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## (54) Apparatus for steam-cleaning surfaces

(57) Apparatus (1) for steam-cleaning surfaces eliminates troublesome running of condensate in trickles on the surface which has just been cleaned and comprises steam-delivery means (15) associated with a steam source, and a cleaning head (5) which delivers the steam and which has scraping-profile means (12) for wiping condensed steam from a surface and condensate-suction means (22) associated with the scraping-profile means (12).

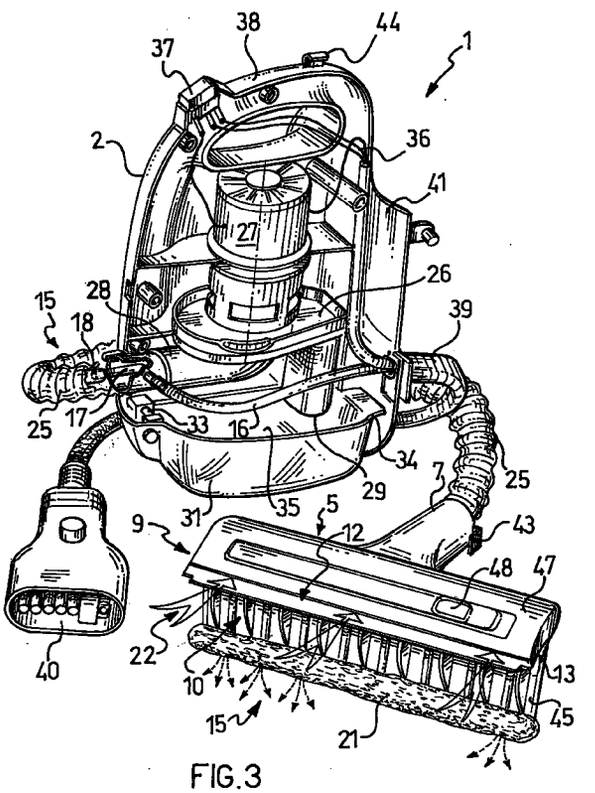


FIG.3

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## Description

The present invention relates to apparatus for steam-cleaning surfaces, of the type comprising steam-delivery means connected to a steam source, a cleaning head having at least one nozzle which delivers steam, and scraping-profile means for wiping the condensed steam from a surface, the delivery means comprising at least one flexible pipe extending between the steam source and the cleaning head.

Apparatus of the type specified above is known. It is normally used in the domestic field for cleaning windows, tiles, washable shelves and the like.

The apparatus can also be used in other fields, such as for industrial cleaning and for washing motor-vehicle bodywork and windscreens.

The above-mentioned scraping-profile means, which is generally a squeegee with a rubber profile, can advantageously be connected to the cleaning head which is used to emit the steam which, because of the heat and its damp nature, loosens the dirt and ensures its removal.

Once the steam has partially condensed on the surface which by now is partially cleaned, it is wiped off by means of the aforementioned rubber profile which, since it fits perfectly against the flat surface, removes any trace of liquid containing the remaining dirt.

Unfortunately, this liquid runs forming trickles which can render the cleaning operation ineffective, leaving traces, marks and deposits of dirt.

The success of the operation is therefore entrusted to the skill of the operator who, however, often cannot help cleaning imperfectly.

The technical problem upon which the present invention is based consists in devising apparatus for steam-cleaning surfaces which can overcome the problems mentioned with reference to the prior art.

This problem is solved by apparatus of the type specified which is characterized in that it comprises condensate-suction means associated with the scraping-profile means.

The main advantage of the apparatus according to the invention is that it eliminates trickling of the condensate which is removed from the cleaned surface with the use of the same cleaning head which is used to deliver the steam.

Further characteristics and advantages of the apparatus according to the invention for steam-cleaning surfaces will become clear from the description of a preferred embodiment thereof, given by way of non-limiting example, with reference to the appended drawings, in which:

Figures 1 and 2 are perspective views of apparatus according to the invention for steam-cleaning surfaces, ready for use and in the carrying configuration, respectively,

Figure 3 is a partially-sectioned, perspective view of the apparatus of Figures 1 and 2,

Figure 4 is a cross-section of a detail of the apparatus of Figures 1 and 2, and

Figures 5 and 6 are exploded, partially-sectioned, perspective views of the detail of Figure 4, from different angles.

The drawings show apparatus, generally indicated 1, for steam-cleaning surfaces. It is intended to be connected to a steam source S of the type comprising a boiler which generates steam, a valve which controls the steam supply and which advantageously consists of a solenoid-valve, and a steam- and electrical-supply socket on the body which houses the boiler and the solenoid valve.

The apparatus 1 comprises a portable body 2 with a handle 3 and a shoulder or back carrying-strap 4, and a cleaning head 5.

The cleaning head 5 comprises a rigid casing defining a handle 7 which is divided internally by a wall 8 into a first and a second portion, indicated 9 and 10, respectively.

The cleaning head 5 also comprises a plurality of steam-delivery nozzles 11 and scraping-profile means 12 for cleaning previously-delivered condensed steam from the surface. The delivery of the steam will be explained in the following description with reference to steam-delivery means.

