(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 177 128**
A2

(12) EUROPEAN PATENT APPLICATION

(21) Application number: 85305206.6

(51) Int. Cl.⁴: B 05 B 3/04

(22) Date of filing: 23.07.85

(30) Priority: 27.07.84 GB 8419286

(43) Date of publication of application:
09.04.86 Bulletin 86/15

(84) Designated Contracting States:
AT BE CH DE FR GB IT LI LU NL SE

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(54) Lawn sprinkler.

(57) A lawn sprinkler comprising first chamber (20) of circular section to which pressurised water is arranged to be supplied from a second chamber (16) via a plurality of angled bores (24) in a connecting wall (18). The bores (16) are positioned and orientated such as to establish in the first chamber a body of water rotating about the chamber axis. A rotor (26) is mounted for free rotation about an axis coincident with the longitudinal axis of the first chamber (20) and carries a plurality of angularly spaced, generally radially directed vanes (46), at least parts of which project into the first chamber (20) so as to be driven by the rotating body of water to thereby rotate the rotor.

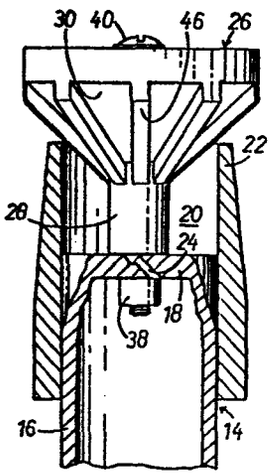

Fig 2.

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DESCRIPTION

"LAWN SPRINKLER"

The present invention relates to lawn sprinklers, that is, to devices adapted to be connected to the end of a water hose to provide a fine spray of water droplets over an area of lawn on which the device is positioned.

A number of different types of lawn sprinkler device are already known. One such device comprises a rotating nozzle from which a spray of water emerges as the nozzle rotates through 360°. Another such device comprises a horizontal bar containing a row of holes through which water jets emerge, the bar being arranged to be repeatedly pivoted about its longitudinal axis through an angle of at least 90° in order to achieve the required spray spread. Neither of the aforegoing devices is very efficient in that the area covered is relatively narrow. Frequent repositioning of the device is therefore necessary to achieve adequate spray coverage.

Another type of known device employs a profiled blade member which is pivotally suspended above a vertically directed water jet, and is shaped so as to be rotated by virtue of the water pressure acting on its one side surface, the rotation of the blade being arranged to cause the water to be flung out generally horizontally over a 360° arc. This latter device has two particular disadvantages. Firstly, it is a relatively complicated device requiring a number of relatively expensive parts which have been made of metal in such devices. Secondly, it is found that the rotating blade member used in such devices is not very efficient in distributing the water in the radial direction so that the resulting area sprayed tends to be in a narrow annular band spaced some feet from the position of the device; a circular area around the device is left substantially unsprayed.

Another known device comprises an upwardly divergent, frusto-conical member which is mounted for free rotation about a vertical axis above a fixed housing. An annular jet of water is arranged to be directed upwardly over the frusto-conical surface so as to impinge on a plurality of tangentially directed vanes carried by said surface and thereby cause the frusto-conical member to rotate about said axis. In rotating, the water is thrown generally upwardly and outwardly so as to form a spray which covers a 360° area around the device.

The latter device has a number of practical disadvantages. Its principal disadvantage is that is requires at least six separate components which thereby raises its cost of production. It is found to operate satisfactorily over only a relative narrow range of water pressures. Furthermore, the construction of the known device is such that a body of water becomes trapped inside the frusto-conical component. This water tends to move around non-uniformly within the frusto-conical component and can cause vibration of the device which reduces its operational efficiency.

It is an object of the present invention to provide a lawn sprinkler which is simpler and substantially cheaper to manufacture than the latter known device.

