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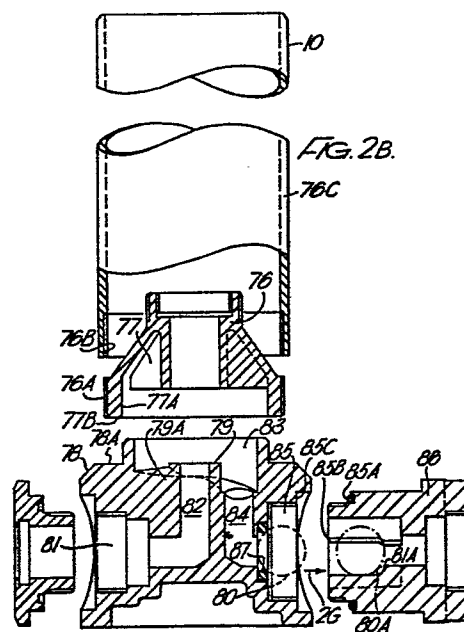
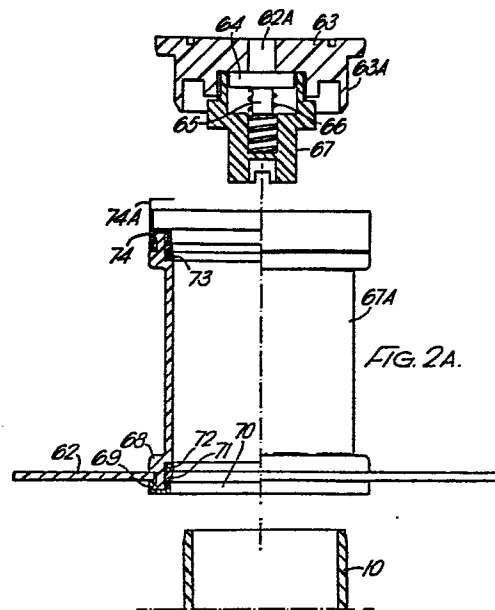
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54 Combined stop-cock chamber and surface box.

57 A combined stop-cock chamber and surface box comprises a plastic tube in two parts 10,11. The upper part 11 forms a surface box and is telescopically attached to the lower part 10 which houses the stop-cock. The two parts can be resiliently supported on a plastic plate to allow the surface box to be depressed resiliently by a load such as a vehicle wheel.

A ball valve housing 20 is moulded in the lower part 10 to prevent back siphonage.



Combined Stop-Cock Chamber and Surface Box

This invention relates to a combined stop-cock chamber and surface box. An object of the invention is to provide a stop-cock chamber which is clean and dry and will remain so in normal conditions in combination with a surface box.

A further object of the invention is to provide a surface box which will withstand fairly heavy loading such as a lorry passing over the surface box.

Yet another object of the invention is to provide a combined surface box and stop-cock chamber in which there is provision for preventing back flow when mains pressure drops or fails.

Stop-cocks are normally under the control of the water authority or water company and are usually to be found in the pavement or road outside the consumers premises. The present stop valve installations have many faults apart from the poor design of the valve itself, which has been recognised by the water industry in their latest documents and the British Standards Institute. Conventional valves, due to their design, leak via the gland at the top of the spindle and get stiff due to build up of matter on the thread section of the valve being in the water at all times. When used in conjunction with polythene or flexible plastic pipe they have a tendency to turn on their side rendering them inoperable.

The chambers in which these conventional stop valves are situated are normally manufactured as concrete sections and assembled on site and a metal surface box is placed on top. When installed the only part that is visible is the top of the metal surface box which has a loose lid to enable the authorities to get at the valve to operate it. The chambers can also be made of earthenware pipe with a metal box on top. These chambers

leak during wet weather and tend to fill up with silt and water during this time as water pours in via the lid of the metal box cover and at the point where the service pipe of the valve goes out through the chamber.

- 5 Vermin and insects build their nests in them and they prove very difficult to remove from the chamber. The total assembly can weigh anything up to 1½cwt and are cumbersome to install.

It is impossible to carry out any maintenance on
10 the valves without having to turn off the mains supply and excavate the roads or pavements. Ideally it would be preferable if the installation could be lightweight, with a valve that was virtually indestructable, which could take the weight of lorries running over it, at
15 the same time the chamber being sealed to keep it clean with the valve always central to the chamber in the upright position at the same time having the facility to be maintained under pressure without excavation in a matter of minutes. This would save the water companies
20 and water authorities a considerable amount of cost.

In accordance with the first aspect of the invention there is a combined stop-cock chamber and surface box installation comprising a tube made of plastics material and adapted at its lower end to house a stop-tap or
25 cock and at its upper end to form a surface box.

Preferably the whole assembly is made of plastic material and the tube is of such a length as to enable the stop-cock to be housed at a reasonable distance below the surface usually anything from half a metre to two
30 metres.

From another aspect the invention comprises a combined stop-cock chamber and surface box installation comprising a plastic tube which at its lower end houses a stop-cock and at its upper end forms a surface box,
35 the tube being split into two telescoping parts.

Preferably the upper telescopic part is attached to a resilient flat plate, so that a load imparted to the upper face of the surface box will be accommodated by the flat plate flexing and the two parts of the two
5 tube telescoping to a limited degree to accommodate the loading.

The flat plate would normally be buried in the ground and will be kept in place by the earth below the plate and the back fill above it.

10 Preferably the surface box has a plastic lid which is a sealed fit in the top of the box and is removable by a key insertable through a hole in the lid. Preferably below said hole is a spring-pressed disk or plate which serves to prevent entry of dirt etc. into
15 the surface box via the key hole. When a key is inserted the disk or plate moves resiliently to allow the key to enter.