The scraping-profile means 12 comprise a squeegee body 13 formed in the head 5 and defined essentially by the first portion 9 of the cleaning head 5 and a straight, flexible wiping profile 14 made of rubber and associated with the squeegee body 13.

A condensate-collection side 14a, on which the liquid wiped from a surface accumulates, is defined on the wiping profile 14.

As already mentioned above, the apparatus 1 according to the invention comprises steam-delivery means, generally indicated 15. These means 15 comprise a first flexible pipe 16 extending between the solenoid valve of the steam source S and a connector 17 in the portable body 2, a second flexible pipe 18 extending between the connector 17 in the portable body 2 and the cleaning head 5, and a steam distributor 19 formed in the cleaning head 5 in the second portion 10 thereof.

In this connection, the wall 8 which defines the distributor 19 has a hole 20 to which the second flexible pipe 18 is connected. The second portion 10 and the distributor 19 are thus in communication with the steam source S.

The delivery means 15 also comprise the nozzles 11 which extend from the distributor 19 and are formed as straight capillary ducts. The nozzles 11 are spaced uniformly in a straight line and open in an abrasive brush 21.

The abrasive brush 21 is formed on one side of a spacer wall 45 which projects from the cleaning head 5 and in which the capillary nozzles 11 are formed, the walls also having a plurality of fins 46 alternating with the nozzles 11 and parallel thereto for preventing accidental release of drops formed on the brush 21.

The apparatus 1 according to the invention also comprises condensate-suction means 22 associated with the scraping-profile means 12.

The condensate-suction means 22 have a plurality of suction openings 23 spaced uniformly along the wiping profile 14 on its collection side 14a.

The suction means 22 also comprise a collector 24 which is formed inside the squeegee body 13 of the cleaning head 5 and into which the suction openings 23 open directly, and a condensate-suction hose 25 connected directly to the collector 24 and extending between the cleaning head 5, to which it is fixed, and the portable body 2.

The cleaning head 5 also has, on the first portion 9, a cover 47 which defines the collector 24 above the openings 23.

The cover 47 can be opened and closed by means of a snap mechanism 48 and defines an internal portion of the squeegee body 13 which can be inspected to permit cleaning operations which become necessary owing to the dirt contained in the condensate.

The suction means 22 comprise, housed inside the portable body 2, a centrifugal rotary extractor 26 with an impeller, and an electric motor 27, also housed in the portable body 2, for driving the impeller extractor 26.

The impeller extractor 26 has a suction hole 28, to which the suction hose 25 is connected, and a discharge opening 29.

In the apparatus 1, the hose 25 advantageously houses the second flexible pipe 18. In this connection, the connector 17 enables the pipe 16 to be connected, outside the hose 25, to the pipe 18 which extends inside the hose 25.

The second pipe 18 thus reaches the interior of the collector 24, from which it extends through the wall 8 defining the collector 24, into the distributor 19.

In this configuration, the suction hose 25 provides protection for the second steam pipe 18 and also thermal insulation which can prevent a user from being scalded.

The portable body 2 has, associated with its exterior, a dish-shaped reservoir 31 which can be emptied, which has transparent walls, and which communicates with the discharge opening 29. The reservoir 31 is disposed in a recess 32 in the lower portion of the body 2 to which it is attached by means of a push-button fastening 33 cooperating with a projecting edge 34 of the reservoir bearing on the inside of the recess 32 of the portable body 2.

The reservoir 31 also has an open upper access side 35 and is located in a manner such that the open side is disposed below the discharge opening 29.

The push-button fastening 33 and the projecting edge 34 constitute releasable means for attaching the reservoir 31 to the portable body 2.

The condensate extracted can thus collect in the reservoir 31 which can easily be emptied when the user notices that it is full through the transparent walls.

The apparatus 1 also comprises electrical wires 36 extending between the steam source S and the portable body 2. The wires 36 have the purpose of supplying the electric motor 27 and controlling and opening and closure of the solenoid valve of the steam source.

In this connection, the apparatus 1 comprises a switch 37 in the wires 36 for controlling both the solenoid valve and the electric motor 27. For more convenient operation, the switch 37 is located directly on the hand-grip, indicated 38, of the handle 3.

The switch 37 is of the type with three positions, of which one corresponds to the switching-off of the apparatus 1, one corresponds to the delivery of steam brought about by the opening of the solenoid valve, and one corresponds to the extraction of the condensate brought about by the switching-on of the electric motor 27.

The apparatus 1 also has a protective tube 39 which extends between the portable body 2 and the steam source S and is preferably made of insulating material, and which houses the first steam pipe 16 and the wires 36.

The apparatus 1 also has, at the end of the protective tube 39, an element 40 for quick-coupling to the steam source S, for engagement in a respective coupling socket P on the steam source S.

The socket P and the coupling element 40 provide both for steam communication between the source S and the first pipe 16 and for the electrical connection.

The portable body 2 has a compartment 41 for housing the coupling element 40 and releasable means 42 for engagement between the cleaning head 5 and the body 2 in a configuration of the apparatus 1 which is more convenient for carrying.