In accordance with the present invention there is provided a lawn sprinkler comprising a generally cylindrical chamber of circular section to which pressurised water is arranged to be supplied in a manner to establish a body of swirling water in the chamber, and a coaxial, freely rotatable rotor which carries a plurality of angularly spaced, generally radially directed vanes, at least part of which project into said chamber so as to be driven by said body of swirling water to thereby rotate the rotor.

Thus, in comparison with the tangentially directed vanes of the abovedescribed known device, the vanes of the present sprinkler lie in respective planes containing the axis of rotation of the rotor. The water leaves the chamber via divergent spaces between adjacent vanes and is distributed in an even spray over a full 360° angle.

Preferably, the body of swirling (rotating) water is established by forcing water into the cylindrical chamber through a circular array of holes in a bottom wall of the chamber, the holes lying generally tangentially relative to the imaginary circle on which they lie so as to direct the water generally tangentially towards the cylindrical wall of the chamber so that the water then tries to follow a circular path around the inside surface of the chamber.

The cylindrical chamber can be defined by a cylindrical wall which is fixed relative to said base wall or can be defined by a cylindrical wall which rotates relative to said base wall and is fixed relative to the rotor.

The invention is described further hereinafter, by way of example only, with reference to the accompanying drawings, in which:-

Fig. 1 is a perspective view of one embodiment of a sprinkler device in accordance with the present invention;

Fig. 2 is a sectional side view of part of the embodiment of Fig. 1;

Fig. 3 is an exploded, partially broken away view of the parts shown in Fig. 2;

Fig. 4 is an exploded perspective view of a modified embodiment;

Fig. 5 is a perspective view of a further embodiment of a sprinkler device in accordance with the invention;

Fig. 6 is a sectional view of part of the embodiment of Fig. 5; and

Fig. 7 is a perspective, partially broken away view of one component of the embodiment of Figs. 5 and 6.

With reference first to Figs. 1, 2 and 3, the illustrated sprinkler device comprises a main plastics housing 10 defining an internal chamber (not shown) to which pressurised water can be supplied via an inlet connection 12, for example from a hose pipe connected to the mains water supply. Screwed into the top of the main housing 10 so as to communicate with said internal chamber is a secondary plastics housing 14 having a hollow tubular portion 16 whose lower outer periphery is screw threaded at 15 for attachment to the main housing 10. The upper end of the tubular portion 16 is substantially closed by a transverse wall 18. Formed immediately above the wall 18 is an open-topped cylindrical chamber which is defined by a tubular wall 22 extending upwardly from the portion 16. The tubular wall 22 can be formed by a separate sleeve slipped over the tubular portion 16 but, preferably, is formed as an integral moulding with the tubular part 16 and the transverse wall 18.

Mounted on the wall 18 for free rotation coaxially of the chamber 20 is a rotor member 26 which comprises a cylindrical shank portion 28 integrally connected to a solid frusto-conical portion 30. The portions 28, 30 have a central bore 32 (Fig. 3) which loosely receives a screw 34 whose free end is engaged in a correspondingly screw-threaded bore 36 disposed centrally of the transverse wall 18. The underside of the wall 18 can have an integral boss portion 38 for increasing the strength and rigidity of the wall where it receives the

screw 34. The head 40 of the screw loosely engages the top surface 42 of the frusto-conical portion, preferably by way of a washer 44, such as to enable the rotor to rotate freely about the screw.

As shown in the drawings, the frusto-conical surface 30 of the rotor 26 carries a plurality of angularly spaced, downwardly extending ribs or vanes 46 each of which lies in a respective plane containing the axis of rotation of the rotor, i.e. the planes of the various ribs or vanes 46 are essentially radial as compared to the initially described known device where the ribs lie in planes which are tangential in relation to the axis of rotor rotation.

