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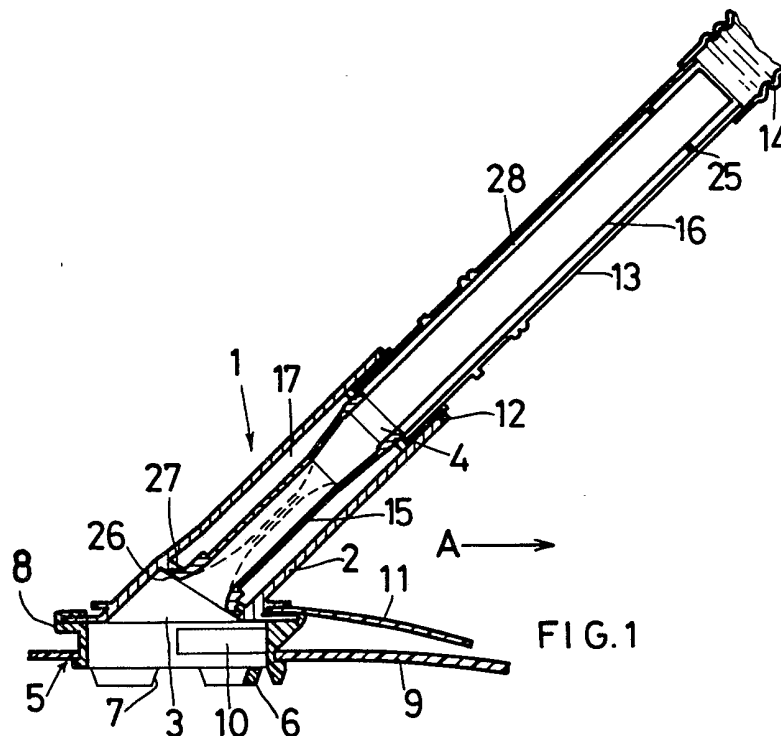
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(54) **Pool cleaner**

(57) A swimming pool cleaner comprising suction head 2 having fluid inlet 3, fluid outlet 4, a transversely contractable and expansible tubular member 15 therebetween, and a chamber 17 surrounding tubular member 15 is characterised in that the fluid is extended by an extension pipe 13 and suction communication is provided between the chamber and the outlet of the extension pipe remote from the suction head. Suction communication may be by way of an annular passage between the extension pipe and an inner rigid pipe 16, or via an exterior tube (30, Fig. 4).