The releasable engagement means comprise a hook 43 on the cleaning head 5 for engaging in a corresponding eye 4 on the portable body 2.

The operation of the apparatus according to the invention will be described below with reference to the drawings.

After connecting the engagement element 40 to the corresponding socket P and grasping the cleaning head 5, a user can select opening of the solenoid valve by means of the switch 37, causing steam to be delivered by the nozzles 11 and hence by the brush 21. The latter is passed over the surface to be cleaned, for example, glass. The heat and the liquid nature of the steam P loosen the dirt which is on the surface on which a film of condensate containing some of the impurities derived from the aforementioned dirt remains.

By suitable manipulation of the cleaning head 5 and after shutting off the steam delivery with the switch 37,

the user passes the squeegee body 13 and, in particular, the profile 14 over the surface in order to wipe or clean and dry the film of condensate from the surface.

This operation is performed before the condensate acquires greater fluidity.

To prevent the condensate from running in trickles, rendering the cleaning operation at least partially ineffective, the motor 27 and with it the extractor 26, can be set in operation by means of the switch 37.

The resulting vacuum causes a suction on the collection side 14a of the profile 14 which extracts the condensate through the openings 23, the collector 24, and the suction hose 25 as far as the discharge opening 29.

From there the condensate reaches the reservoir 31 which can then be emptied as described above.

Many variations may be applied to the apparatus 1 according to the invention.

For example, it may be constituted by a cleaning head as described, by an extractor housed in the casing of the steam source, and by a suction hose extending between the head and the steam source.

The apparatus may be operated in a different manner, for example, by means of a pedal.

Moreover, the squeegee body may be separate from the cleaning head and the suction hose may be separate from the steam pipe.

For certain applications, the scraping-profile means may be formed differently, for example, as a brush instead of a squeegee, without losing their wiping ability which, in any case, is improved by the presence of the extractor.

Moreover, for certain applications the delivery means may have a single nozzle.

These modifications of the cleaning head may also be interchangeable.

In addition to the advantages mentioned above, the apparatus according to the invention has no electric current in the cleaning head, which cannot electrocute a careless user.

Moreover it is easy to handle even with one hand and enables surfaces of various types, such as domestic windows, motor-vehicle windscreens and bodywork, tiled walls, sanitary facilities, kitchen surfaces, and the like to be cleaned.

Furthermore, it permits cleaning of surfaces which have grooves, roughness or the like, and are very difficult to clean.

Moreover, the apparatus is easy to clean and put away. It can be assembled with currently-available components without incurring high costs.

Finally, it constitutes an ideal addition for someone who has a cleaning system with a steam source to which the apparatus can be adapted without any modification.

In order to satisfy further and contingent requirements, an expert in the art may apply to the apparatus described above many further modifications and variations all of which, however, are included within the scope of protection of the present invention as defined by the appended claims.

## Claims

1. Apparatus (1) for steam-cleaning surfaces, comprising steam-delivery means (15) connected to a steam source (S), a cleaning head (5) having at least one nozzle (11) which delivers steam coming from the delivery means (15), and scraping-profile means (12) for wiping the condensed steam from a surface, characterized in that it comprises condensate-suction means (22) associated with the scraping-profile means (12).

2. Apparatus (1) according to Claim 1, in which the scraping profile means (12) comprise at least one squeegee body (13) which has a flexible wiping profile (14), the suction means (22) comprising a plurality of suction openings (23) associated with the flexible wiping profile (14), along a condensate-collection side (14a) thereof.

3. Apparatus (1) according to Claim 2, in which the suction means (22) comprise a condensate-collector (24) disposed inside the squeegee body (13), a condensate-suction hose (25) connected to the collector (24) and an extractor (26) connected to the suction hose (25), the suction openings (23) opening directly into the collector (24).

4. Apparatus (1) according to Claim 3, comprising a portable body (2) which houses the extractor (26) and a motor (27) connected to the extractor (26), the extractor (26) having an opening (29) for discharging the condensate from the portable body (2).

5. Apparatus (1) according to Claim 4, in which the portable body (2) has a reservoir (31) which can be emptied and which is in communication with the discharge opening (29).

6. Apparatus (1) according to Claim 4, in which the steam-delivery means (12) comprise a first flexible pipe (16) between a steam-delivery valve of the steam source (S) and the portable body (2), a second flexible pipe (18) extending between the portable body (2) and the cleaning head (5), a distributor (19) formed in the cleaning head (5) and connected to the second flexible pipe (18), and a plurality of steam-delivery nozzles (11) on the cleaning head (5) in hydraulic communication with the distributor (19).

7. Apparatus (1) according to Claim 6, in which the motor (27) is electric and the steam-delivery valve is a solenoid valve.

8. Apparatus (1) according to Claim 7, which comprises at least one switch (37) on the portable body (2) for controlling the electric motor (27) and the solenoid valve, with wires (36) extending between the portable body (2) and the steam source (S) for the electrical supply of the motor (27) and for the electrical control of the solenoid valve, and a protective tube (39) which houses the wires (36) and the first flexible pipe (16).