As best seen in Figs. 2 and 3, the transverse wall 18 is formed with a circular array of through-holes 24 disposed coaxially in relation to said cylindrical chamber 22 with the individual holes 24 all extending generally tangentially of the circle on which they lie and also extending at an angle to the common longitudinal axis of the tube 16 and the cylindrical chamber 20. The arrangement of the holes 24 is such that when the tubular portion 16 is supplied with pressurised water via the main housing 10, water is forced through the holes 24 and into the cylindrical chamber 22 where it adopts a relatively uniform swirling motion around the peripheral wall of the cylindrical chamber 22 (i.e. following a generally circular path around the axis of the chamber 22) before being ejected from the upper end of the chamber between the rim of the chamber 22 and the frusto-conical rotor 26.

As best seen in Fig. 2, the lower ends of the axial ribs or vanes 46 are arranged to project into the upper end of the cylindrical chamber 20 so that they lie within the rotating mass of water in the chamber and are thereby carried around with that water

at substantially the same speed as the water. Thus the greater the pressure of the water supplied to the tubular portion 16, the faster the swirling water moves in the chamber 20 and the faster the rotor 26 is rotated. The water is able to leave the chamber 20 via the diverging channels 30 between the adjacent pairs of ribs 46 and is thus thrown out in a fine spray over a full 360° angle as the rotor rotates.

It will be appreciated that this sprinkler device will operate over a very wide pressure range. The number, thickness and shape of ribs 46 is relatively unimportant, as is the shape of the upper part of the rotor part 26.

It will also be appreciated that the shape of the main housing 10 is unimportant. For example, the part 16 could be integral with the housing part 10 or could be dispensed with altogether, for example, if the transverse wall 18 is actually part of the roof of the main housing. All that is essential in this respect, is the circularly sectioned chamber, the angled holes in the base of this chamber and the rotor having radial ribs which project into the chamber so as to be driven by the swirling water therein.

A further possibility is shown in Fig. 4 where the wall defining the cylindrical chamber is arranged to rotate with the rotor itself. For this purpose a tubular skirt 52 is attached to or integrally moulded with the rotor so as to be coupled to the ribs about half way along their length. In this arrangement, the water emerges as before via the spaces between adjacent ribs, the only difference being that the wall 52 rotates with the rotor relative to the transverse wall 18' and the tubular portion 16' carrying same.

Figs. 5 to 7 illustrate a further embodiment of the invention wherein like parts have been given the

same reference numerals as in Figs. 1 to 3.

In the embodiment of Figs. 5 to 7, the cylindrical chamber 20 is defined by a generally cup-shaped member 56 whose base 58 defines a transverse wall equivalent to the wall 18 of Fig. 2. The wall 58 contains a circular array of angled through-bores 24 as before. The outer peripheral surface of the cup-shaped member 56 is screw-threaded at 60 and is received within a correspondingly screw-threaded bore 62 in the roof of the housing 10.

The base 58 of the cup-shaped member 56 receives the screw-threaded end of the screw 34 on which the frusto-conical rotor 26 is mounted. One further modification in this embodiment is that the upper end of the screw 34 carries a knob 64 to enable the screw to be easily manipulated manually. If the screw is released slightly from the base 58, the rotor is able to move upwardly by a corresponding distance on the screw, thereby increasing the gap between the mouth of the member 56 and the rotor and enabling the spraying characteristic of the device to be altered accordingly.

As shown in Fig. 6, a spring clip 66 can be attached to the shank of the screw below the rotor so that when the screw is released by rotation of the knob 64 the rotor is automatically lifted by the spring clip 66.

The operation of the embodiment of Figs. 5 to 7 is otherwise the same as those of Figs. 1 to 4.

Although it is preferred for the circularly sectioned chamber 20 to be truly cylindrical, it will be appreciated that in principle the longitudinal wall of the chamber 20 could be somewhat divergent or convergent whilst still being capable of establishing the necessary rotating body of water therewithin. It is therefore

intended that this possibility be included within the scope of the appended claims.

It will be appreciated that the present device can be made with as little as three components (plus washer if needed) if the main housing and tubular portion having the transverse wall are formed as an integral moulding; the other two components are the rotor and the screw.

Devices in accordance with the present invention are characterised by a particularly even dispersion of sprayed water, together with the ability to operate satisfactorily over a wide range of water pressures.