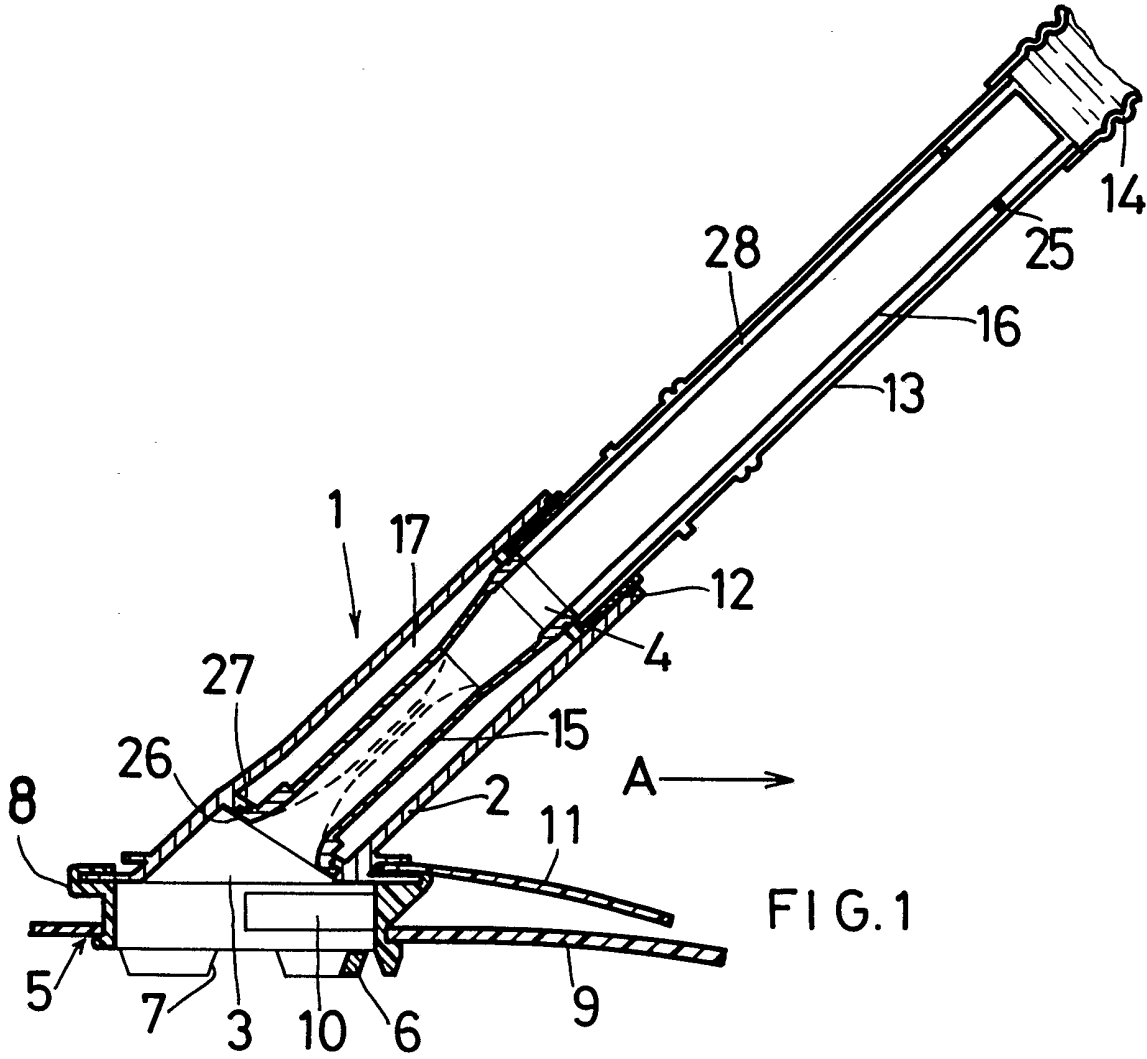


FIG. 1

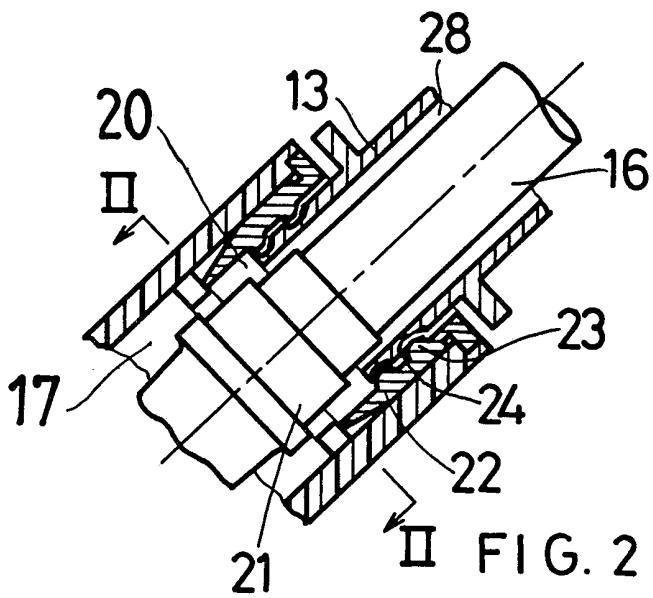


FIG. 2

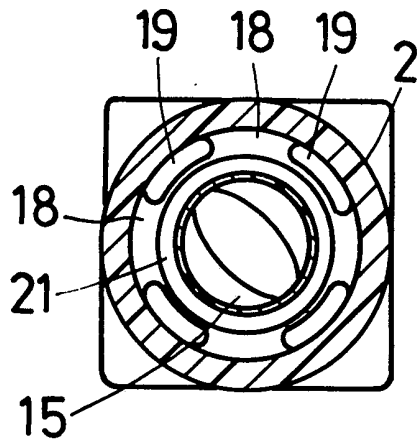


FIG. 3

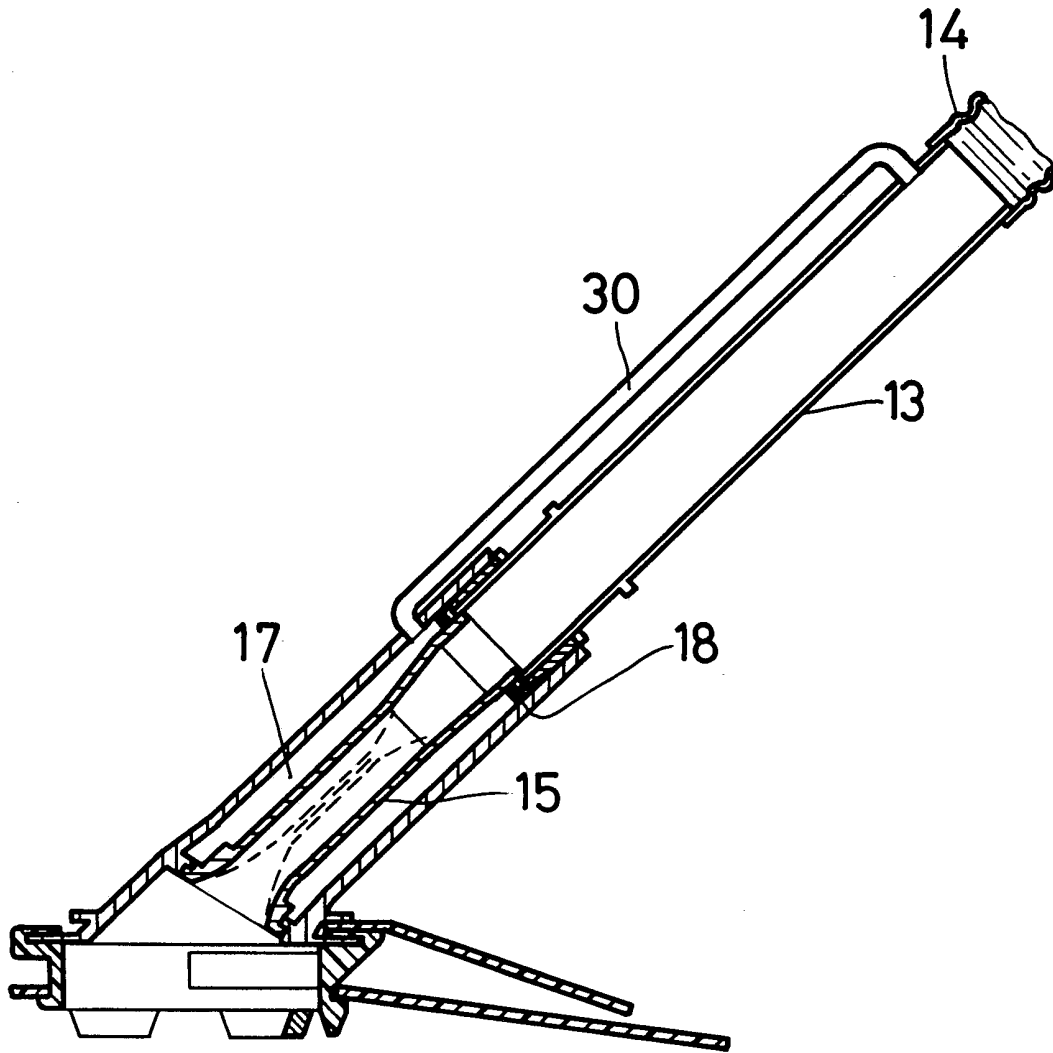


FIG. 4

SPECIFICATION

Pool cleaner

5 THIS INVENTION relates to a pool cleaner and more particularly to a pool cleaner that is operated by the suction of the water through the pool cleaner to the usual form of filter unit for the pool water. In particular the pool cleaner
10 relates to a modification to the cleaner described and claimed in our British Patent Application No 8432658.

In the specification of the abovementioned application there is described a particular embodiment of pool cleaner. This description makes reference to a cylindrical diaphragm forming a passage through the head of the pool cleaner and forming with the head an annular cylindrical chamber around the diaphragm. The cylindrical diaphragm contracts and expands in a cyclical manner as water is sucked through the passage, the relative pressures in the chamber and within the passage determining the particular condition of the diaphragm at any particular time. The chamber is described as being either sealed or vented to the outlet from the head of the cleaner.

The present invention relates to a simple means for venting the chamber which will result in cyclical expansion and contraction of the diaphragm in a satisfactory manner.

