Oct. 26, 1971 J. O. JONES 3,614,797

METHOD FOR CLEANING AND PARTIALLY DRYING CARPETS

Original Filed April 24, 1969 3 Sheets-Sheet 1

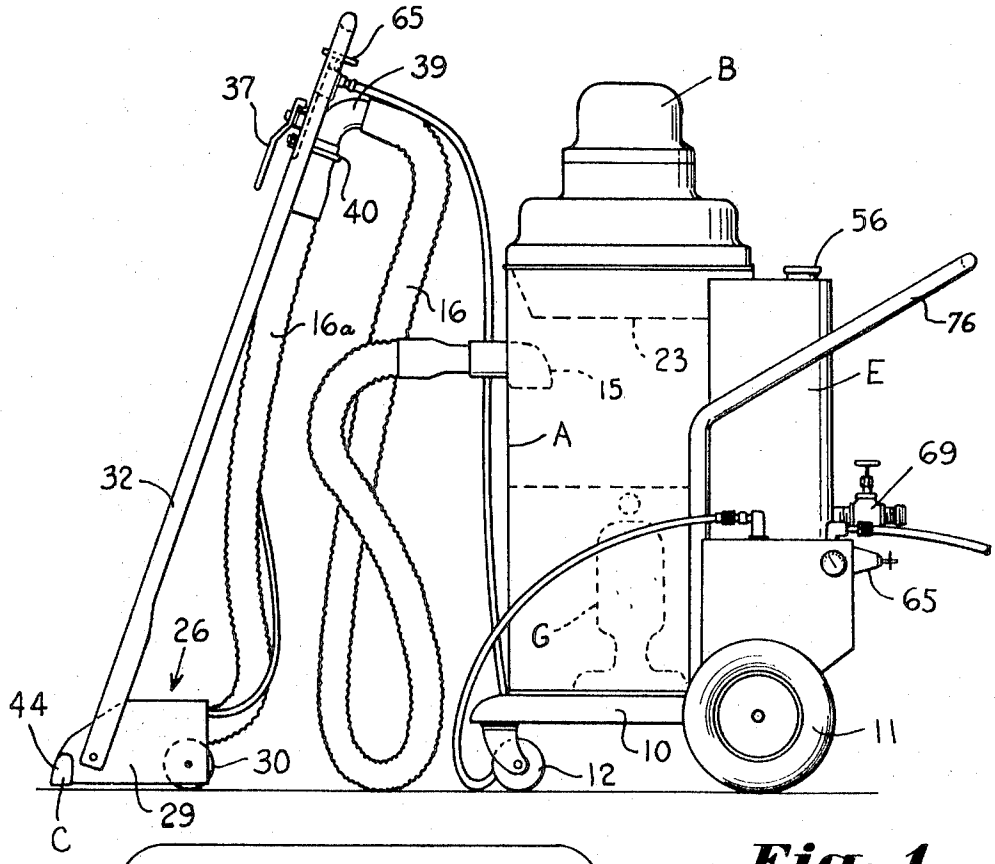


Fig. 1.

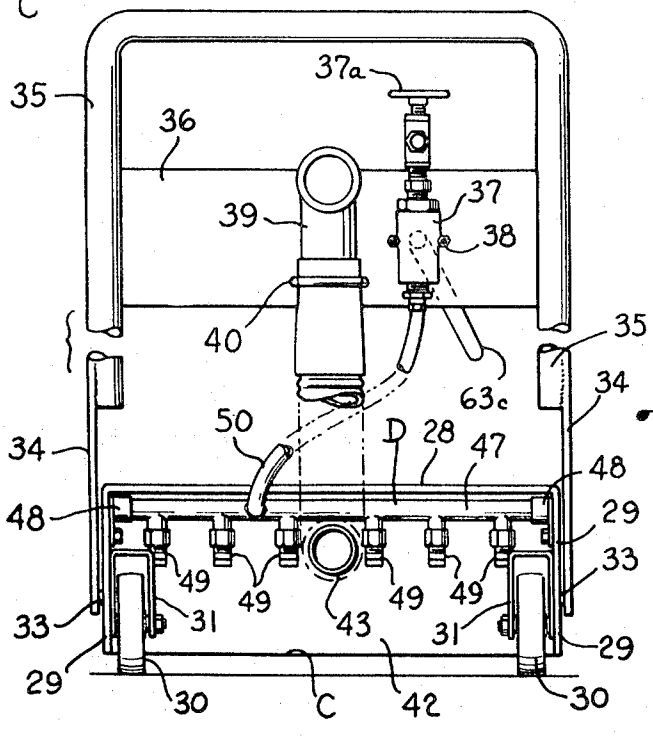


Fig. 2.