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CLAIMS

1. A lawn sprinkler comprising a rotor mounted on a housing and carrying a plurality of vanes against which a body of water is arranged to be directed so as to rotate the rotor relative to the housing and to form a spray of water over a 360° area around the housing, characterised by nozzle means (24) positioned to supply pressurised water into a circularly sectioned chamber (20) of generally cylindrical configuration in a manner such as, in use, to establish a body of swirling water in the chamber (20), and a freely rotatable rotor (26) whose axis is coaxial with the chamber axis and which carries a plurality of angularly spaced, generally radially directed vanes (46), at least part of which project into the chamber (20) so as, in use, to be driven by said body of swirling water to thereby rotate the rotor.

2. A lawn sprinkler as claimed in claim 1, characterised in that the nozzle means comprises a circular array of angled bores (24) in a bottom wall (18) of the chamber (20), the axes of the bores (24) lying generally tangentially relative to the imaginary circle on which they lie so as to direct water emerging therefrom generally tangentially towards the cylindrical inner wall of the chamber (20) whereby the water then tries to follow a circular path around said inner wall of the chamber (20) before being ejected from the end of the chamber remote from said bottom wall (18).

3. A lawn sprinkler as claimed in claim 2, characterised in that the cylindrical wall of the chamber (20) is fixed relative to said base wall (18).

4. A lawn sprinkler as claimed in claim 2, characterised in the the cylindrical wall of the chamber

is formed by a cylindrical skirt member (52) which is joined to, and rotates with, the rotor (26).

5. A lawn sprinkler as claimed in claim 1, 2, 3 or 4, characterised in that the rotor comprises a body of inverted frusto-conical configuration, whose frusto-conical surface (30) carries said plurality of angularly spaced, generally radially directed vanes (46), said vanes (46) lying in respective planes containing the axis of rotation of the rotor.

6. A lawn sprinkler as claimed in claim 5, characterised in that the extent of projection of the vanes (46) into the chamber (20) is adjustable manually to enable the spray characteristics of the sprinkler to be adjusted.

7. A lawn sprinkler as claimed in any of claims 1 to 6, characterised in that the housing (10) contains an internal chamber for receiving pressurised water from an external, supply, said internal chamber of the housing (10) being connected to the interior of the chamber (20) by way of said nozzle means (24).

8. A lawn sprinkler as claimed in claim 7, when appendant to any of claims 2 to 6, characterised in that the cylindrical chamber (20) is defined by a generally cup-shaped member (56) whose base (58) defines said bottom wall of the chamber (20) and contains said array of angled bores (24), the cup-shaped member (56) being fitted into a bore (62) in the housing whereby the interior of the housing communicates with said chamber (20) via said angled bores (24).

9. A lawn sprinkler as claimed in any of claims 2 to 8 characterised in that the rotor is mounted on a spindle (34) whose one end is fixedly received in said bottom wall (18) of the cylindrical chamber (20).

10. A lawn sprinkler comprising a rotor mounted on a housing and carrying a plurality of vanes against

which a body of water is arranged to be directed so as to rotate the rotor relative to the housing and to form a spray of water over a 360° area around the housing, characterised by a chamber (20) of circular section to which pressurised water is arranged to be supplied in a manner to establish a body of water in the chamber (20) rotating about the chamber axis, and a rotor (26) mounted for free rotation coaxially of the chamber axis and which carries a plurality of angularly spaced, generally radially directed vanes (46), at least part of which project into the chamber (20) so as to be driven by said rotating body of water to thereby rotate the rotor.