9. Apparatus (1) according to Claim 2, in which the squeegee body (13) is formed in the cleaning head (5).

10. Apparatus (1) according to Claims 6 and 9, in which the condensate-suction hose (25) houses the second flexible steam pipe (18) between the portable body (2) and the cleaning head (5).

11. Apparatus (1) according to Claim 6, which comprises an element (40) for quick-coupling to the steam source (S) at the end of a protective tube (39) which houses the first flexible pipe (16), the portable body (2) having a compartment (41) for housing the quick-coupling element (40) in a carrying configuration.

12. Apparatus (1) according to Claim 10, which comprises releasable means (42) for engagement between the cleaning head (5) and the portable body (2).

13. Apparatus (1) according to Claim 12, in which the releasable engagement means (42) comprise a hook (43) on the cleaning head (5) and a corresponding eye (44) on the portable body (2).

14. Apparatus (1) according to Claim 8, in which the portable body (2) comprises a handle (3) which has a hand-grip (38) on which the at least one switch (37) is located.

15. Apparatus (1) according to Claim 4, which comprises a shoulder or back carrying-strap (4) associated with the portable body (2).

16. Apparatus (1) according to Claim 5, in which the reservoir (31) is associated externally with the portable body (2), the reservoir (31) having transparent walls.

17. Apparatus (1) according to Claim 16, in which the reservoir (31) is dish-shaped, having an open upper side (35) disposed below the discharge opening (29) of the extractor (26).

18. Apparatus (1) according to Claim 17, in which the dish-shaped reservoir (31) has releasable means (33, 34) of attachment to the portable body (2) to enable it to be emptied.

19. Apparatus (1) according to Claim 3, in which the collector (24) is defined by a cover (47) which can be opened by a snap mechanism (48) and which defines a portion (9) of the squeegee body (13) which can be inspected to permit cleaning operations.

20. Apparatus (1) according to Claim 8, in which the at least one switch (37) is of the type with three positions, of which one corresponds to the switching-off of the apparatus (1), one corresponds to the delivery of steam brought about by the opening of the solenoid valve, and one corresponds to the extraction of the condensate brought about by the switching-on of the electric motor (27).

