United States Patent [19]

Fegan

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[45] **Apr. 8, 1975**

[54] **RUG SHAMPOOER**

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[73] Assignee: **General Signal Corporation,** Rochester, N.Y.

[22] Filed: **Aug. 1, 1973**

[21] Appl. No.: **384,851**

[52] **U.S. Cl.** ..... **15/50 C**

[51] **Int. Cl.** **A47l 11/34**

[58] **Field of Search** ..... 15/24, 29, 50 R, 50 C, 15/98, 320, 321

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Primary Examiner—Edward L. Roberts

Attorney, Agent, or Firm—Milton E. Kleinman; Harold S. Wynn; John Ohlandt

[57] **ABSTRACT**

A rug shampooing machine, including means for producing dry foam from a liquid detergent source and for working such foam into a rug or carpet by means of a brush rotating on a horizontal axis; further comprising a vacuum nozzle, roller and squeegee means for picking up the dirty solution resulting from the scrubbing or shampooing action. A foam generator mechanism is especially adapted to produce the aforesaid foam from the detergent source. This mechanism includes two rollers situated above the scrubbing brush, just below the outlet from the detergent source. The axes of the rollers are in a substantially horizontal plane and parallel to the surface to be cleaned. The rollers are of different diameters, the larger of the two being a foam plastic roller, which is driven by a belt connected to the scrubbing brush. The two rollers are continuously compressed together in order to create the desired foam. A reverse-stroke brush lift-off mechanism is also incorporated in the rug-shampooing machine. The scrubbing brush, being in contact with the surface to be cleaned, is active in propelling the machine forwardly and is effective in working the foam detergent into the rug. However, on the return stroke, which is a natural stroke that the user would tend to indulge in because it has become a habit in the use of conventional vacuum cleaners, the rotation of the brush would act to interfere with easy return movement. Accordingly, as the user pulls the machine backwardly, the brush is lifted by means of a reaction principle involving very little force.