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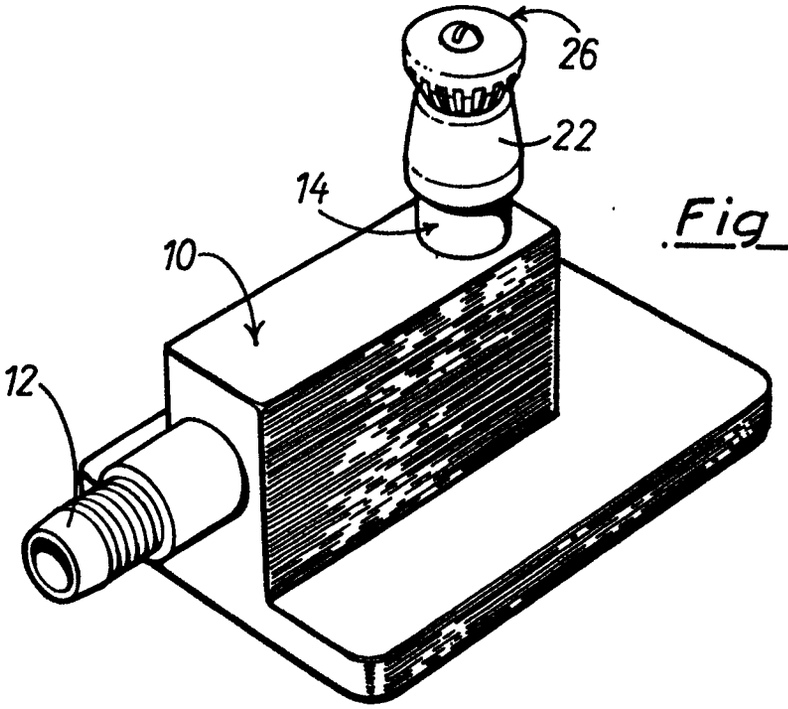