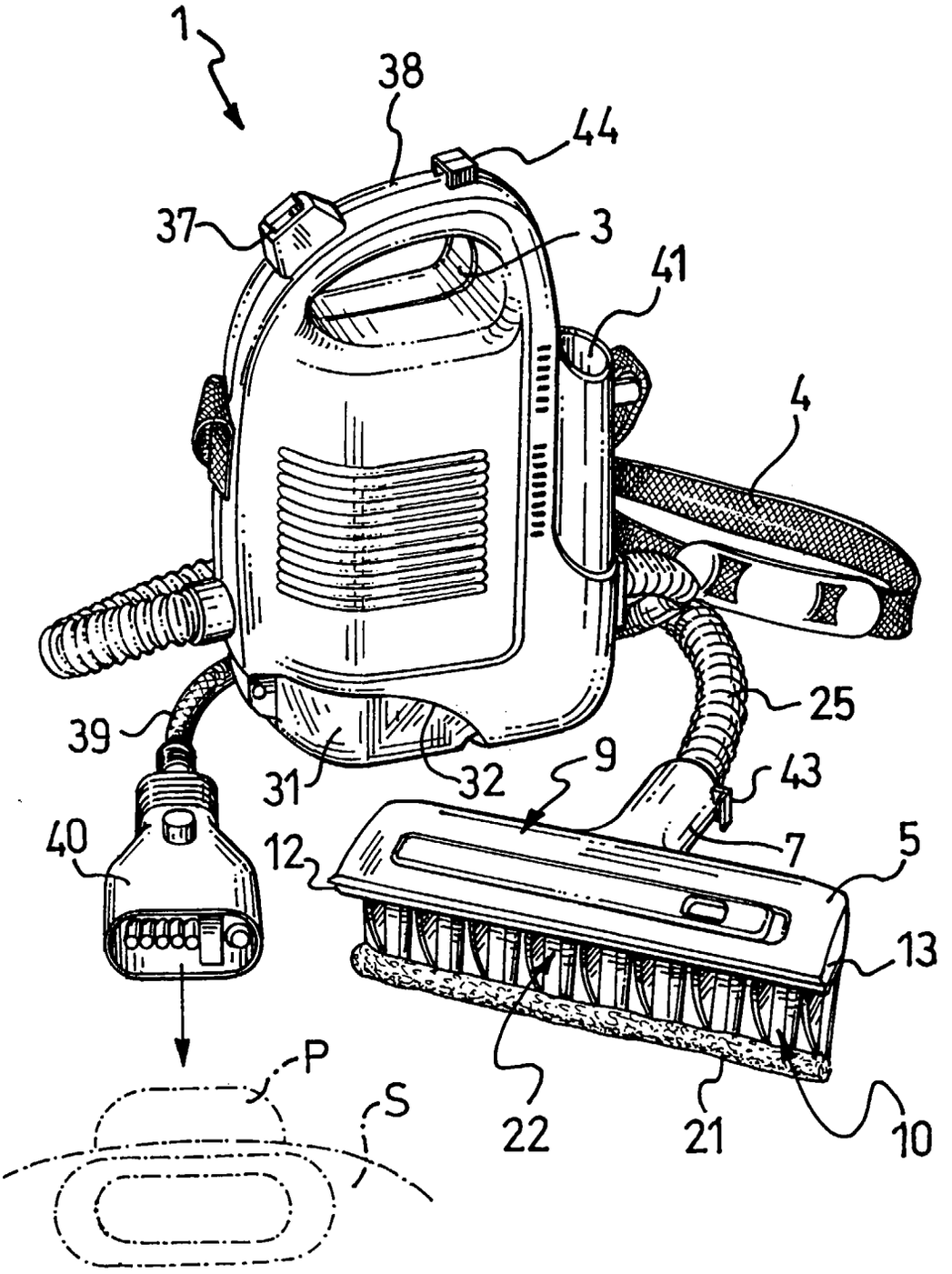


FIG.1

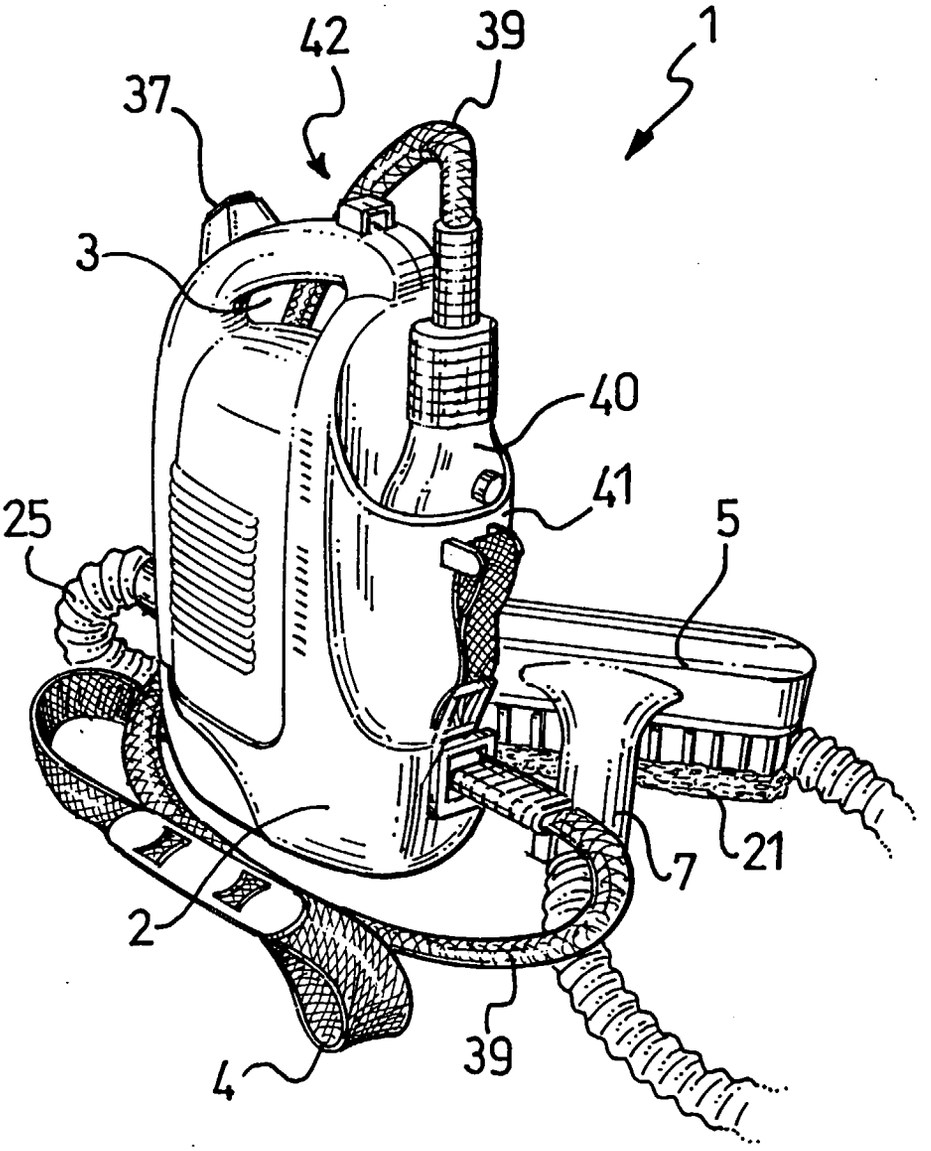


FIG.2

