) See especially Fig.9
A	-	FR 2742206 A	(BAYARD) See abstract and Figs.
A	-	AU 751891	(TYCO WATER) See all Figs.

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC[V]:

F2B

Worldwide search of patent documents classified in the following areas of the IPC[7]:

E03B; F16J; F16K

The following online and other databases have been used in the preparation of this search report:

WPI; EPODOC; JAPIO