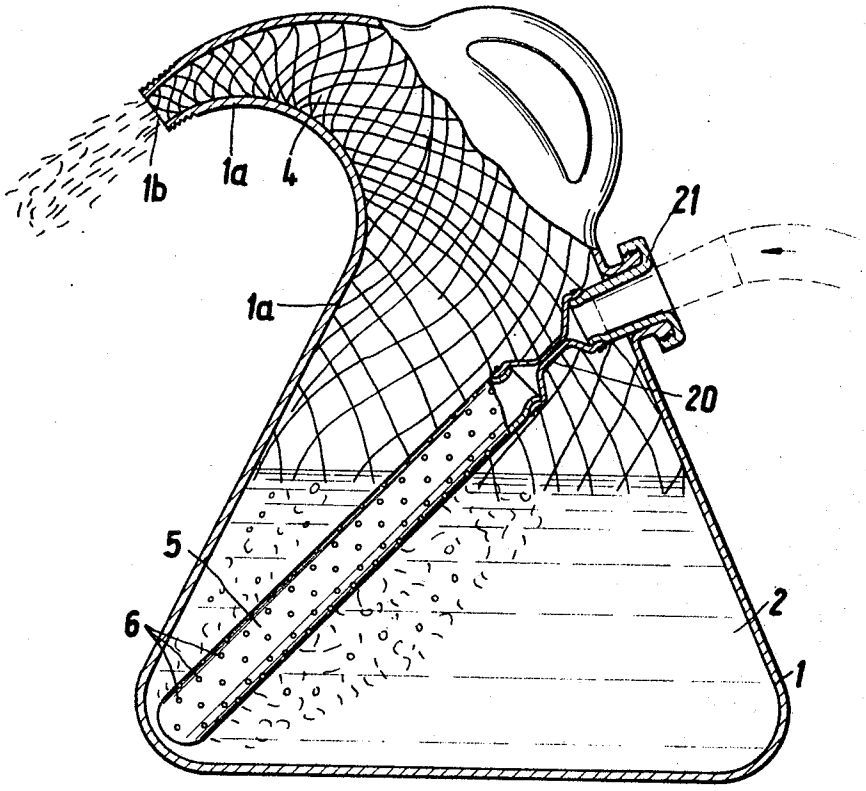
June 3, 1969 E. NOHL 3,447,754

FOAM CLEANING

Filed Oct. 4, 1965 Sheet 1 of 3

Fig. 1



Inventor:
EGON NOHL

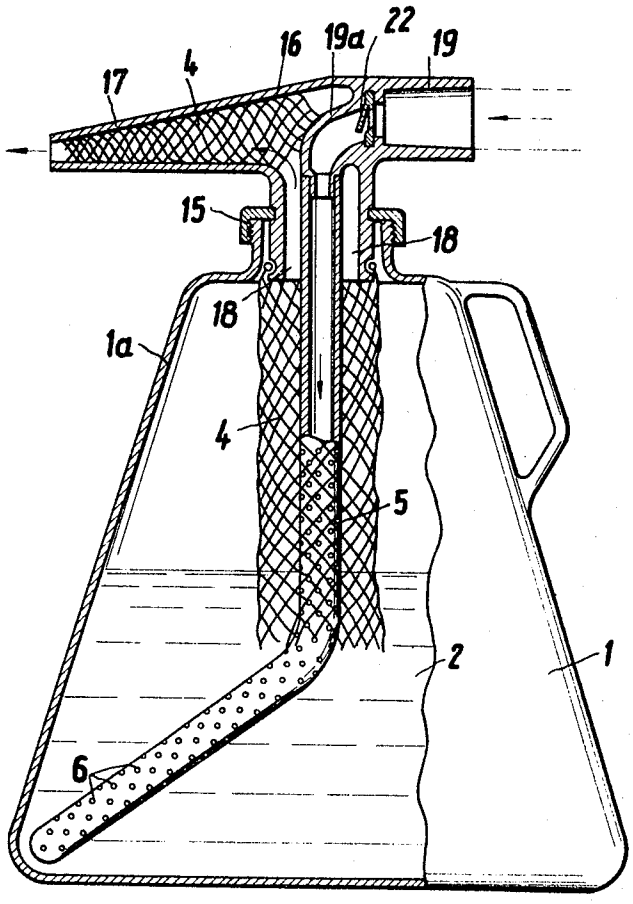
By H. Edward Mostern

June 3, 1969 E. NOHL 3,447,754

FOAM CLEANING

Filed Oct. 4, 1965 Sheet 2 of 3

Fig.2



Inventor:
EGON NOHL

BY H. Edward Mostern

June 3, 1969 E. NOHL 3,447,754

FOAM CLEANING

Filed Oct. 4, 1965 Sheet 3 of 3

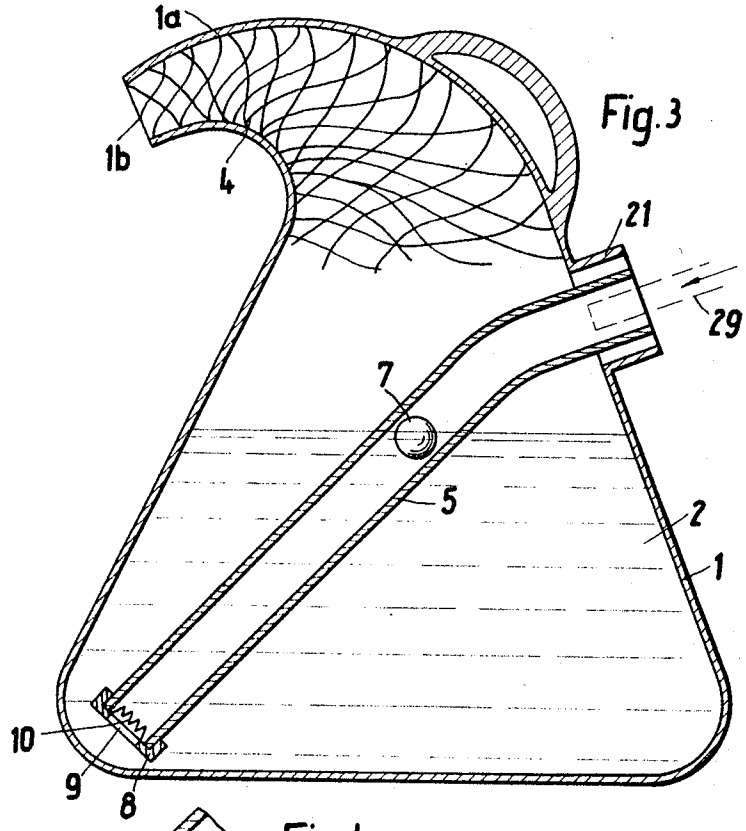


Fig. 3

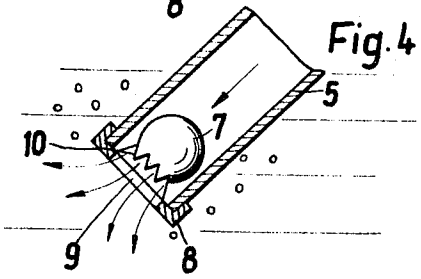


Fig. 4

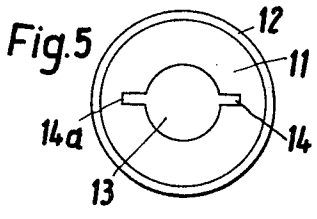


Fig. 5

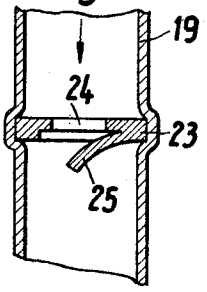


Fig. 6

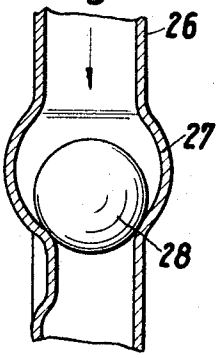


Fig. 7

Inventor:
EGON NOHL

By H. Edward Mostern

United States Patent Office 3,447,754
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3,447,754

FOAM CLEANING

Egon Nohl, Wiener Neustadt, Austria, assignor to Firma Lewo, Chemische Fabrik GmbH, Steinau, Kreis Schluchtern, Germany

Filed Oct. 4, 1965, Ser. No. 492,390
Claims priority, application Germany, Oct. 16, 1964, N 25,691; Aug. 7, 1965, N 27,150
Int. Cl. B05b 7/28, 1/34
U.S. Cl. 239—343 19 Claims

This invention concerns improvements in and relating to foam cleaning.