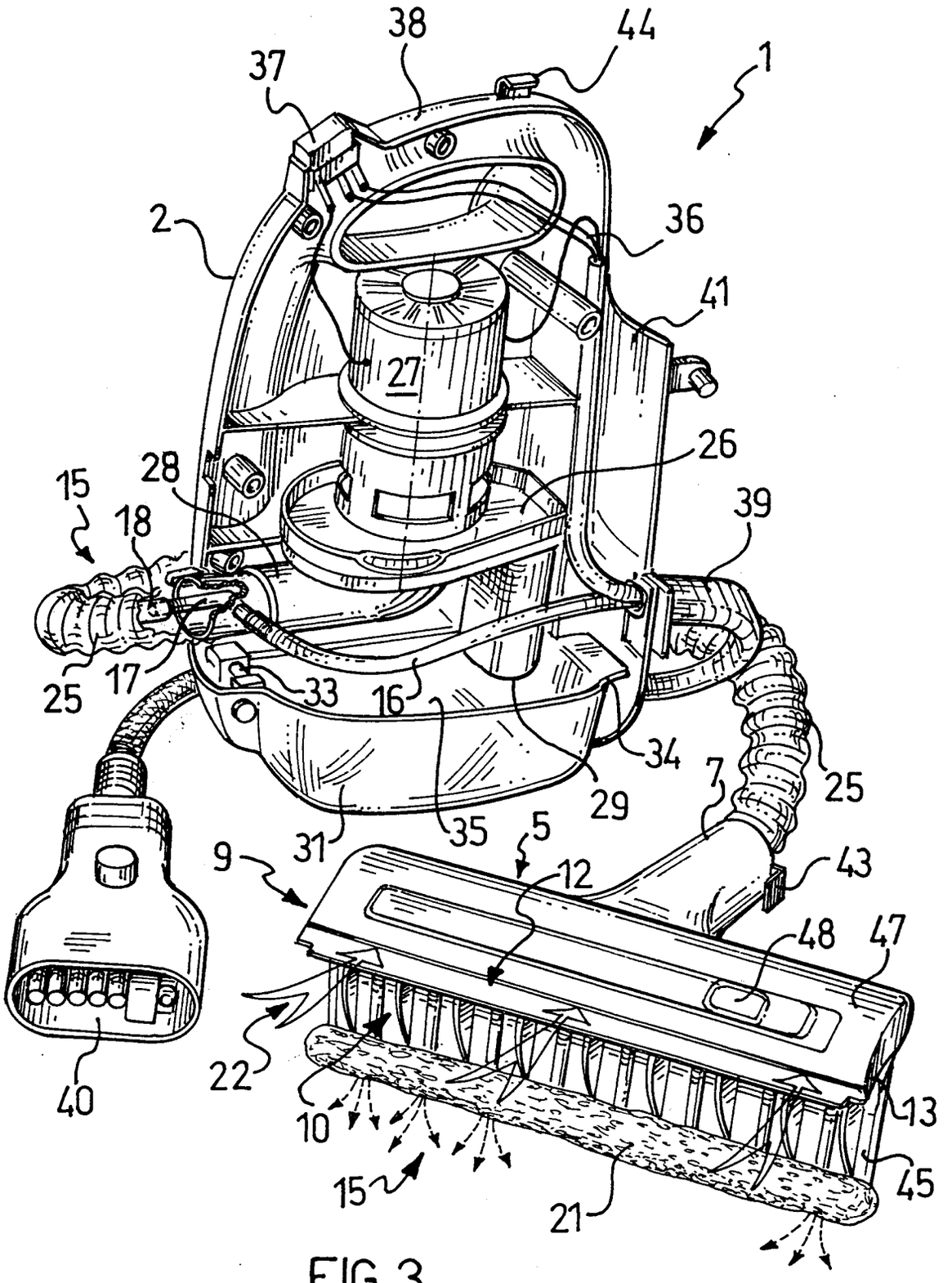
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FIG.3