6 Claims, 9 Drawing Figures

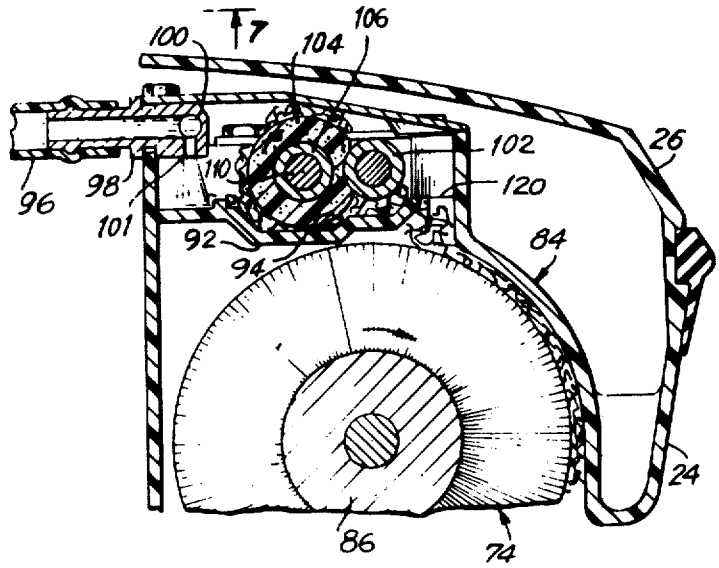


FIG. 1

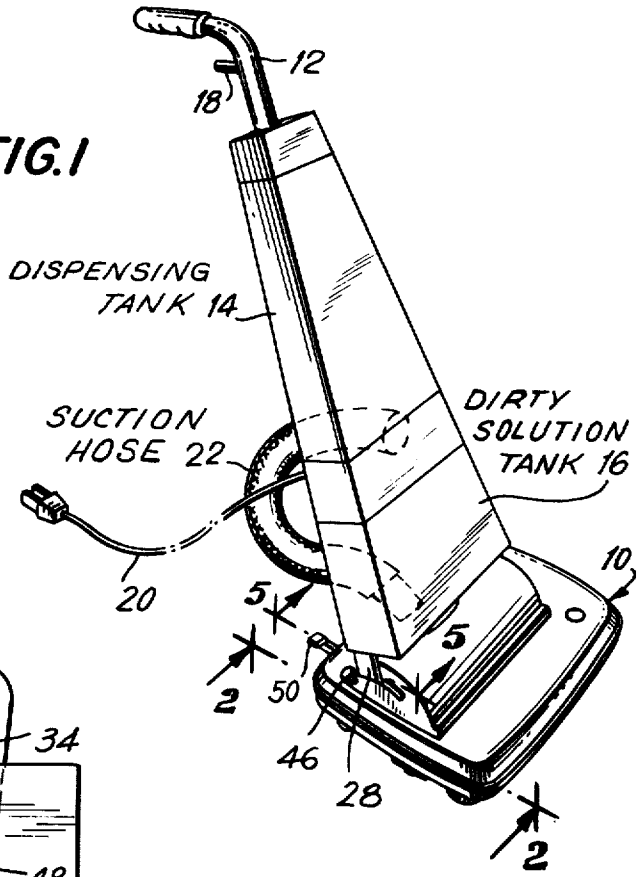


FIG. 4

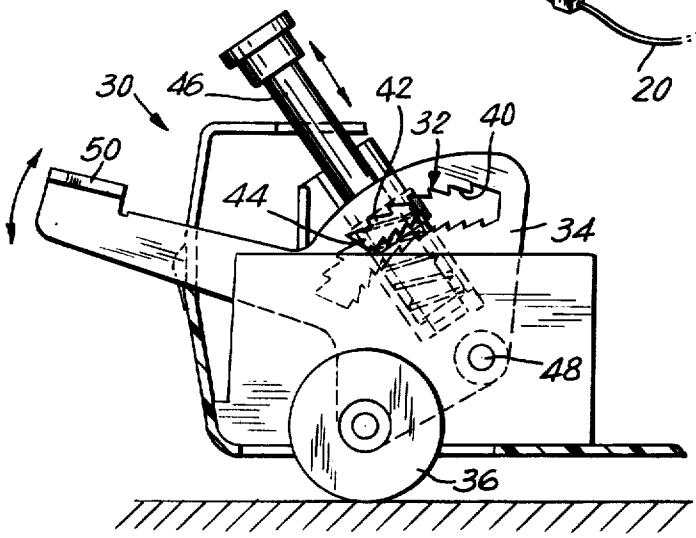
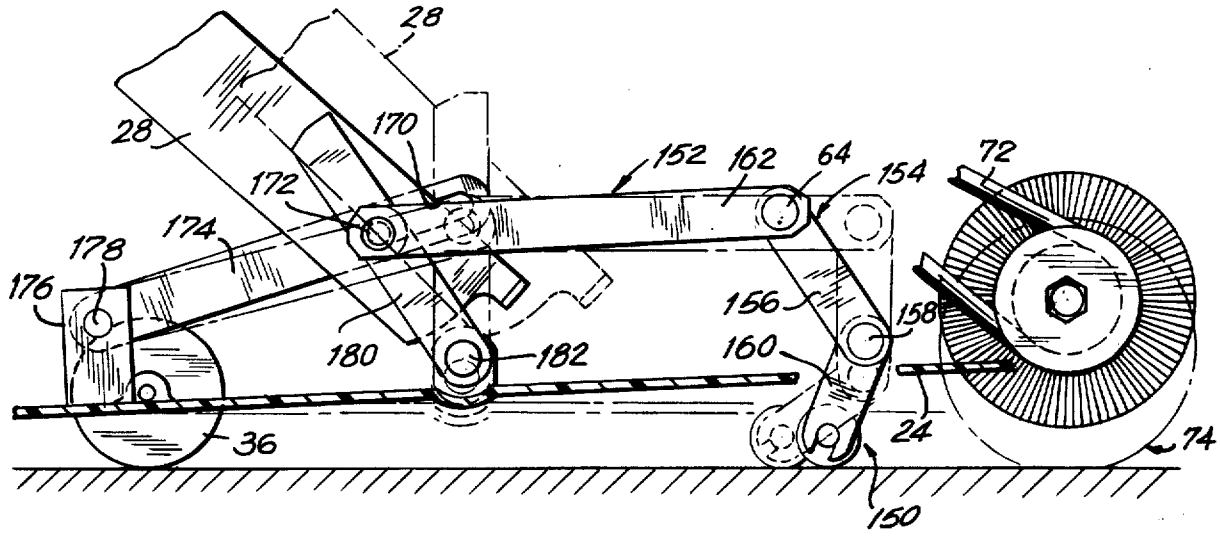