Fig 1

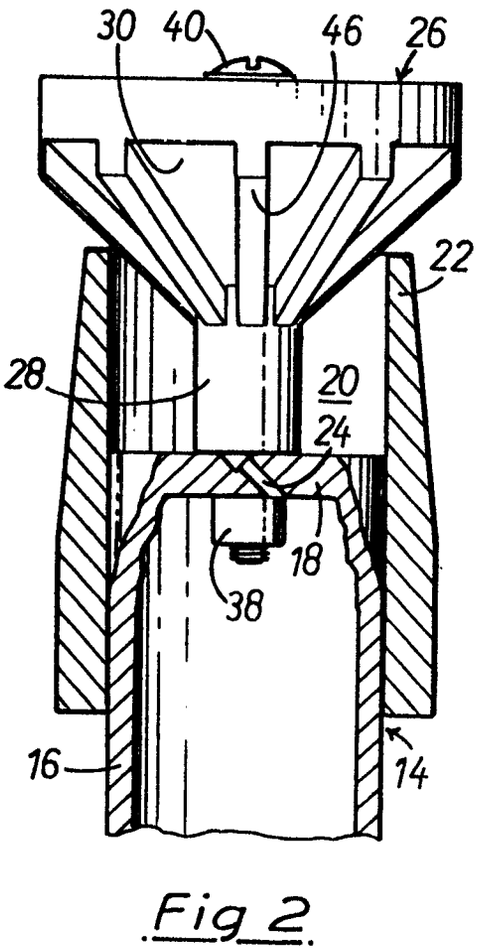

Fig 2

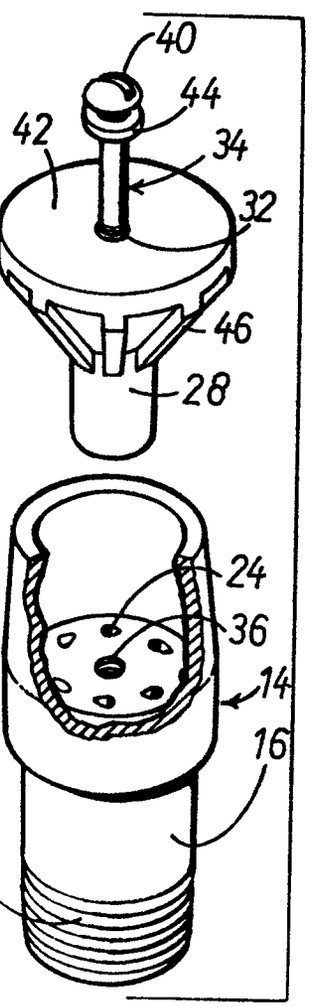

Fig 3

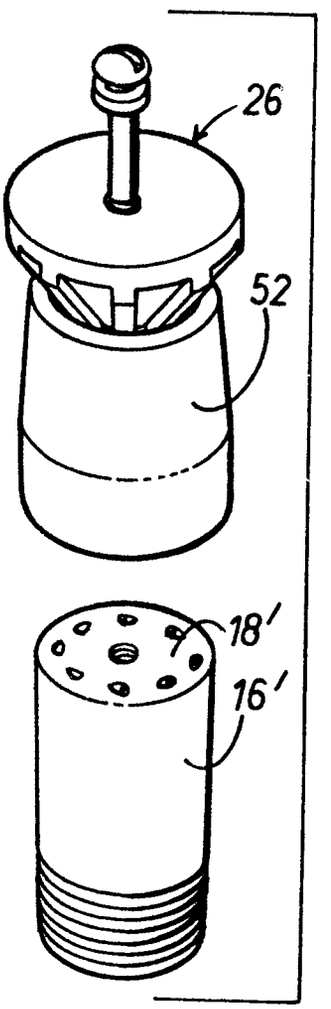

Fig 4

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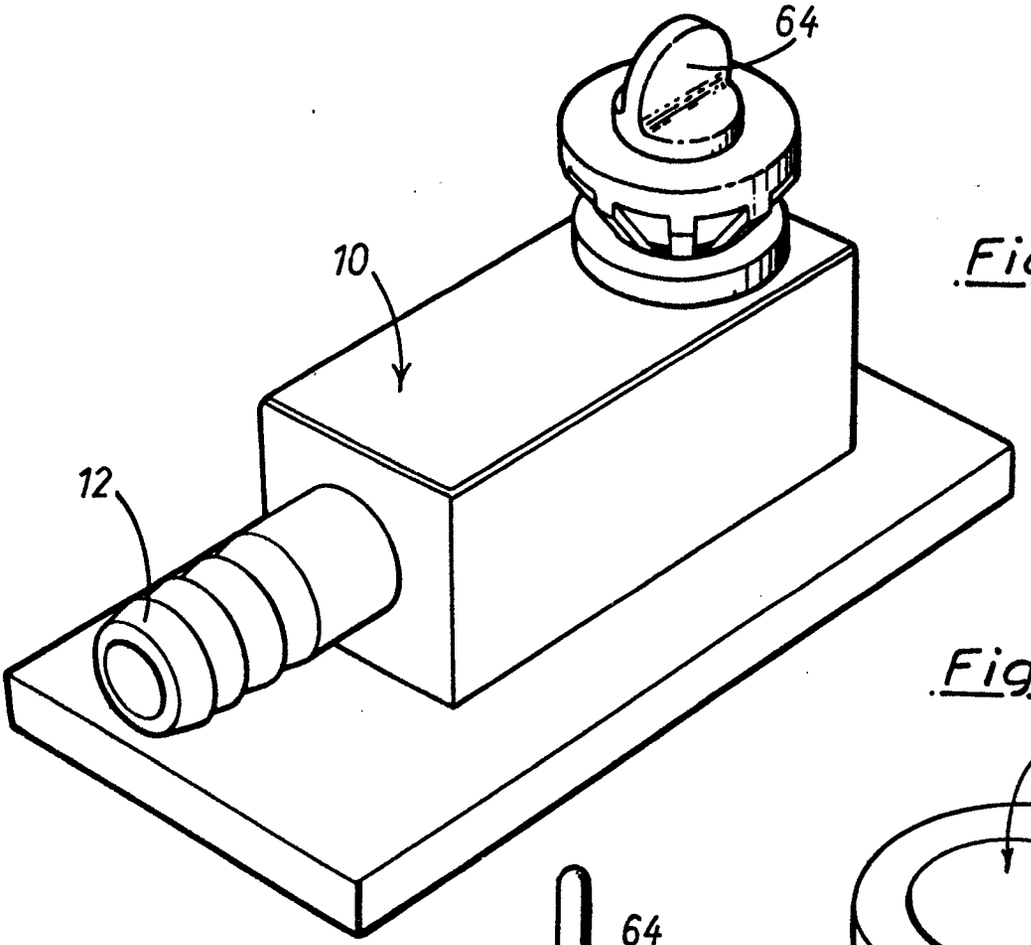
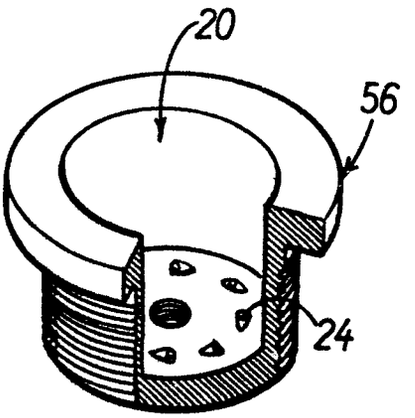