From another aspect the invention comprises a combined surface box and stop-cock chamber, the whole
20 being made of plastic material and there being means incorporated in the plastic chamber at the lower end to prevent back flow of water or other liquid into the supply in the event that the supply pressure should fail or be reduced. The means preferably comprises a spring
25 pressed ball which is incorporated into a channel in the lower portion of the plastic housing of the stop-cock, the ball acting in such a way that it will be opened by mains pressure to allow flow through the stop-cock but will be closed by the spring so as to close off the
30 entry to the mains pipe if the mains pressure fails or is reduced.

The stop-cock or valve housed within the chamber is preferably adapted to be serviced whilst under pressure.

35 This may be effected in many ways but would normally

involve providing a thread around the cock or tap to which a chamber containing a sliding valve may be attached so that the valve may be withdrawn into the chamber while under pressure, the sliding valve closed
5 to prevent flow from the mains and the valve removed for repair or replacement.

For example, the combined surface box and stop-cock chamber may be used with a set of tools as described in our copending Patent Application 8303761 to enable the
10 stop valve to be serviced under pressure.

The stop-cock or valve is preferably of the crutch handle type rather than the lockshield or plug cock type.

In the drawings:

Figures 1A and 1B together represent one embodiment
15 of the present invention as applied to a combined stop-cock, chamber and surface box, the parts being shown in exploded form and in section;

Figures 2A and 2B together represent a second embodiment of the invention again in exploded form
20 with parts in section;

Figure 2E is a plan view of valve headworks shown in Figure 2B;

Figure 2C shows a modified form of the crutch handle, dust cap and headworks of the embodiment shown in Figures
25 1A and 1B;

Figures 2D and 2F are respectively a side elevation and a plan view of the base section shown in Figure 2B;

Figure 2G is an end view in the direction of arrow
30 2G shown in Figure 2B; and

Figure 3 shows a combination of a combined stop-cock chamber and surface box embodying the invention with a meter.

The combined stop-cock chamber and surface box
35 shown in Figures 1A and 1B consist of two main plastic

mouldings. The lower moulding is an extruded plastics tube (e.g. P.V.C.) 10 forming the main part of a stop-cock, or stop-valve, chamber. Above this is a plastic moulding in the form of a surface box 11 which acts as a

5 telescopic collar. The lower end of the surface box 11 has an extension 12 with an internal diameter 13 matched to slide over the upper end 14 of the chamber 10. The top end of the chamber 10 is chamfered to allow the chamber to slide into the telescopic surface box past the seal 15 when being

10 assembled. A seal 15 is provided and the fit is such as to form a good seal but to allow telescopic movement between the surface box 11 and the stop-cock chamber 10.

The surface box has a cover 16, also moulded from material which has a thread 17 engageable in a corresponding thread 18 at the top end of the surface box 11.

15 There is a seal 19 to provide for sealing between the surface box cover and the internal surface of the surface box wall 19A.

At the bottom end of the stop-cock chamber 10 is a

20 combined stop-cock valve base section and housing for a non-return ball valve or check valve to prevent back siphonage. This base section 20 is preferably a moulded plastics housing and has a stop-cock valve seat 21 which may be flat as shown or may be raised and/or

25 shaped to produce swirl. In this particular embodiment the mains water supply is assumed to be coming from the right of the drawing and the mains water pipe 9 is fed into an adaptor 22 preferably made of plastics and also acting as part of the ball valve housing. The ball

30 valve is trapped in a passage which provides limited movement between an O ring 23 at one end of the passage and a shoulder 24 at the other end of the passage. The shoulder 24 has a number of apertures in it for flow of water past the ball valve when the ball valve seats against the

35 flange 24A on the shoulder.

If the mains supply fails or is reduced in pressure and there is a tendency for back flow or back siphonage of water from within the domestic water supply, the ball valve 25 will close on the seal 23 and prevent this back siphonage. In the drawing, the ball valve in its normal flow position is shown in dotted lines on the left and in its back siphonage prevention position it is shown in dotted lines against the seal 23 on the right. The incoming mains water flows through this ball valve assembly into a vertical passage 26 leading into a chamber 27. From the chamber 27, if the stop-cock is opened, the water flows through another vertical passage 28 and out of an aperture 29. The aperture 29 is adapted to receive an appropriate screwed in gland nut with a seal by which the outlet pipe going away to the services in the house may be attached to the housing.

The base section 20 has, around the chamber 27, a threaded flange 30 adapted to screw onto a corresponding threaded extension 31 on the chamber 10.

Attached to the base section 20 is a headworks section 32 preferably moulded in plastic. This headworks section has at its lower end a flange 33 surrounding a space 34 which, when the headworks section is in place, forms part of chamber 27. The drawing Figure 1B illustrates one of the many methods of keeping the base section 20 and the headworks section 32 together using bolts 35 extending through holes 36 in the flange 33 and there is a headworks gasket 37 between the flange 33 and the stop-cock valve base seating 21.

The two part spindle assembly 38 lies within a bore 39 in the headworks section 32 and is retained there by a collar 40 which has an external thread so as to be threaded into the flange 41 at the top of the headworks section, being sealed by a fibre seal 42. The collar 40 has an internal thread 43 which engages an external

thread 44 on the upper part of the spindle assembly 38. The upper part of the spindle assembly 38 has an internal hexagon slot 45 adapted to receive a corresponding hexagonal spanner 46 at the lower end of a crutch spindle 47. The crutch has a handle 48 and a flange 49 adjacent its lower end. The flange 49 and the handle 48 between them trap the crutch in a combined, dust cap, locking ring and thread protector 50. This thread protector 50 has a flange 51 internally threaded at 52 to engage an external thread 53 on the flange 41 of the headworks section 32. The thread protector 50 also has an annular internal projection 54 which will bear against the collar 40 and act as a locking ring to hold the collar in place.

15 The thread protector has external splines 55 engageable by an appropriate tool so that it can be removed by unscrewing it thus bringing out the crutch handle and thread protector as a unit.