FIG. 5



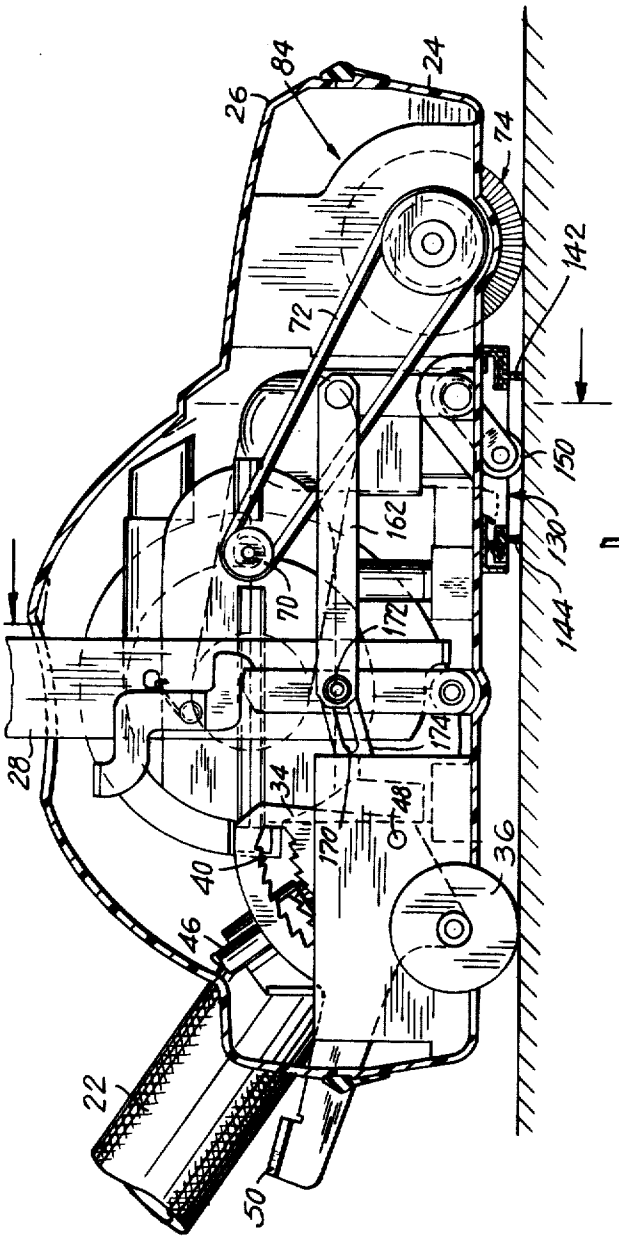

26
84
24
74
142
72
162
70
172
150
130
144
28
174
34
48
170
36
40
46
22
50

FIG. 2

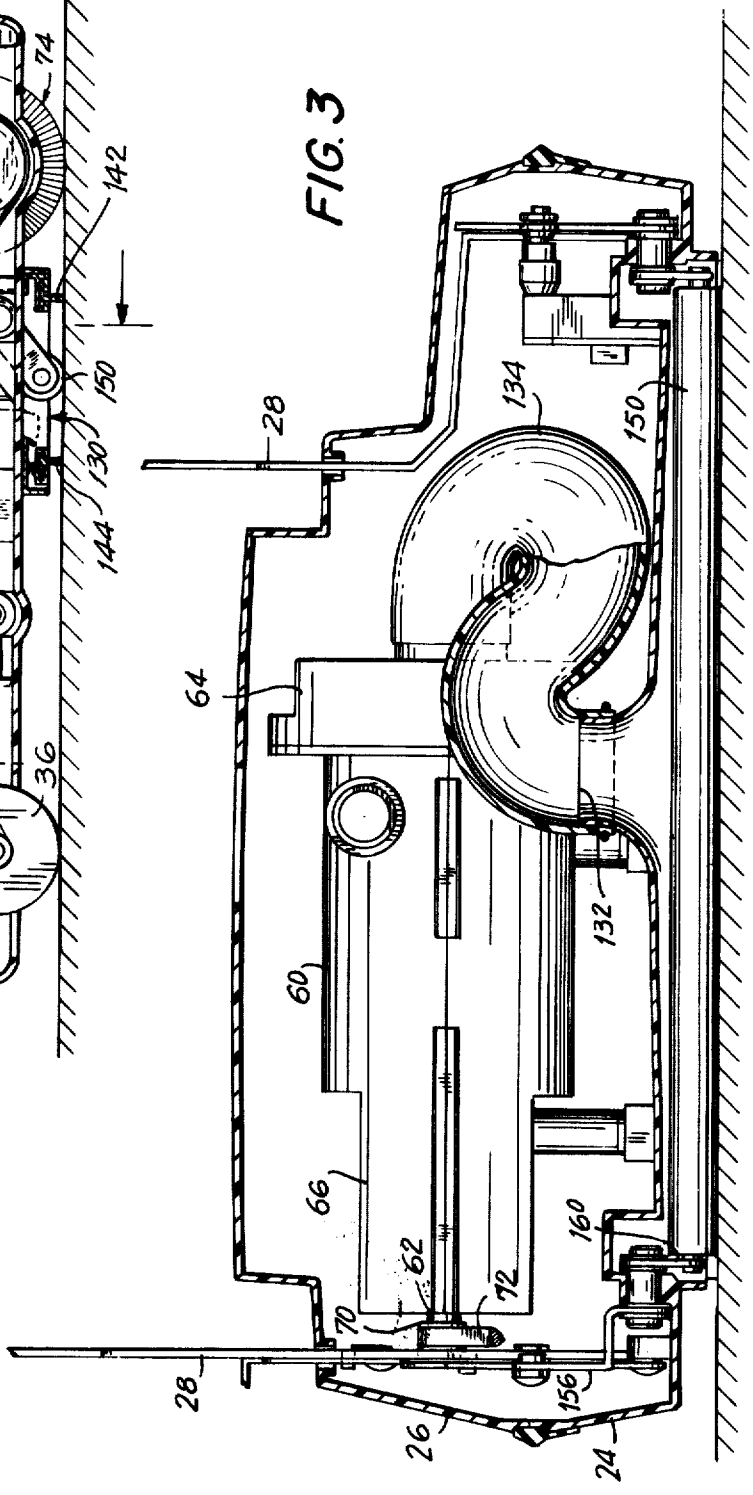

28
134
150
64
60
132
66
62
72
160
70
28
156
26
24

FIG. 3

FIG. 6

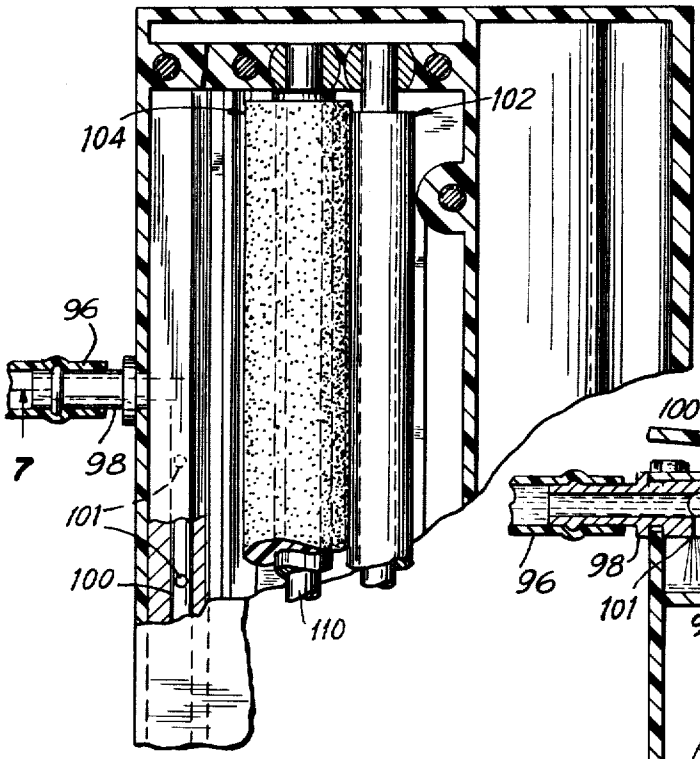


FIG. 7

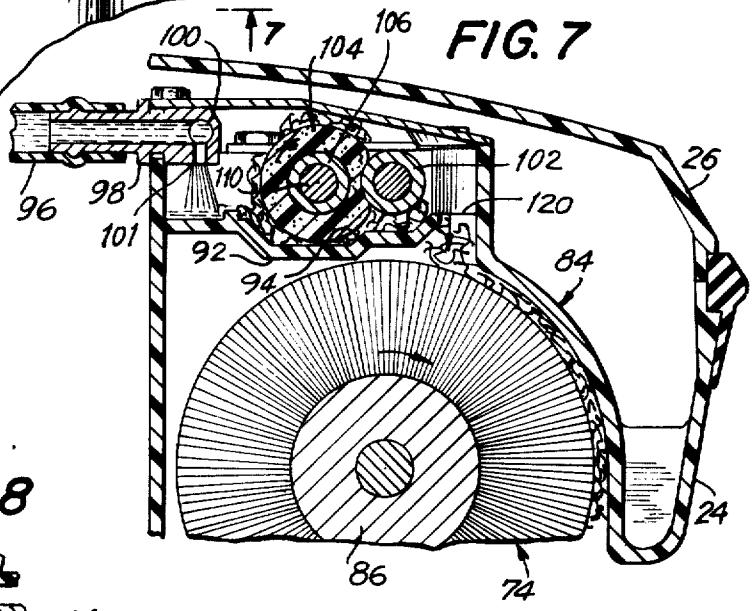


FIG. 8

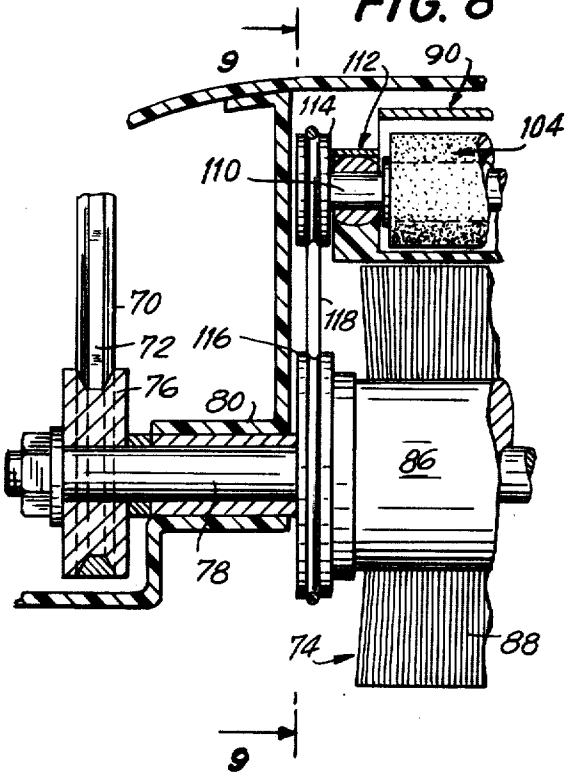
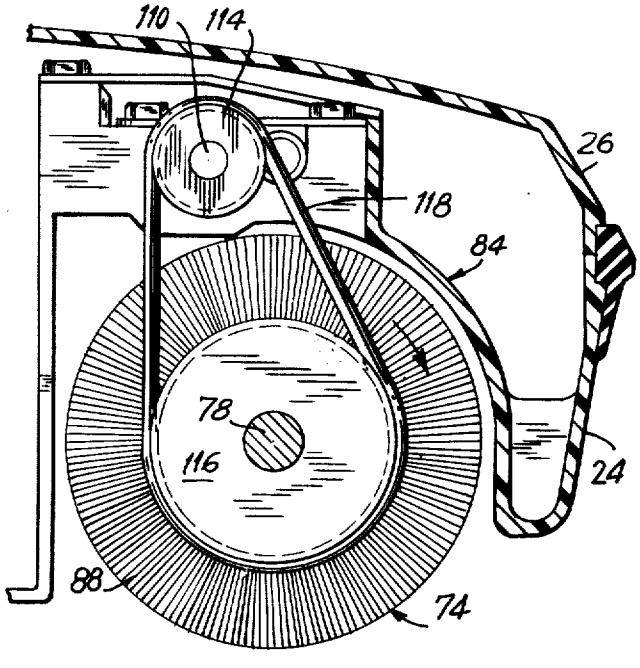


FIG. 9



RUG SHAMPOOER

BACKGROUND, OBJECTS, AND SUMMARY OF THE INVENTION

The present invention relates to a rug shampooing machine and especially to a rug shampooer which uniquely and efficiently provides for cleaning of rugs and the like with a prefoamed detergent.

A variety of devices of machines for home use in scrubbing and polishing floors, and also in scrubbing or shampooing rugs and carpets, has developed over the past decade or so. The resultant mass production effort attendant these developments has brought about sharp decreases in the cost of the units; hence, they have found a widespread market compared with the commercial units that were available 10 years ago.

A fundamental approach that has been taken in the design of machines for rug cleaning is to provide a unit that is eminently suited to produce the required scrubbing action for cleaning the rug or carpet and at the same time includes a means for vacuuming the dirty water resulting from the scrubbing action. An example of a rug shampooer which provides this assembly of functions is described in U.S. Pat. No. 3,392,418.