Cleaning and maintaining coarse fabrics such as carpets is effected to an increased degree by means of cleaning and maintenance agents which are applied in the form of foam on the fabric, distributed and after a certain time of action are removed again by brushing off, vacuuming or beating out. The application heretofore was effected by means of manual implements in which the cleaning fluid is charged and the foam is formed and applied to the floor covering by means of mechanically driven brushes. This method of operation is cumbersome and offers no guarantee for the forming of a dry foam and its effective working into the fabric.

An object of the present invention is to provide a method and an apparatus suitable for carrying it out by means of which a practically completely dry foam is produced and applied effectively on the fabric, i.e. adapted even to be charged into the lower lying regions of the fabric.

According to the invention foam is produced by injecting compressed gas such as compressed air into the liquid treatment agent and force, by further impacting with compressed gas, through an outlet passage containing a screen and/or mesh and having a constricted cross-section, and centrifuged onto the fabric.

As mesh or screen member any metal, textile or the like screen or mesh may be used. Preferably however, a tubular screen or mesh member is provided having a mesh reduction in the outlet passage corresponding to the cross-sectional constriction. In this case marketable and hence good value finished products, e.g. of plastics material, metal wire or the like may be used. As pressure gas source any device may be provided. Thus, for example, in the case of large-size technical cleaning installations compressed gas cylinders or stationarily installed blowers may be used, whilst in individual domestic cleaning the conventional vacuum cleaner may be employed as compressed air source.

Carrying out the method of the invention in accordance with the invention is effected by means of a container to receive cleaning fluid, the funnel-like constricted part of which located above the liquid level is filled with a screen and/or mesh and in which a pipe is retained which immerses in the treatment liquid and is provided with outlet openings and adapted to be connected to a compressed air or compressed gas source. The funnel-like extending end of the container is preferably bent sidewise or extended diagonally downwards. In this way the foam outlet opening in the upright working position of the apparatus maintains a favourable position relative to the working surface, whereby a constantly satisfactory immersion of the gas supply pipe in the liquid is ensured.

The air supply pipe may comprise a pipe closed at its free end and having holes, slots or the like for the gas outlet formed in the pipe wall. With particular advantage however there is used an all around closed pipe open at its free end immersed in the liquid, in which a buoyant ball is enclosed and which is closed by means of an elastic cap, which has an opening deviating from the simple circular shape, the notional circle having a smaller diameter than the ball enclosed in the pipe. Thus, for example, it is possible to provide a closure cap having a circular opening serrated saw-like at its edge, the saw-like ring of serrations preferably being bent into the interior of the pipe. The saw-like serrated opening may also be replaced by an oval or square and a circular opening having slots branching off laterally, the minimum internal diameter of which is smaller than the diameter of the ball enclosed in the gas supply pipe. This embodiment, apart from the substantially simplified method of production, has the advantage that the supply of air forced into the treatment liquid is constantly regulated automatically to the quantity predetermined by the size of the foam outlet opening provided in the container. Thus, for example, when the pressure of the air introduced into the air supply pipe is increased the ball is urged with greater force against the elastic closure cap, whereby, corresponding to the elastic deformation of the closure cap caused thereby, the outlet openings are reduced. Owing to the direct dependency of the supplied air upon the pressure on the one hand and upon the size of the outlet openings on the other hand the increase of conveying capacity resulting from the increase of pressure is compensated by accordingly reducing the outlet openings. To obtain this effect it is of course also possible conversely to replace a resilient cap in conjunction with a rigid ball by a fixed cap in conjunction with an elastic buoyant ball. The ball to obtain its buoyancy may be a hollow ball or made of a light material.

A further essential advantage of such a construction of the gas supply pipe also consists in reliably preventing the gas passage openings from being blocked, as the buoyant ball in the inoperative position floats on the treatment liquid and hence in this position a considerably enlarged communicating opening between the pipe interior and container is exposed, through which any particles of dirt possibly carried along can readily pass over into the container. The particles of dirt hence collect in the storage container whence they can readily be removed or with the subsequent actuation be discharged together with the foam.