20 At the upper end the thread protector has a bore 56 which acts as a guide for the crutch handle spindle and keeps it upright when it is being used to turn the upper section of the spindle 38.

25 The two part spindle which is joined in the middle by a spigot and recess has preferably a single O ring 57 on the upper spindle 44A and two on the washer plate section 58B at point shown as 58 and 58A. On the bottom of the washer plate is a rubber washer 59 which is placed over a spigot 60 and held in position by a nut 61. By using the O rings in this manner, it ensures 30 that the water pressure in the service pipe never gets past the bottom O ring 58A, when the valve is under the full water pressure. The principle of an O ring is that the greater the pressure applied, the better the seal. Therefore, the valve should never leak via the headworks. 35 The rubber washer 59 seats on the stop-cock valve seat

21 over the vertical passage 26 to cut off the flow of water from the mains supply when required.

The combination of the surface box with its telescopic fitting on the stop-cock chamber ensures that
5 if a vehicle should go over the surface box cover 16 and depress it the telescopic collar will slide downwardly on the chamber and thus avoid any fracture of the service pipe or any disruption of the device as a whole.

The surface box may be supported by means of a plate
10 as shown in Figure 2A. This plate 62 is made preferably of plastics material and is relatively thin. It will be supported below ground level in the earth with backfill above it and will provide resilience so that the telescopic collar of the surface box is resiliently
15 supported in the earth and will allow the collar to move up and down to a limited degree. When a heavy load passes over the surface box cover the telescopic collar will move downwardly a small amount (a few millimetres) and the plastic plate 62 will flex and then will tend to
20 return the telescopic collar to its original position.

The arrangement shown in Figure 2A differs in some details from that shown in Figure 1A.

Firstly the surface box cover 63 is modified. It is no longer screwed into the upper end of the telescopic
25 collar but is a push-fit into the upper end. It is removed by inserting an appropriate key through an aperture 62A in the top of the surface box cover. This aperture is normally closed at its lower end so as to protect against ingress of dirt, etc., by a plate 64
30 which has a spigot 65 and is resiliently held in place by a spring 66. Spring 66 is housed in a housing 67 which may be screwed, welded or stuck into the underside of the surface box cover 63. The telescopic collar 67A is also modified as shown in the drawing in that at one
35 end it is adapted to receive the plate 62. At the one

end is a flange 68 and the plate 62 has a hole in it which is a push or spring fit over a smaller flange 69 on the end of the collar and the plate is then held in place by a ring moulding 70 which is welded, stuck or just a
5 push fit onto the end of the telescopic collar. The ring 70 also holds sealing ring 71 and a resilient seal 72 in place so that when the chamber 10 is pushed into the bottom of the telescopic collar, it effects a good water-tight seal.

10 Similarly at the top end of the telescopic collar it has a seal ring 73 held in place by a ring moulding 74 which may be welded or stuck or just a push fit onto the top end of the collar. The surface box lid 63 is then pushed into the top of the telescopic collar making
15 an effective seal between the resilient seal 73 and the lower perimeter face of the surface box cover 63A. There is a rim 74A which acts as a guide for the level of tarmac or surface level and prevents the lid 63 being stuck to the tarmac.

20 A modified form of dust cap 75 and locking ring and thread protector 75A are shown in side elevation in Figure 2C and in plan view in 2E illustrating the dogs or splines into which the key used to remove the cap fits. The headworks section 76 in Figure 2B of the
25 valve is modified by the introduction of braces or vanes 77 and 77B as shown in Figures 2B and 2E. These vanes give greater mechanical strength and allow much greater volume of water to enter the chamber 83 and reduces the possibility of head loss across the valve. The flange
30 77A (Fig. 2C) on the bottom of the headworks is not necessarily threaded and depending on the material used, can be welded, glued or bolted to the base 78 as an alternative. This method of fixing the headworks 76 to the base section 78 may eliminate the necessity to use a gasket as a seal between the two. If welded, the face

of the headworks at 77B is preferably butted to 78A on the base section.

5 The chamber 76C has been slightly modified by putting the thread 76B on the inside instead of the outside as in the earlier model. In this version it is shown to fit directly onto thread 76A on the headworks section by means of a matching thread. However, a suitable thread can be placed on any part of the body or even an adaptor used to make sure suitable pipe
10 could be made to fit.

The stop-cock valve seat 79 and the surrounding base of the chamber 79A have been modified, and illustration is shown of this in detail in Figures 2D and 2F. Water from the mains now flows from left to
15 right, the mains supply entering the base section of the valve 78 via part 81 and a vertical passage 82. If the stop-cock valve is open the flow continues through the chamber 83 and down the passage 84 to the ball valve housing 85 in the base of the valve, forcing the
20 ball 80 to open to position 80A and allowing flow through the other section of the ball valve housing 86. If the mains pressure is reduced, the back flow from the service pipe will be stopped by the ball valve 80 moving against O ring seat 87 in the base of the valve
25 body and making an effective seal.

There has been a modification in the position of the anti-back siphonage device which is in essence a check or non-return valve. In the previous design it was on the water mains side; it is now on the consumers
30 side of the base section 78. There are two views of the non-return valve 86, one illustrates how the non-return valve 86 fits into the base section of the stop-cock valve and the position the ball takes during certain functions. There is an end view above the side
35 elevation that illustrates what shape the housing is

inside looking from the direction of 85B. In the side elevation the ball is shown as 80A and demonstrates the position the ball would take in normal flow conditions with the ball resting on the shoulder of the runner 81A. The O ring seal 85A forms a seal between the ball valve housing 86 and the base of the valve when it is screwed or fitted by other means into the base of the stop-cock valve body 78. The face of the O ring seal 85A fits against the face 85C as they are screwed together and form a seal.