It has become an object of the machine described in the aforesaid patent, as well as other machines known in the prior art, to minimize the wetting of the rug in the scrubbing or shampooing operation and thereby to promote efficient cleaning thereof. Accordingly, it becomes necessary to create a foam from the liquid detergent before depositing the detergent on to the rug. It is noteworthy that a properly prepared foam made from a liquid detergent is far less expensive and more effective than dry, powdered materials, which have sometimes been sprinkled on the rug.

It is therefore a fundamental object of the present invention to provide a compact, efficient and economical rug shampooing machine.

A more specific object of the present invention is to provide an efficient foam generating mechanism.

Another object is to provide such a foam generating mechanism so as to avoid the complications entailed when a source of air must be supplied to a manifold in creating such foam.

A primary feature of the present invention resides in the arrangement of a simplified foam generating mechanism which includes two rollers situated above the scrubbing brush just below a detergent source outlet. The two rollers are continuously compressed together in order to create the foam. More specifically, the axes of these rollers are in a substantially horizontal plane and parallel to the surface to be cleaned. The rollers are of different diameters, the larger of the two being a foam plastic roller, which is driven by a belt connected to the scrubbing brush.

Since it is a well known fact that the user of a typical vacuum cleaner device has become accustomed to a forward and reverse stroke, that is to a back and forth movement of the cleaning device, the rug shampooer of the present invention has been designed with this in mind.

Accordingly, it is another major object of the present invention to make the rug shampooing machine operation conform closely to the conventional operation of cleaning devices which are operated by the user with a back and forth movement. In other words, it has been recognized as extremely efficacious to provide a rug shampooing machine which conforms as closely as possible to this preconditioned mode of operation. However it becomes desirable, as will be apparent, that the scrubbing action on the carpet or rug will take place only during the forward stroke or forward movement of the machine and not during the return stroke.

It is therefore another object of the present invention to provide a mechanism which will produce lift-off of the brush from the surface to be cleaned when the machine is in its reverse stroke or backward movement.

Yet another object is to incorporate the lift-off mechanism such that it automatically operates on the return stroke to lift off the brush.