The gas supply pipe may be secured with its open end rigidly on the container wall, in which case a conical seat, a bayonet catch or a threaded socket pipe is provided for attached to a gas pressure hose, in the pipe end or in a socket pipe of the side wall. It is however also possible for the pipe to be inserted from above through the container outlet for the emission of foam, in which case for closing the container there is preferably provided a nozzle head, for example, having a screw thread through or adjacent to the opening through which the air supply pipe is passed into the container. The essential advantage of this embodiment consists in that the whole nozzle head comprising the foam outlet opening and gas supply pipe in its essential parts may be made, for example, of plastics material in one piece and hence at good value. The further advantage of this embodiment also consists in that the screen or mesh can be arranged coaxially about the pipe and secured to the nozzle head, so that a unit is obtained which is simply and readily secured and which, for example for topping up or cleaning the container, may be removed as a whole.

The gas supply pipe is preferably provided on its upper end facing the pressure source with a non-return valve. In this way if the gas supply pipe is inadvertently connected to the suction pipe instead of to the pressure pipe, for example of a vacuum cleaner, the liquid contained in the container cannot be sucked into the vacuum cleaner. As non-return valve any valve may be provided, for example, a lip, flap or ball valve. In the event of using a gas supply pipe having a buoyant ball enclosed in the supply pipe a ball non-return valve is preferably used, since in this case the ball serving the pressure medium

control may simultaneously act as closure member for the non-return valve. In this case it is only necessary to introduce a valve seating sleeve into the gas supply pipe.

When carrying out the method according to the invention the foam is sprayed under pressure against the article to be treated and in this manner also forced right into the deeper layers of the fabric. Nevertheless it may be convenient in certain instances to follow up the spraying operation directly by a distributing and possibly a brushing operation, for which purpose for example a roller mounted so as to be rotatable on an axis may be used, the roller comprising a number of elastic cylindrical discs of a sponge-like material mounted at spaced intervals in juxtaposition on the axis. By means of this device the foam may be uniformly spread and a kneading action supporting the cleaning effect obtained without the foam, as in the case of using a solid axle progressively displaced by the roller. An advantageous feature herein is the mounting additionally of a brush or bristle ledge on a crosshead of the device, adapted to assume such an angled position relative to the brush that by slightly swinging the handle it comes into action either on its own or simultaneously with the roller in local succession.

The invention is illustrated by way of example in the accompanying drawings, in which:

FIG. 1 shows a foam producing and foam applying device in section in accordance with the invention,

FIGS. 2 and 3 show alternative embodiments of such a device are also shown in section,

FIG. 4 shows an enlarged fragmentary section of a gas supply pipe used in the device of FIG. 3,

FIG. 5 is a plan of an alternative embodmient of a closure cap, and FIGS. 6 and 7 show by way of example embodiments of non-return valves for use in the gas supply pipes.

The apparatus shown in the drawing comprises in accordance with the invention a container **1** for receiving cleaning liquid **2**, the part **1***a* of which disposed above the liquid level and serving the discharge of the foam formed is funnel-like and houses a screen and/or mesh **4**. Further retained in the container is a pipe **5** immersing in the cleaning liquid **2** and provided with outlet openings, which is adapted to be connected to a compressed air or compressed gas source. The funnel-like tapering end **1***a* of the container **1**—see more especially FIGS. 1 and 3—is bent so as to extend diagonally downwards, whereby it is achieved that the foam outlet opening **1***b*, in an upright working position of the device, assumes a favourable position relative to the working surface so that a constant satisfactory immersion of the gas supply pipe **5** in the liquid **2** is ensured.

As mesh or screen member any metal, textile or the like sieve or mesh may be used. Preferably however a tubular sieve or mesh member is used the width of mesh of which is also reduced in accordance with the cross-sectional constriction in the outlet passage. FIG. 1 shows such a mesh, the width of mesh of which in the part of the container **1** disposed directly above the liquid **2** is substantially larger than the adjacent part in the foam outlet opening **1***b*.

The gas supply pipe may comprise a pipe closed at its free end and having holes **6**, slits or the like for the gas outlet formed in the pipe wall. Such an embodiment is shown in FIGS. 1 and 2.