The stop-cock valve seat 79 is surrounded by a curved surface 79A around it to create a swirl in the water flow which will keep this chamber clean.

The other parts including the two parts spindle itself may be the same as in Figures 1A and 1B.

Figure 3 shows a combined meter box and stop valve arrangement. The stop-cock housing 89 has a surface box 90 similar to Figures 1A and 1B or 2A and 2B but shown diagrammatically. The surface box 90 is supported on a plate 91, as before, but the plate 91 also supports a surface box of a meter box 92 which may also be telescopically arranged. Flow from stop-cock may pass through pipe 95, meter 96 and service pipe 97 in conventional manner. The meter box 92 can be supported from the stop-cock housing 89 by a bracket 98, all parts preferably being made of plastic material.

The stop-cock valve itself may be of the type shown or it may have more or less O ring seals. One or more of the O ring seals may be adjustable as described in my earlier patent application. The body of the valve may be of the conventional type shown.

It would be appreciated that the parts for this assembly, with the exception of the two part spindle, crutch handle and crutch spindle itself, are all capable of being injection moulded from plastics. The whole

- 12 -

assembly is designed in effect as a shock absorber to prevent damage to the service pipes should a lorry run over it.

5 The headworks thread protector can be removed to allow attachments to be fitted so that it can be repaired without cutting off the water or fluid supply in the service or mains.

The valve as a whole is self-cleaning due to the base of the valve chamber and the seating of the valve being shaped to encourage the water to flow towards
10 the outlet. The vanes described above assist in this. Due to the very large chamber and the full bore through the valve the pressure loss across the valve is reduced to a minimum.

The valve can be serviced by one man. at pavement
15 or road level without excavation in a matter of minutes and no interference is necessary with any of the services. This is very important as the valve is specifically designed to be buried to a depth of 2ft 6ins (76cm) and no excavation is required. Conventional stop
20 valves at present on the market cannot be maintained under pressure. Because the chamber is clean at all times repairs can easily be carried out as well as eliminating the great expense of cleaning them. As the threaded part of the upper spindle is never in water and
25 therefore never becoming corroded.

It is generally recognised now that the anti-back siphonage device should be immediately downstream of the stop valve. In the arrangement described above this anti-back siphonage device i.e. the ball valve is
30 within about 1.2 cm ($\frac{1}{2}$ inch) of the stop valve and it forms an integral part of the valve and reduces costs in production.

The plastic valve chamber is very important because it keeps the top of the valve clean to enable
35 various apparatus to be connected to the head of the

valve for sampling and other operations. Also the spring loaded plate below the surface box cover prevents ingress of dirt water etc. and assists in keeping the whole assembly clean. The spring loaded device is a
5 straight forward simple device and can be removed and cleaned out should it be necessary. The chamber with the telescopic collar can be used for many other things such as meter boxes, sluice valve, drains etc. The chamber ensures that the valve is kept in an upright
10 position. Many conventional stop valves in conventional pits turn on their sides when using flexible plastic pipe.

The triple O ring seal on the spindle of the valve which is shown and described above ensures that the
15 valve never leaks through the headworks section, the seals being strategically placed to ensure this. Whereas the thread of a conventional valve is constantly in the water, the thread of this valve is never in the water and can be kept lubricated at all times.

20 The whole assembly is particularly adapted for use with polythene pipes, it is lightweight and vandal resistant, it is sealed against the ingress of water and is vermin proof.

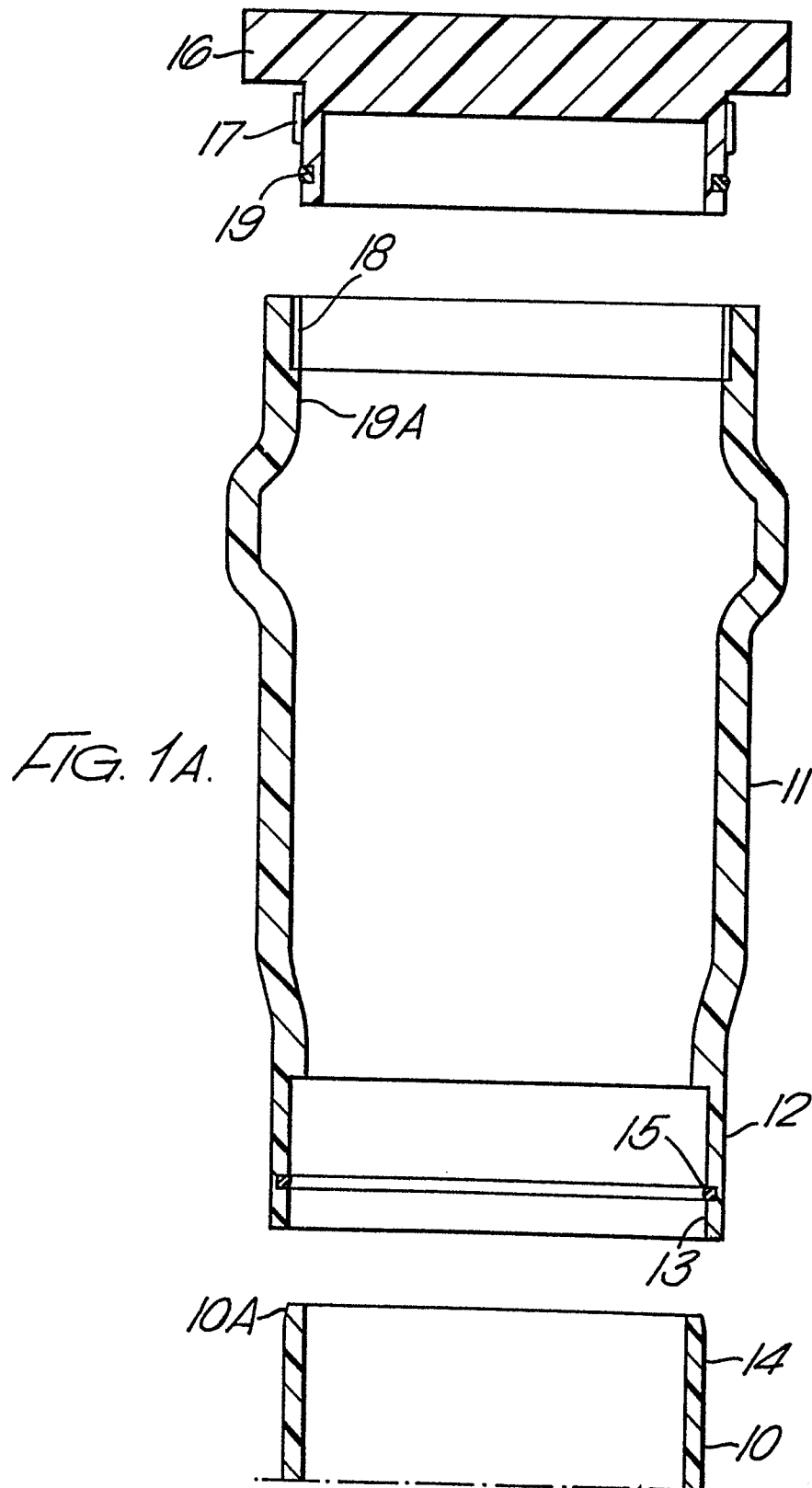
Claims:

1. A combined stop-cock chamber and surface box installation comprising a tube made of plastics material and adapted at its lower end to house a stop-tap or cock and at its upper end to form a surface box.
- 5 2. A combined stop-cock chamber and surface box installation according to claim 1 in which the whole assembly is made of plastic material and the tube is of such a length as to enable the stop-cock to be housed at a reasonable distance below the surface.
- 10 3. An installation according to claim 2 and in which said distance is from half a metre to two metres.
4. A combined stop-cock chamber and surface box installation comprising a plastic tube which, at its lower end, houses a stop-cock and at its upper end forms
15 a surface box, the tube being split into two telescoping parts.
5. An installation according to claim 4 and in which the upper telescopic part is attached to a resilient flat plate, so that a load imparted to the upper face
20 of the surface box will be accommodated by the flat plate flexing and the two parts of the two tube telescoping to a limited degree to accommodate the loading.
6. An installation according to claim 5 when in use
25 with the flat plate buried in the ground and kept in place by the earth below the plate and the back-fill above it.
7. An installation according to any preceding claim and in which the surface box has a plastic lid which
30 is a sealed fit in the top of the box and is removable by a key insertable through a hole in the lid.
8. An installation according to claim 7 in which, below said hole, is a spring-pressed disk or plate which serves to prevent entry of dirt etc. into the

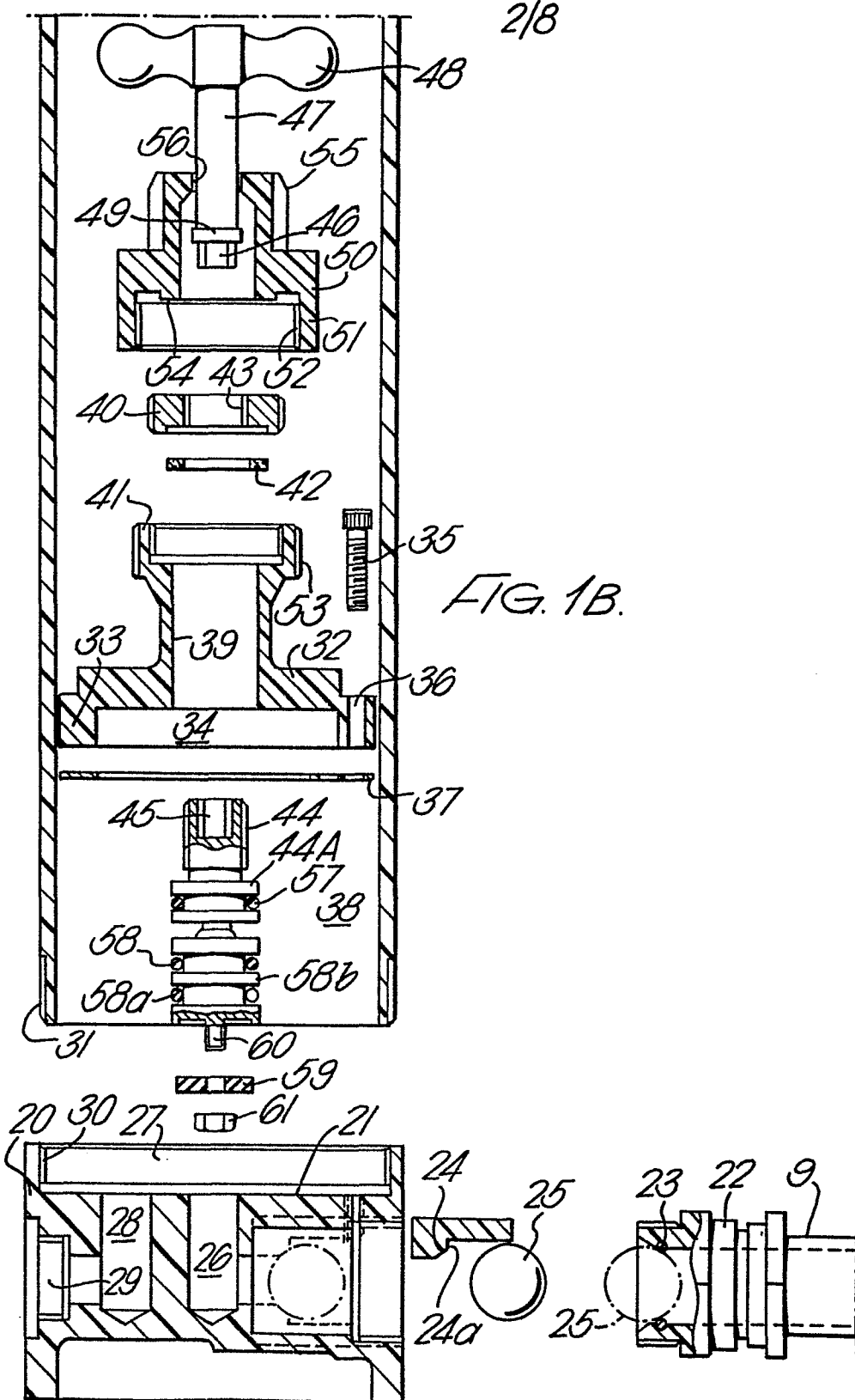
surface box via the key hole, such that when a key is inserted the disk or plate moves resiliently to allow the key to enter.