According to the invention there is provided a swimming pool cleaner of the type wherein an interruption of the flow of water through the cleaner is utilized to provide a propulsive force to cause the cleaner to move automatically across the surface to be cleaned, the cleaner comprising a head having a fluid inlet and a fluid outlet, a flow passage within the head between the inlet and outlet at least partially defined by a tubular member which is transversely contractable and expansible over at least a part of its length to control the flow of fluid through the passage, a chamber being defined within the head around the tubular member, the outlet from the head extended by an extension pipe, a suction communication connecting the chamber to the outlet of the extension pipe remote from the head.

50 Further there is provided for the suction communication from the head to be an extended rigid pipe concentric with the extension pipe with venting provided from the chamber into the annular space between the rigid pipe and the extension pipe, or to be a tube exterior of the head and extending between the chamber and the outlet end of the extension pipe.

A further feature of this invention provides for the upper end of the rigid pipe to be located in position by radially extending projections contacting the inner surface of the extension pipe.

Two embodiments of the invention are described below by way of examples with refer-

ence to the accompanying drawings in which:

Figure 1 shows a cross-sectional side elevation of a pool cleaner;

Figure 2 shows an enlarged cross-sectional side elevation of the point of connection between the head and extension pipe of the cleaner;

Figure 3 shows a section taken along lines II-II of *Fig. 2*, and

Figure 4 shows a cross-sectional side elevation of a second embodiment of the invention.

As illustrated in *Figs. 1* and *2*, the cleaner has an operating head 2 which has a basically rectangular cross-section which extends from an inlet opening 3 to an outlet opening 4. These openings are circular in shape with the axis of the inlet offset from that of the outlet at an angle which is preferably 45°.

The inlet 3 is made with a foot 5 for the cleaner which will contact the surface to be cleaned. The lower part 6 of the foot 5 has a stepped face 7 so that there are spaced apertures between the surface to be cleaned and the face 7 through which water and dirt may pass when the machine is in operation.

Spaced above the lower part 6 of the foot 5 is a peripheral flange 8 and the wall between the flange 8 and the lower part 6 of the foot is of reduced diameter around which is fitted an annular flexible disc 9 to be rotatable thereon.

An opening 10 is provided through the wall between the flange 8 and the lower part 6 of the foot 5 through which water and dirt may pass. A flexible apron 11 is secured around the head to extend over the disc 9 in what is the normal forward direction of the cleaner indicated by arrow "A".

A swivellable fitting 12 is provided at the outlet opening 4 to which is connected a rigid extension pipe 13 made to a length which will facilitate turning the head 2 on a vertical wall during use. A flexible suction hose 14 is attached to the outlet end of the extension pipe 13 for connection to the suction pump of the swimming pool filtration plant (not shown).

Releasably sealed into the head 2 is a tubular diaphragm 15 providing a valve assembly and illustrated as being of circular cross-section and having a flexible and resilient portion between its ends.

The lower or inlet end of the tubular diaphragm is enlarged to define a flange 26 which engages and seals with a flange 27 inside the head 2. This configuration provides a smooth lead-in region for water passing through the diaphragm.

The upper or outlet end of the tubular diaphragm 15 is in sealed engagement with an elongate rigid pipe 16 which extends through the extension pipe 13 to a point near the outlet end of the extension pipe 13.

The flexible portion of the tubular diaphragm is housed within the head 2 and the diaphragm defines a chamber 17 between the

outer surface of the diaphragm and the inner surface of the head. The upper or outlet end of this chamber 17 is defined by a plate 18 having a plurality of apertures 19 there-
5 through. These apertures 19 are clearly seen in Fig. 3. The plate 18 holds the outlet end of the diaphragm 15 in position in the head.

The plate 18 shown in Fig. 3 is substantially square as is the cross-section of the head 2
10 below this plate 18. The part of the head above the plate 18 is substantially circular in cross-section. The lower or inlet end 21 of the rigid pipe 16 is located in the outlet end of the tubular diaphragm 15 and the dia-
15 phragm 15 is thereby urged radially outwardly and into sealing engagement with a central hole in the plate 18. This configuration defines an annular space 20 between the head 2 and the end 21 of the rigid pipe 16.

Suction communication is thus provided be-
20 tween the interior of chamber 17 and the flexible hose 14 along a path defined by aper- tures 19, annular space 20, and the annular space 28 between the extension pipe 13 and
25 the rigid pipe 16.