Preferably however there is used—see FIGS. 3 and 4—an allround enclosed pipe open at its free end which immerses in the liquid, in which pipe a buoyant ball **7** is enclosed and which is closed by means of an elastic cap **8** which has an opening **9** deviating from the simple circular shape, the notional circle described thereby having a smaller diameter than the ball **7** enclosed in the pipe. Thus, for example, a closure cap may be provided having a circular opening serrated saw-tooth-like at its edge **10**, the saw-tooth-like serrated ring **10** preferably being bent over inwardly of the pipe **5**. In place of a saw-tooth-like serrated opening it is however also possible to provide an oval, square or a circular opening having slits branching off laterally, the smallest inner diameter of which is smaller than the diameter of the ball enclosed by the gas supply pipe. Such an embodiment is shown, for example, in FIG. 5. It shows a cap base **11** with a laterally encircling bulge **13** for slipping the cap over the pipe and a circular opening **13**, emanating laterally from the slits **14** and **14***a* into the cap base **11**.

The above described embodiment of the gas supply pipes has the particular advantage that the quantity of air forced into the treatment liquid is constantly and automatically regulated to a predetermined quantity by the size of the foam outlet opening provided in the container. Thus, for example, by increasing the pressure of air introduced the ball is urged with greater force against the elastic closure cap, whereby in accordance with the elastic deformation of the closure cap the outlet openings are reduced. Owing to the immediate dependence of the supplied air quantity upon the pressure on the one hand, and upon the size of the outlet openings on the other hand, the increase of output given by the pressure increase will be compensated by the corresponding reduction of the outlet openings. To obtain this effect it is of course also possible conversely to use instead of an elastic cap in conjunction with an elastic buoyant ball or an elastic cap in conjunction with an elastic ball. To obtain the buoyancy of the ball **7**, the latter may be produced as a hollow ball or from a light material.

The gas supply pipe **5** may be secured with its open end rigidly on the side wall of the container **1**, in which case in the pipe end or in a socket of the side wall there is provided a conical seat, a bayonet catch or a threaded socket for mounting the gas pressure pipe. Such a rigid arrangement of the gas supply pipe in the container wall is shown in FIGS. 1 and 3.

The gas supply pipe however may also—see FIG. 2—be inserted from above through the container outlet for the foam, in which case for closing the container a nozzle head **16** provided with a screw thread **15** having a constricting foam outlet opening **17** may be provided through the opening **18**, through which the air supply pipe **5** is passed, which by means of a pipe socket **19**, **19***a* arranged in the nozzle head **16** may be conneocted to a compressed air source. The substantial advantage of this embodiment consists in that the whole nozzle head comprising the foam outlet socket and gas supply pipe in its most essential parts may be made—for example of plastics material—in one piece and hence at good value. A further advantage also consists in that the mesh **4** may be arranged around the gas supply pipe and secured to the nozzle head **16**, so that the whole arrangement forms a unit readily detached from the container. It is also possible in this way for the container to be cleaned or topped up in a simple manner.

The gas supply pipe **5** is preferably provided at its upper end facing the pressure source with a non-return valve. In this way, in the event of the gas supply inadvertently being connected to the suction pipe instead of the pressure pipe of a vacuum cleaner, the liquid contained in the container is prevented from being sucked into the vacuum cleaner. In the case of FIG. 1 there is even incorporated a so-called lip valve **20**, comprising an elastic tubular member having walls supported lip-like one on the other between gas supply pipe **5** and connecting socket **21** for the compressed gas hose, whilst in the case of FIG. 2 a flap valve **22** is provided.

The flap valve **22** is shown enlarged in FIG. 6. It comprises a closure disc **23** inserted, in this embodiment, in the nozzle head **19**, the disc having a gas passage opening **24** and an elastic lip **25** serving the closure thereof. It is of course also possible to provide a ball valve shown by way of example in FIG. 7, comprising a ball socket **27** arranged in the gas supply pipe **26** with an enclosed ball **28**.

In the event of using the embodiment shown in FIG. 3

a ball valve is preferably used, in which case it only requires the arrangement of a ball seating sleeve **29** in the end of the gas supply pipe **5** secured in the container wall **1** or nozzle head **16**. The ball **7** enclosed in the gas supply pipe **5** in this case serves as valve member for closing the valve sleeve **29** in the event of being connected by mistake to the compressed air source.