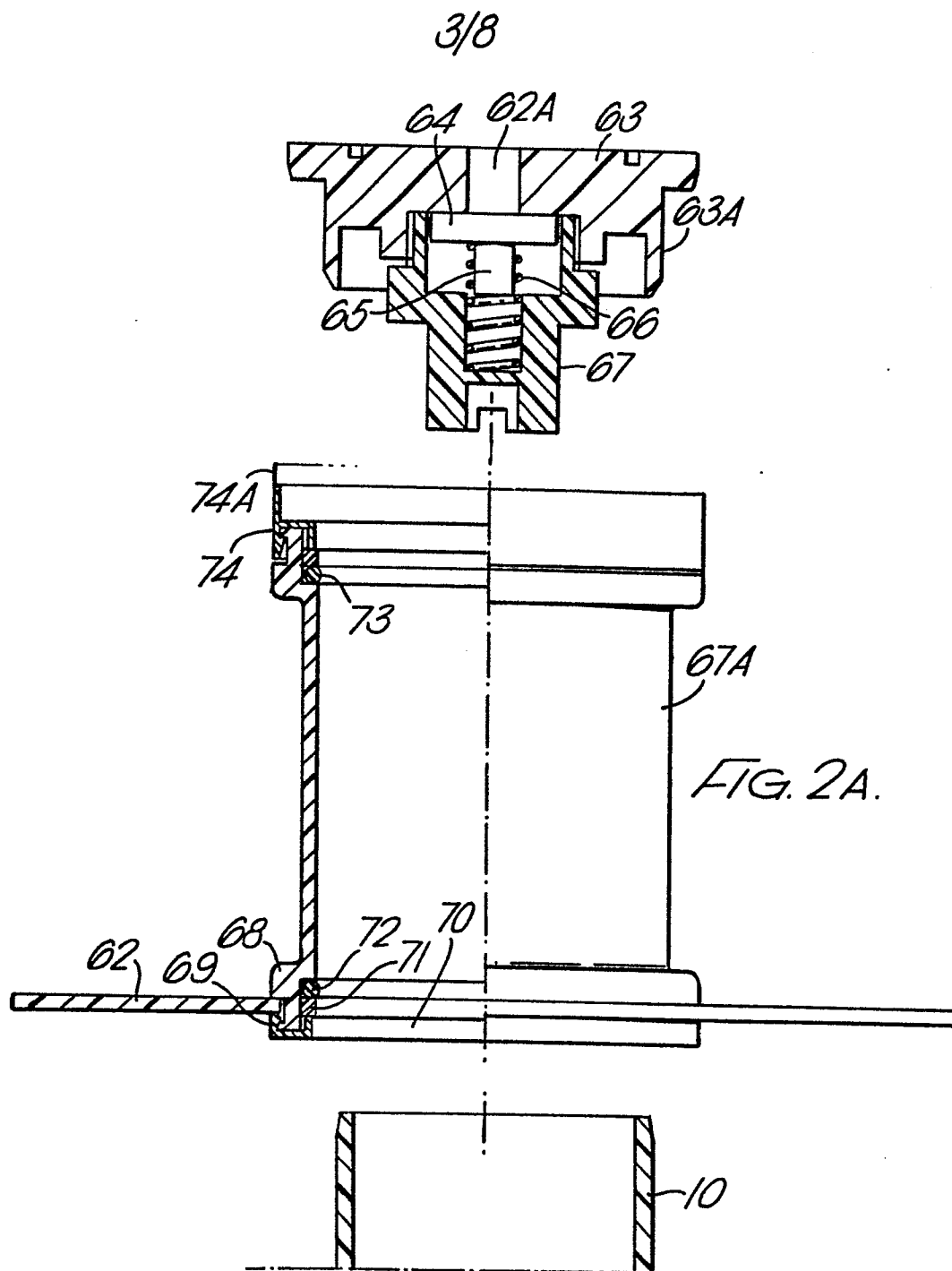
- 5 9. A combined surface box and stop-cock chamber installation, the whole being made of plastic material and there being means incorporated in the plastic chamber at the lower end to prevent back flow of water or other liquid into the supply in the event that the supply pressure should fail or be reduced.
- 10 10. An installation according to claim 9 and in which said means comprises a spring-pressed ball which is incorporated into a channel in the lower portion of the plastic housing of the stop-cock, the ball acting in such a way that it will be opened by mains pressure to
15 allow flow through the stop-cock but will be closed by the spring so as to close off the entry to the mains pipe if the mains pressure fails or is reduced.
11. An installation according to claim 9 or claim 10 and in which the means to prevent back flow is
20 incorporated in the outlet to the service pipe rather than in the inlet to the stop-cock.
12. An installation according to any preceding claim and in which the stop-cock or valve is adapted to be serviced under mains pressure.
- 25 13. An installation according to claim 12 and in which the stop-cock or valve is adapted to be used with a set of tools as described in my copending UK application 8303761 to enable it to be serviced under pressure.
14. An installation according to any preceding claim
30 in which the stop-cock or valve is of the crutch handle type.