The extension pipe 13 fits into the tubular upper end of the head 2 and is held in posi-
30 tion by a cylindrical bushing 22. The bushing has one or more inwardly directed rounded ribs 23 which snap or otherwise fit loosely within grooves 24 in the lower end of exten- sion pipe 13 to form the swivelable fitting 12
35 referred to above. The extension pipe 13 is joined to the head by simply forcing the bush- ing into the tubular upper end of the head.

The free end of the rigid pipe 16 is, if neces-
40 sary, held concentrically in position in the extension pipe 13 by means of radially extend- ing projections 25 which contact the inner surface of the extension pipe. These projec-
45 tions do not inhibit suction communication from the chamber to the flexible hose.

It will of course be appreciated that the dia-
50 phragm 15 can be located in the body in any other convenient manner. It will be preferable for the diaphragm to be easily replaceable should it deteriorate or become damaged for any reason. It is for this reason that the con-
55 nection between the plate 18 and the end 21 of the rigid pipe is designed in this embodi- ments to be a simple friction fit allowing sep- aration of those two parts when necessary.

The material from which the diaphragm is
60 made must be capable of flexing very many times in an environment of chlorinated water without deterioration over a considerable per-
65 iod of time. In this application it is anticipated that polyurethane or a polyurethane mix will be suitable. Other materials are also expected to be developed for this application.

In use the pool cleaner will operate in sub-
stantially the following manner. As suction is applied through flexible hosing 14, water will
be sucked through the flexible diaphragm 15.

Due to flow through the diaphragm, a drop in

pressure occurs within the diaphragm com-
pared with the pressure in the chamber 17. The diaphragm will then contract to a closed
70 or partially closed condition resulting in an in- terruption of the flow of water through the cleaner and causing the cleaner to be pro- pelled in the direction of arrow "A". This
75 contraction results in the suction being applied mainly to the chamber 17 through the suction communication referred to and this will open
80 the diaphragm. Once this happens water will again flow through the diaphragm reducing the practical effect of the suction in the chamber and allowing the cycle to repeat. This cycle
85 will be repeated at frequent intervals resulting in forces causing the cleaner to move around the submerged surfaces of the pool, sucking
90 water from against these submerged surfaces, and thereby cleaning them.

The main advantage of the rigid pipe 16
85 extending through the extension pipe is that there is a long path of suction communication between the chamber and the flexible hose
90 which it is believed has a material effect on the cyclic time of contraction of the diaphragm and consequently the movement of the ma-
chine.

In an alternative embodiment shown in Fig.
4, the plate 18 is formed without apertures
95 and suction communication is provided by an exterior tube 30 connecting the chamber 17 with the interior of the extension pipe 13 near the outlet from the extension pipe. This device
100 operates in much the same manner as that described above.

It should be clearly understood that it is not
essential for the diaphragm to completely cut off flow. It is satisfactory if there is sufficient
105 contraction of the diaphragm to produce an interruption of the water stream through the tubular passageway of a magnitude sufficient to induce movement in the device.

CLAIMS

110 1. A swimming pool cleaner of the type wherein the interruption of the flow of water through the cleaner is utilised to provide a propulsive force to cause the cleaner to move
115 automatically across the surface to be cleaned, the cleaner comprising a head having a fluid inlet and a fluid outlet, a flow passage within the head between the inlet and outlet
120 at least partially defined by a tubular member which is transversely contractable and expan- sible over at least a part of its length to control the flow of fluid through the passage, a
125 chamber being defined within the head around the tubular member, the outlet from the head extended by an extension pipe, a suction
communication connecting the chamber to the
outlet of the extension pipe remote from the head.

130 2. A swimming pool cleaner as claimed in claim 1 wherein the outlet from the head is extended by a rigid pipe concentric with the

extension pipe with venting provided from the chamber into the annular space between the rigid pipe and the extension pipe.

5 3. A swimming pool cleaner as claimed in claim 2 in which the upper end of the rigid tube is located in position by radially extending projections contacting the inner surface of the extension pipe.

10 4. A swimming pool cleaner as claimed in claim 1 in which the suction communication is defined by a tube exterior of the head which extends between the interior of the chamber with the interior of the extension pipe near the outlet from the extension pipe.

15 5. A swimming pool cleaner substantially as hereinbefore described with reference to either Figs. 1 to 3 or to Fig. 4 of the accompanying drawings.

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