The above cited objects and purposes relating to brush lift-off are accomplished by the mechanism of the present invention which works upon a reaction principle and involves very little force in the operation. In effect, there is no conscious manipulation of any part by the operator in order to bring about the brush lift-off. Rather, by simply pulling the machine backwardly, which is an accustomed action, the reaction principle is effectuated. Specifically, the brush lift-off mechanism comprises a linkage system connected to the handle and suitably pivoted to the base or housing of the rug shampooing machine such that the inertia of the machine on the rug creates enough reaction to operate the linkage with no effect on the operator. Moreover, when the return stroke is finished the brush, and concomittantly if desired, the vacuum pick-up, are automatically dropped down and assume their original positions.

Further objects, features and advantages of the present invention will be appreciated as the description of the invention in the following specification proceeds, such description being taken in connection with the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a perspective view of a rug shampooer embodying the concepts of the present invention.

FIG. 2 is a vertical sectional view taken on the line 2—2 of FIG. 1.

FIG. 3 is a vertical sectional view taken on the line 3—3 of FIG. 2.

FIG. 4 is a fragmentary view of the rear of the rug shampooer, illustrating a mechanism for adjusting the height of the rear of the machine from the surface to be cleaned.

FIG. 5 is a diagrammatic view illustrating the brush lift-off mechanism of the present invention, the different positions in the operation of the mechanism, as well as the affected parts, being shown in full and in dotted lines.

FIG. 6 is a fragmentary plan view illustrating the foam generator mechanism of the present invention.

FIG. 7 is a sectional view taken on the line 7—7 of FIG. 6, particularly illustrating the relationship between the foam generator mechanism and the cleaning brush of the rug shampooer.

FIG. 8 is a fragmentary view illustrating the drive for the brush and foam generator mechanism.

FIG. 9 is a vertical section taken on the line 9—9 of FIG. 8.

DESCRIPTION OF PREFERRED EMBODIMENT

Referring now to the drawing and particularly to FIG. 1 thereof, a rug shampooer embodying the concepts of

the present invention is illustrated. The rug shampooer comprises a base or lower housing **10** and a handle **12.** Mounted on the handle are an upper dispensing tank or container **14** for dispensing liquid detergent and a lower tank **16** for storing the dirty solution as it is vacuumed from the surface being cleaned. At the upper end of the handle **12,** there is provided a valve actuating device **18** for controlling the dispensing of the liquid deterent from tank **14.** A conventional power cord **20** is provided for supplying power to the shampooer, and a suction hose **22** will be seen at the rear of the machine for conveying the dirty solution to the tank **16.**

The lower housing or base **10** is made up of a dish-shaped frame **24** and a cover **26** (see especially FIG. **2**). The handle is suitably bifurcated as it extends downwardly to define the yoke members **28,** such yoke members being connected in a manner hereinafter described.

At the rear of the housing **10** there will be seen a mechanism **30** for adjusting the height of the housing **10** above the surface to be cleaned, thereby to affect the elevation of the brush and nozzle of the rug shampooer with respect to that surface. Such mechanism per se is conventional in the art and includes a ratchet-escapement **32** and a pivotable bracket **34** which carries a wheel **36.** A corresponding wheel **36** is located at the other side of the machine. The pivotable bracket **34** is provided with ratchet teeth **40** which cooperate with similar teeth **42** on a pawl **44** carried by a spring biased rod **46.** The bracket **34** is adapted to be pivoted about the pin **48.** An integral lever **50** on the bracket is used to raise the rear end of the machine in steps, as is well known, while the rod **46** functions to lower it in corresponding steps, such being accomplished by the respective lowering and raising of the two wheels **36** in response to actuation of the aforesaid lever and rod.

Within the housing **10,** there is mounted a motor **60,** the drive shaft **62** of which carries and rotates a vacuum fan **64,** seen on the right in FIG. **3,** and a motor-cooling blower **66,** seen on the left in the same figure. The shaft **62** is also effective to drive a pulley **70,** also on the left, which in turn drives belt **72,** thereby to drive a cleaning brush **74** by way of pulley **76** fixed to shaft **78** (FIG. **8**).

The cleaning brush **74** extends transversely with respect to the front of the machine and is suitably journaled in bushings **80** and **82** at opposite sides thereof. A shroud **84** surrounds and partially encloses the cleaning brush **74.** It will be noted that the brush consists of a core roller **86,** typically constructed of stainless steel or the like, on which are mounted bristles **88.**

In accordance with a primary feature of the present invention, a foam generator mechanism **90** is judiciously arranged and disposed in cooperative relationship with the cleaning brush **74.** This mechanism is capable of producing abundant quantities of dry foam in an efficient manner. As can be especially appreciated by reference to FIG. **7,** the foam generator mechanism is located immediately above the cleaning brush **74** in a housing **92;** the housing being especially constructed so that a reservoir or well **94** for liquid detergent is provided in its lower wall. Such detergent is supplied from the dispensing tank **14** by operation of the actuating device **18** which affects a valve in a conventional manner to produce flow of detergent from the tank **14.** The detergent is transmitted by means of the hose **96** at the rear of the foam generator mechanism, such hose being fitted over a nipple **98.** The nipple in turn is connected to a distribution pipe **100** which extends transversely of the foam generator housing **92** (FIG. **6**), the pipe **100** having a series of apertures **101** spaced along its transverse extent.