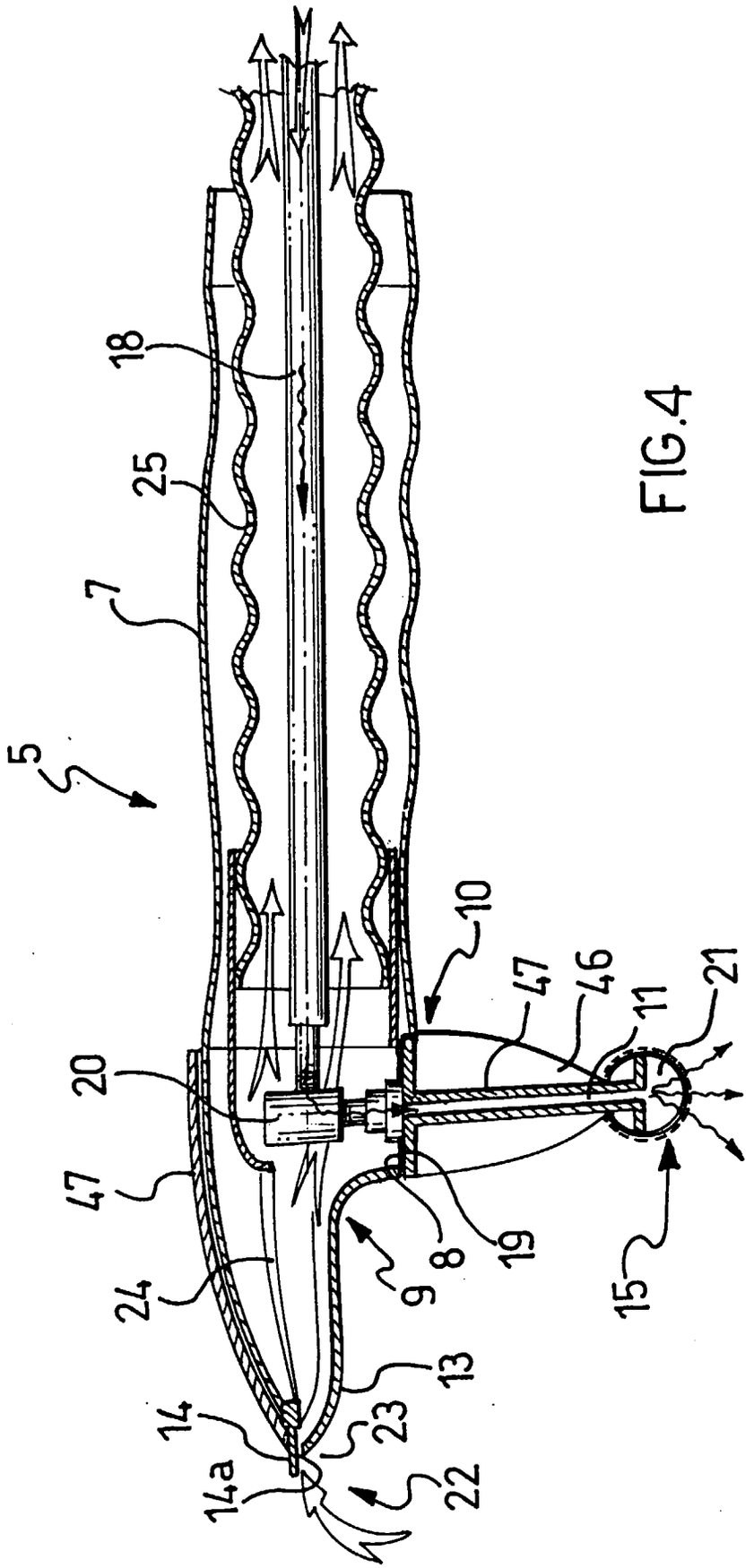


FIG.4

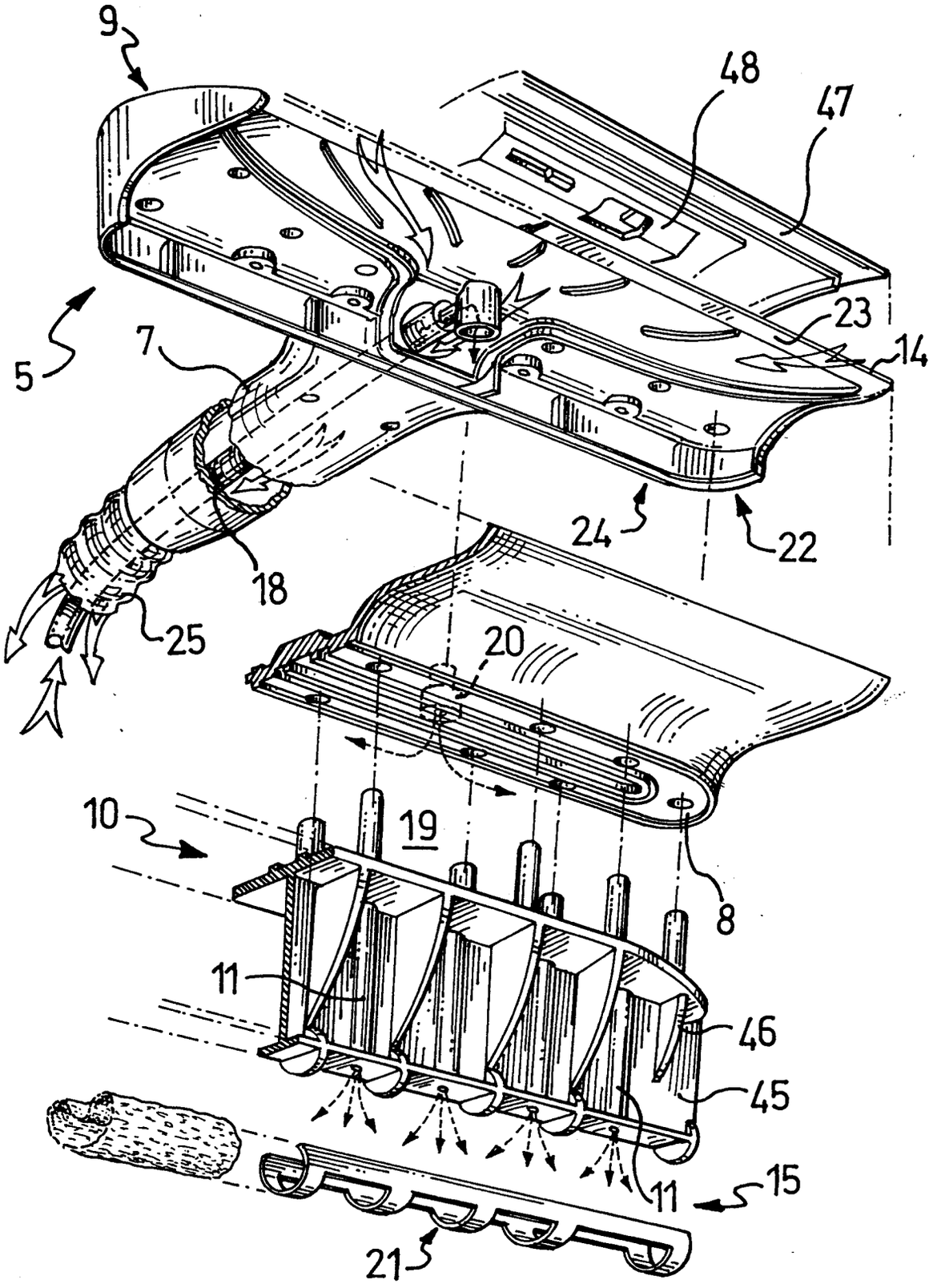