1/8

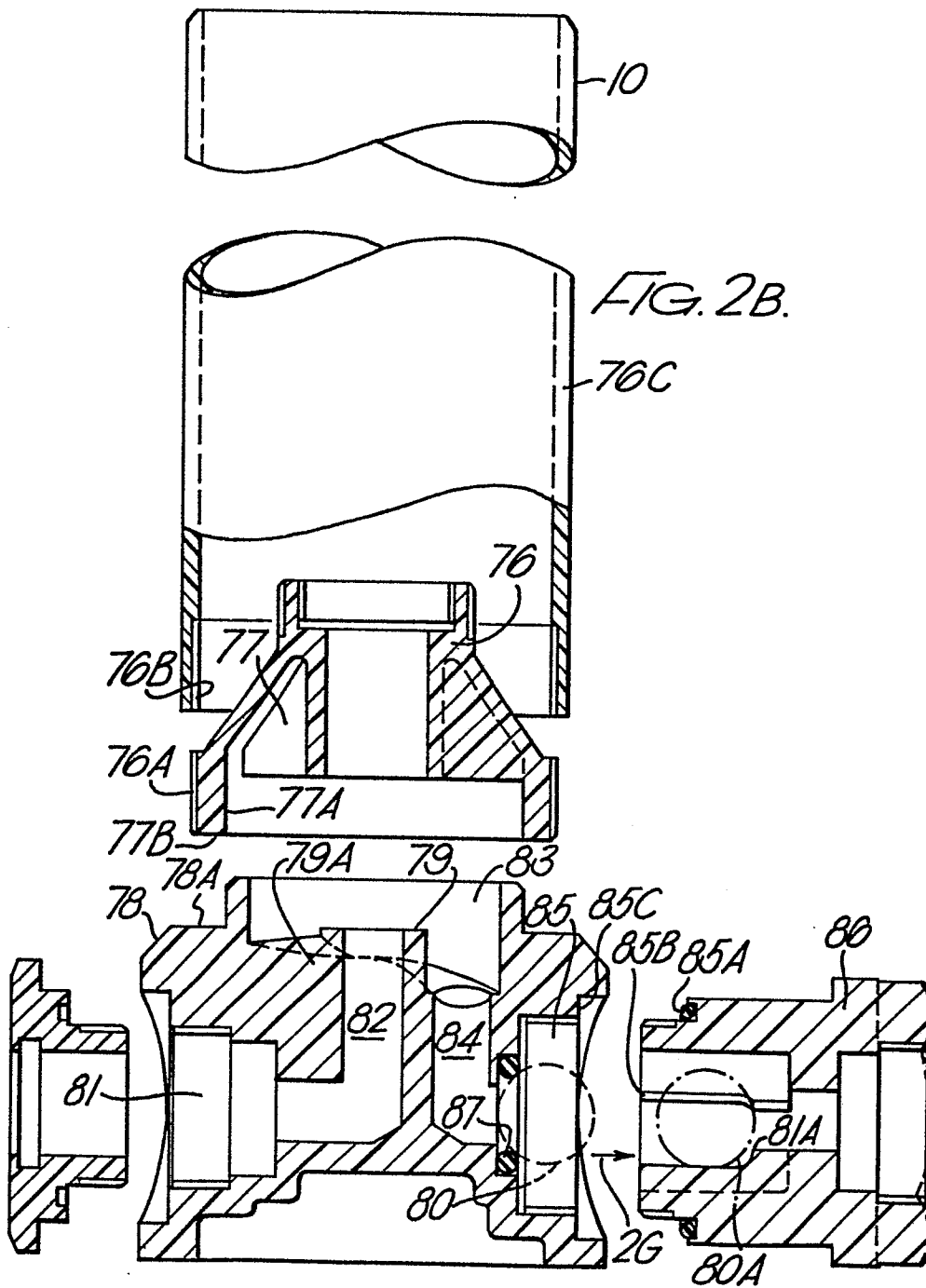


2/8





4/8



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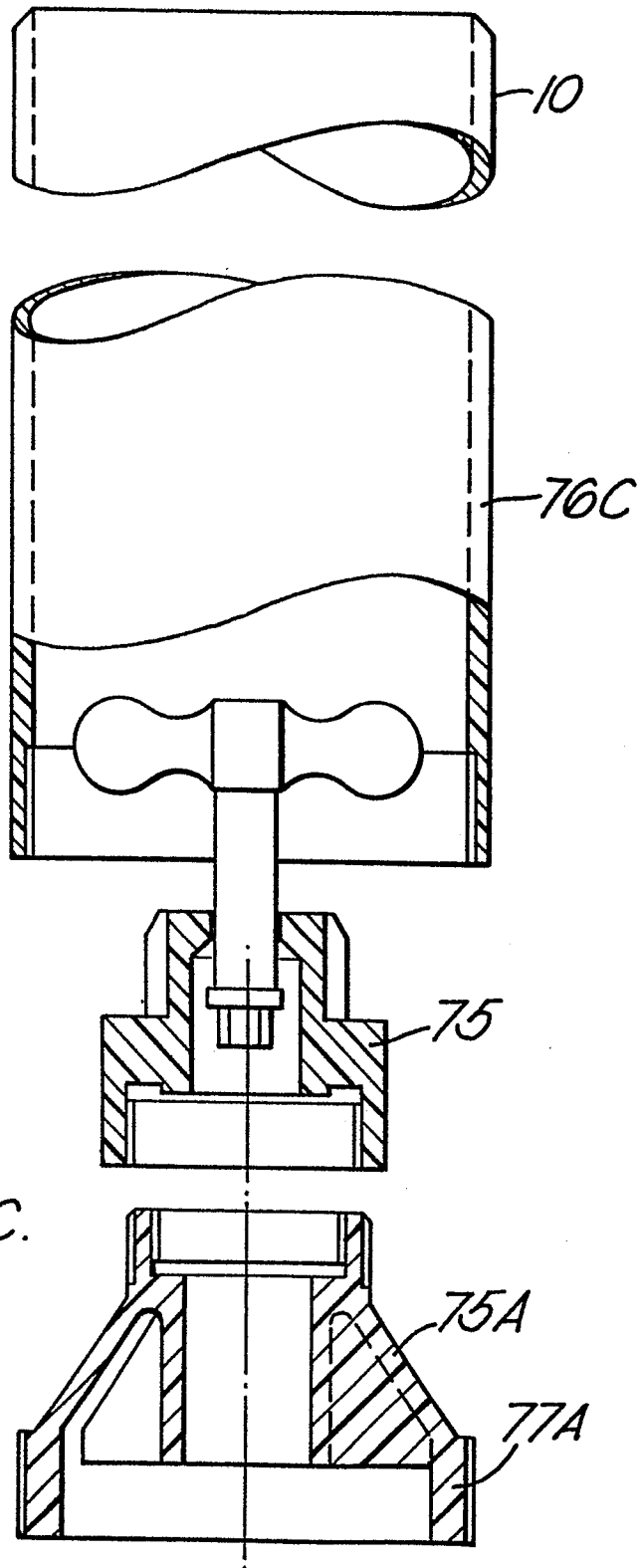