It will be seen that the foam generator includes a pair of rotatable rollers **102** and **104.** The roller **102** is of solid steel construction, whereas the roller **104** consists of a core **106** of stainless steel or the like on which is mounted a foam plastic cover **108.** It will be seen that the axes of the rollers **102** and **104** are in a substantially horizontal plane and parallel to the surface to be cleaned. The roller **104** has a much larger outside diameter than has roller **102,** it having been found that this is an extremely efficient construction for the rollers. The cover **108** is preferably constituted of a foam plastic material such as polyurethane which is adaptable to be readily flexed when the peripheries of the rollers **102** and **104** are brought into pressure contact.

The roller **104** is affixed to a shaft **110** which is journaled in the bearings **112** at the end of the housing **92.** The shaft **110** extends beyond the housing and is fitted with a pulley **114.** The shaft **78** which supports the brush core **86** is fitted with a pulley **116,** and a driving connection between the two pulleys **114** and **116** is established by means of a belt **118.** It will thus be appreciated that the driving connection between the motor **60** and the brush **74** by way of the appropriate pulleys and belt, will also serve to transmit movement to the foam plastic roller **104.**

It will be apparent, especially by reference to FIG. **6–9,** that liquid detergent stored in the dispensing tank **14** is fed to the foam generator mechanism **90** via the tubing **96** and the nipple or pipe **98.** The liquid detergent is discharged into the foam generator mechanism through the apertures **101** in the distribution tube or pipe **100** so that the liquid detergent becomes evenly distributed along the transverse extent of the housing.

It will be seen, by reference to FIG. **7,** that as a result of the well **94** formed in the lower wall of the housing **92** of the foam generator mechanism, the incoming liquid detergent will collect therein and thence be taken up by the foam roller **104.** It will also be seen that the foam roller **104** is in constant peripheral flexing contact with the rigid roller **102** and hence that this flexing action of the foam plastic material of the roller **104** will serve to aerate the detergent and generate the required dry foam. An opening, or series of openings **120,** is provided at the front of the housing **92.**

It will be understood that in the operation of the foam generator mechanism it is preferable that the amount of liquid detergent permitted to flow down into the housing of the foam generator **90** be regulated such that the liquid detergent just fills the well **94.** However, such an objective is not critical and the detergent can be permitted to rise to a somewhat higher point.

It will be apparent from the preceding description that, upon energization of the rug shampooer, the brush **74,** because of suitable reduction gearing, will rotate slowly in the clockwise direction as viewed in FIG. **7.** The plastic foam roller **104** is likewise driven in a clockwise direction because of the belt connection **118.** The dry foam, which has been generated by the aforenoted flexing action of the foam plastic roller **104** against the steel roller **102,** is efficiently moved forwardly and down through the openings **120** whence it falls onto the bristles of the brush **74** and is thereby car-

ried by the bristles so as to be deposited on the rug being cleaned. Since the brush **74** acts to propel the machine forwardly the aerated, essentially dry, foam is deposited on successive areas of the rug and is worked into the nap of the rug. The detergent foam of course acts to pick up the dirt in the rug as a result of the thorough scrubbing of a given area. The foam with the entrained or collected dirt is then removed from the rug or other surface. This is accomplished by a vacuuming and squeegeeing operation to be described.

Vacuuming of the dirty foam is achieved by apparatus including nozzle **130,** which is of conventional construction and extends transversely to the direction of movement of the machine, being provided with an upper outlet **132** that communicates with suction hose **134** (FIG. **3**), the upper end of which is connected to vacuum fan **64.**

The vacuum cleaning operation is performed both in the forward stroke and reverse stroke directions. As a result of the placement of the nozzle **130,** it is effective to pick up the foam resulting from the scrubbing operation. Also, a squeegee assembly **140** is associated with the nozzle **130.** This squeegee assembly, which can be removed as desired, is preferably floatably mounted to the frame **24** and is spring biased to permit it to conform to minor variations in the contour of the particular rug being scrubbed as well as to various settings of the height adjustment mechanism **30.** The assembly includes two wipers **142** and **144** which extend transversely, roughtly to the same extent as the forward roller to be described. Variable adjustment with respect to the two directions of movement of the machine can be accommodated by mounting the squeegee assembly in such a way that the assembly floats upwardly and offers little resistance during the forward stroke, but the squeegee assembly is pushed downwardly onto a floor during a reverse stroke motion, at that time providing an increased squeezing action so as to remove dirty foam.