FIG.5

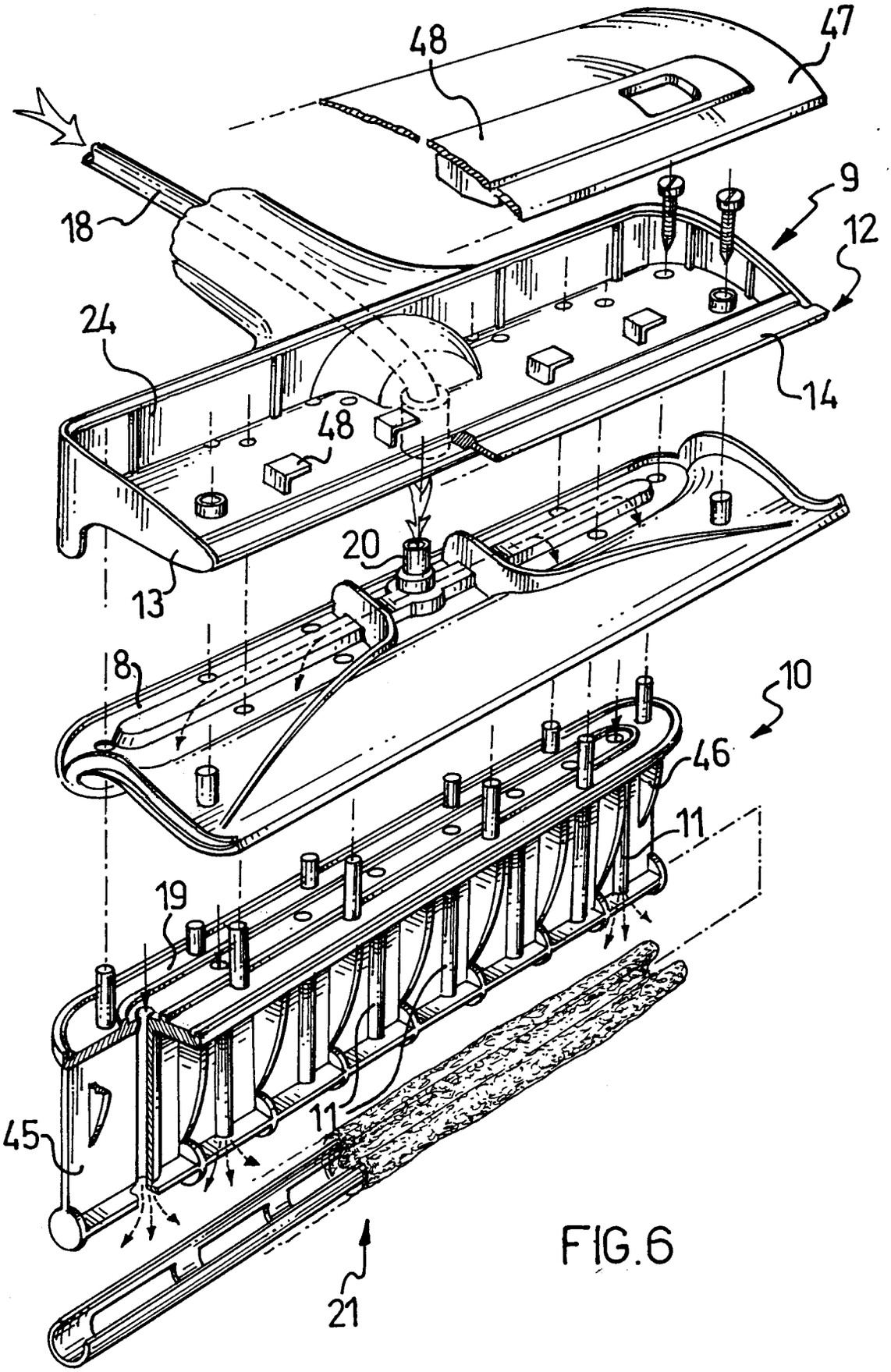


FIG.6