FIG. 2C.

6/8

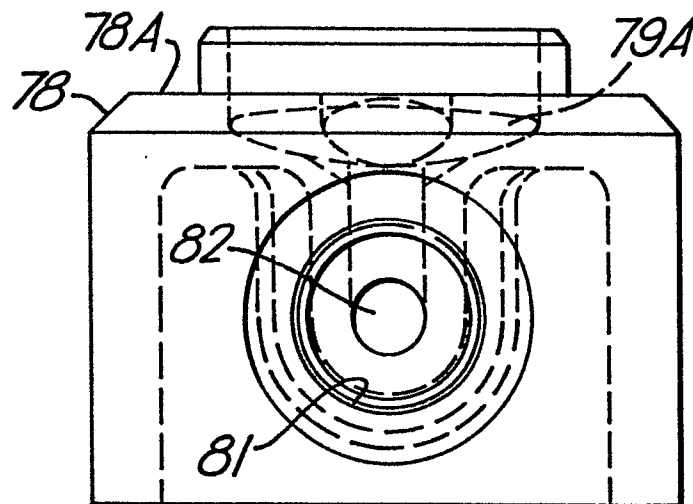


FIG. 2D.

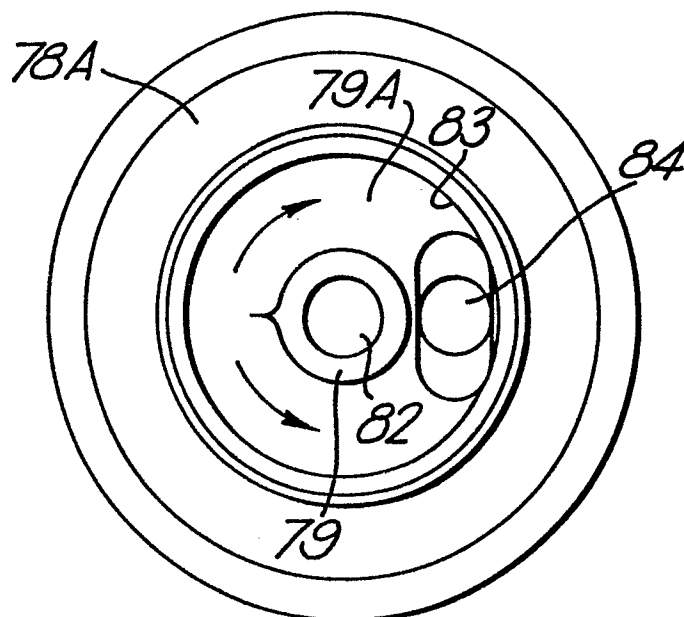


FIG. 2F.

7/8

FIG. 2E.

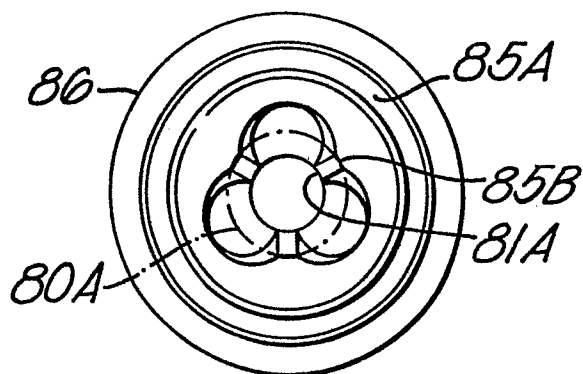
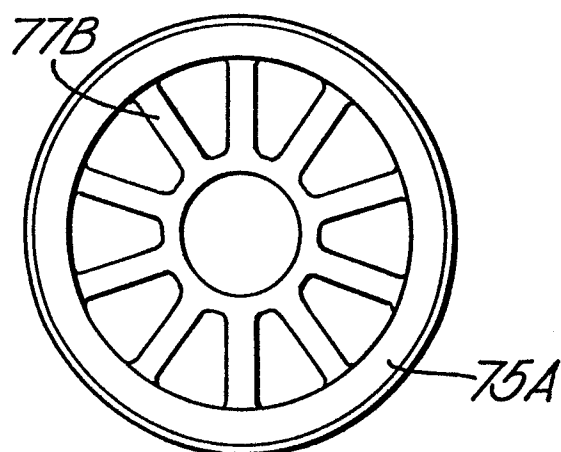


FIG. 2G.

8/8

FIG. 3.