The reverse stroke mechanism for providing lift off of the brush **74** in response to backward movement of the rug shampooer may best be appreciated by reference to FIG. **5** of the drawing. This view is diagrammatic with certain parts not shown for clarity of illustration. It will be seen that the rear wheels **36** are relatively conventionally mounted. That is, they can be raised or lowered by the height adjustment mechanism **30.** However, it is at the forward end of the machine that the mechanism of the present invention is mainly operative. Thus, there will be seen a front roller **150** which is so arranged that it can be placed in two significantly different operative positions by dint of the operation of a linkage system generally designated **152.** The normal position, that is to say, the position of the roller and linkage which corresponds to forward movement or to the forward stroke for the machine, is shown by phantom lines. The brush **74** is also shown in its normal position by means of phantom lines.

The linkage system **152** comprises a bell crank **154** having an arm **156** secured to a shaft **158** which is fixed in the frame **24.** Another arm **160** is likewise secured to the shaft **158.** It will be understood that corresponding structure is provided at the opposite side of the machine (see FIG. **3**). A link **162** is pivotally connected by the pin **64** to arm **156.** The other end of link **162** is connected by means of a lost motion connection, including slot **170** and pin **172,** to a link **174** which in turn is connected to a bracket **176** by means of pin **178.** Link **174** is free to turn about the pivot pin **172** and likewise an additional link **180** is connected at its lower end for pivotal movement by means of the pin **182** secured to the frame **24.**

It will be seen that the yoke portions **28** of the handle **12** are pivotally connected by means of the pivot pin **172** to the linkage system **152.** Referring now to FIG. **2** it will be understood that in the inoperative position, i.e., when the machine is not being utilized, the yoke **28** of the handle will be in the completely upright or vertical position such that the roller **150** will be in the position illustrated in FIG. **2.** Likewise, when the yoke **28** is as shown in the phantom line position in FIG. **5,** that is, when the machine is being moved forwardly, or is in the forward stroke, the roller **150** remains in the same position as in FIG. **2.** However, when force is exerted upon the handle in the conventional reverse stroke movement by the user of the machine, movement of the handle and, consequently, movement of the yoke portions **28** results in shifting the roller **150** to its solid-line position whereby, also shown by solid lines for the brush **74,** the brush is lifted off the surface being cleaned so that its rotation will not interfere with the desired reverse movement for the machine.

The desired position for the roller **150** in response to return stroke operation is achieved by reason of the reaction principle at work with the linkage system **152.** That is to say, because of the inertia of the machine on the surface, there is enough reaction to operate the linkage immediately upon the operator pulling back on the handle **12** so as to move the yoke portions **28,** and hence the pins **172,** within the slots **170.** This automatically and immediately produces movement of the link **162** in the rearward direction which in turn causes the arm **156** of the bell crank **154** to be rotated and hence produces rotation of the arm **160** thereof. Consequently, the roller **150** is forced downwardly against the surface being cleaned. The final result is that the forward part of the machine is raised and hence the brush is lifted off the surface.

While there has been shown and described what is considered at present to be the preferred embodiment of the several features of the present invention, it will be appreciated by those skilled in the art that modifications of such features may be made. Accordingly, it is desired that the invention not be limited to this embodiment, and it is intended to cover in the appended claims all such modifications as fall within the true spirit and scope of the invention.

What is claimed is:

1. A rug shampooing machine comprising:

a. a motor;

b. a brush rotatably driven on a horizontal axis by said motor, said brush being adapted to contact a surface to be cleaned and to propel said machine forwardly;

c. a foam generator mechanism including:

1. a housing situated above said horizontal axis for containing a liquid detergent;

2. first and second rollers having their axes substantially parallel to said horizontal axis and with said first roller having an outer surface comprising a resiliently deformable foam plastic;

3. said first and second rollers positioned for contact so that said second roller deforms the outer surface of said first roller;

4. one of said first and second rollers coupled to said motor for rotational driving thereof and frictional driving of the other roller; and

5. said first roller having at least a portion of its deformable surface in contact with said liquid detergent in said housing so as to pick up and aerate the liquid detergent and thereby generate foam in response to the rotation of said first and second rollers and the concomitant deformation of the deformable surface of said first roller; and

d. a series of openings in said housing for depositing foam produced by said foam generator mechanism on top of said brush so that foam is carried forward to the surface to be cleaned in response to the rotation of said brush.

2. A machine as defined in claim **1** wherein the coupling between one of said rollers and said motor comprises a driving connection between said brush and said one roller.

3. A machine as defined in claim **1,** further comprising a well or reservoir in the bottom wall of the foam generator housing for retaining liquid detergent.

4. A machine as defined in claim **3,** in which at least a portion of said one roller is in contact with the liquid detergent in said well.

5. A machine as defined in claim **1** further comprising:

a roller for supporting the front of said machine, including means for automatically moving said roller downwardly, with respect to the axis of said brush, in response to translational movement rearwardly of the handle of said machine, so as to lift said brush.

6. A machine as defined in claim **5** in which said last-named means includes a linkage system comprising a bell crank, one of the arms of said bell crank carrying said support roller.

* * * * *