Fig 5.

Fig 7.



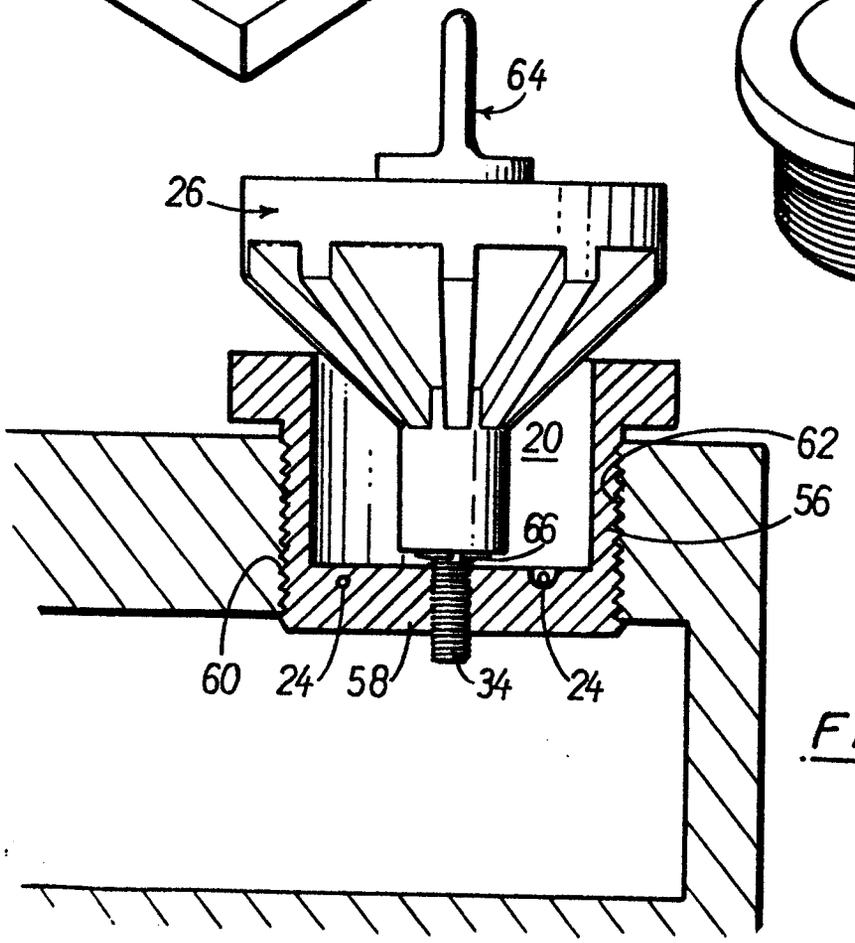


Fig 6.