For carrying out the method the liquid container is connected with its connecting socket **29** or **21** to the compressed air source, whereupon a pressure medium is forced via the gas supply pipe **5** and the outlet openings **6** or **9**, **10** into the liquid. Consequently foam is formed which due to further impacting by a pressure medium is forced through the mesh **4** with continuous cross-section reduction, whereupon a considerable speed is obtained. The foam is then ejected at relatively high speed from the outlet opening **1***b* or **17** and in this way is applied to the fabric and charged extremely effectively therein.

I claim:

1. Apparatus for cleaning and maintaining coarse fabrics such as textile floor coverings comprising; a container; a container bottom part for receiving a liquid treatment agent; a container upper part adapted for discharge of foam and being tapered inwardly and upwardly away from said bottom part; a sieve in said upper part; a gas supply pipe secured in said upper part, extending into said bottom part and being adapted to be connected to a source of compressed gas; and outlet openings in said gas supply pipe communicating at least with said bottom part.

2. Apparatus as claimed in claim **1** with an end part of said upper part being curved over and extending diagonally downwardly.

3. Apparatus as claimed in claim **1** with a tubular mesh sieve, the width of mesh being reduced corresponding to the taper of said upper part.

4. Apparatus as claimed in claim **1** with a closed wall around said gas supply pipe and an open end in said bottom part, an apertured cap mounted on said open end and a buoyant ball housed in said pipe adjacent the cap, in which irregular ball retaining edges bound the aperture.

5. Apparatus as claimed in claim **1** with an apertured wall around said gas supply pipe and a closed end in said bottom part.

6. Apparatus as claimed in claim **4** in which the opening is circular and the edges serrated.

7. Apparatus as claimed in claim **6** in which the serrated edges extend into said gas supply pipe.

8. Apparatus as claimed in claim **4** in which the cap is resilient and the opening is oval.

9. Apparatus as claimed in claim **4** in which the cap is resilient and the opening is square.

10. Apparatus as claimed in claim **4** in which the cap is resilient and the opening is circular, with laterally extending slits.

11. Apparatus as claimed in claim **4** in which the cap is rigid and the buoyant ball resilient.

12. Apparatus as claimed in claim **4** in which the cap and the buoyant ball are both resilient.

13. Apparatus as claimed in claim **4**, in which the buoyant ball is hollow.

14. Apparatus as claimed in claim **1** in which the gas supply pipe is rigidly secured to the container upper part.

15. Apparatus as claimed in claim **1** having a nozzle head engageable with the container upper part, a tapered outlet and a nozzle socket in the nozzle head, the gas supply pipe being connected to the nozzle socket and extending through the nozzle head.

16. Apparatus according to claim **15** in which mesh fabric is disposed around the gas supply pipe and secured to the nozzle head, forming a detachable unit therewith.

17. Apparatus as claimed in claim **1** with a non-return valve in the gas supply pipe for preventing outlet of liquid therethrough.

18. Apparatus as claimed in claim **17** having a flap non-return valve.

19. Apparatus as claimed in claim **4** with a valve seating in the gas supply pipe, the valve seating and the buoyant ball forming a non-return valve for preventing outlet of liquid through the gas supply pipe.

References Cited

UNITED STATES PATENTS

1,995,215	3/1935	Mehlsen et al.	252—359.5
2,107,666	2/1938	Hechman	252—359.5
2,540,064	1/1951	Weber	252—359.5
3,258,803	7/1966	Wolter et al.	252—359.5

FOREIGN PATENTS

832,774	7/1938	France.

EVERETT W. KIRBY, *Primary Examiner.*

U.S. Cl. X.R.

8—142; 252—359

PO-1050
(5/69)

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,447,754 Dated June 3, 1969

Inventor(s) EGON NOHL

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

The name of the assignee should be changed

from: Lewo

to: Rewo

SIGNED AND
SEALED
DEC 23 1969

(SEAL)
Attest:

Edward M. Fletcher, Jr.
Attesting Officer

WILLIAM E. SCHUYLER, JR.
Commissioner of Patents