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METHOD FOR CLEANING AND PARTIALLY DRYING CARPETS

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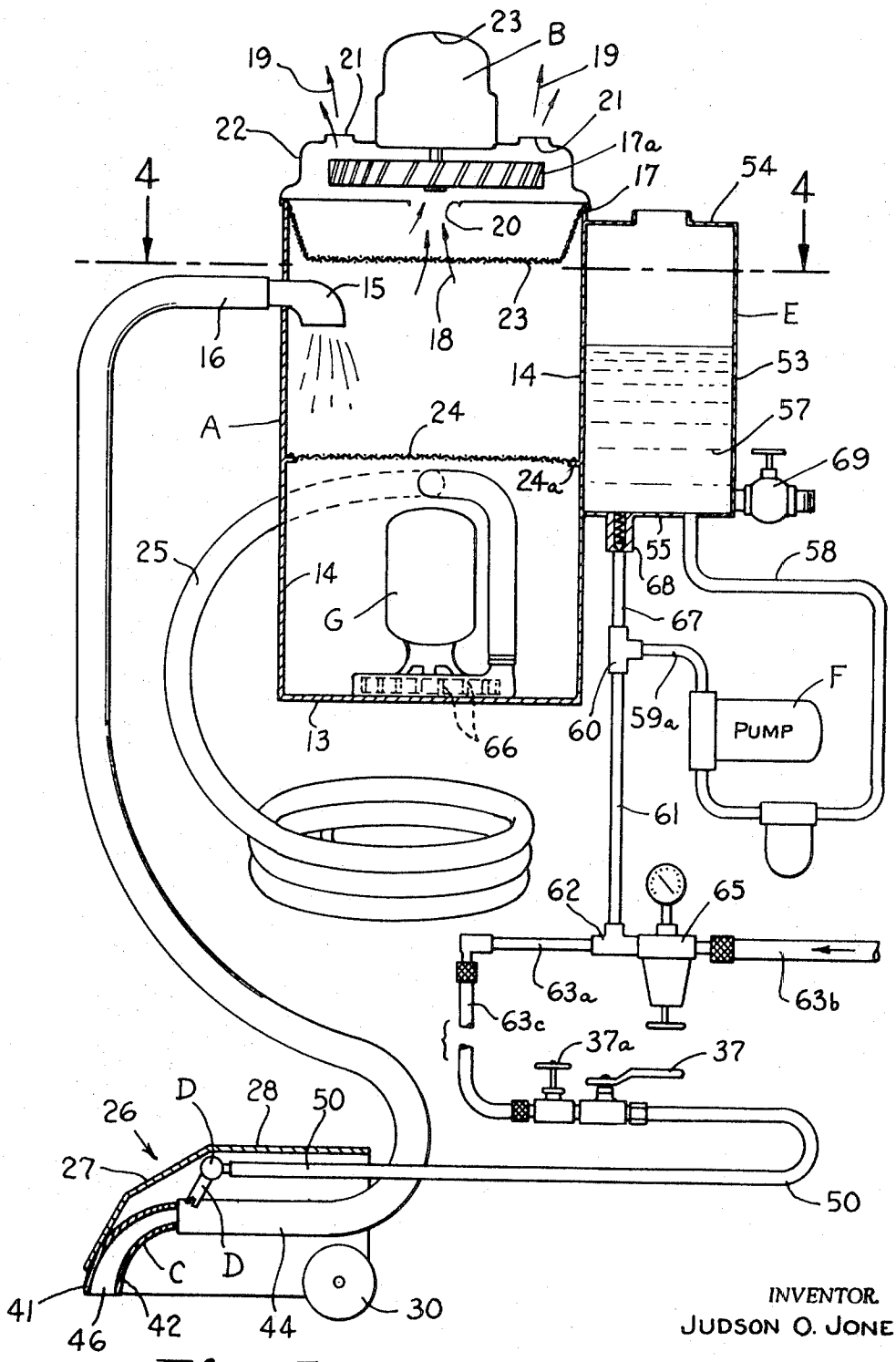


Fig. 3.

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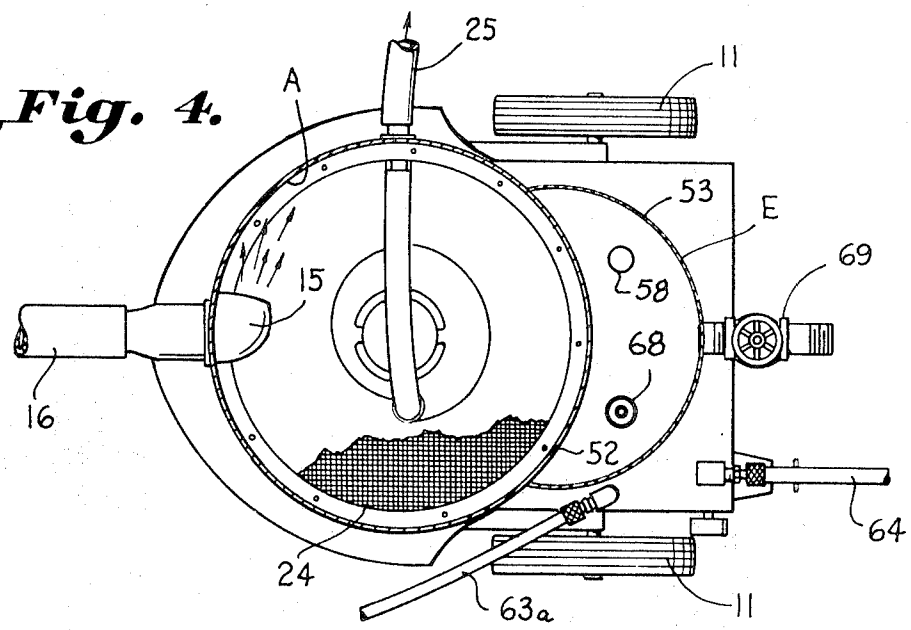
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METHOD FOR CLEANING AND PARTIALLY DRYING CARPETS

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Fig. 4.



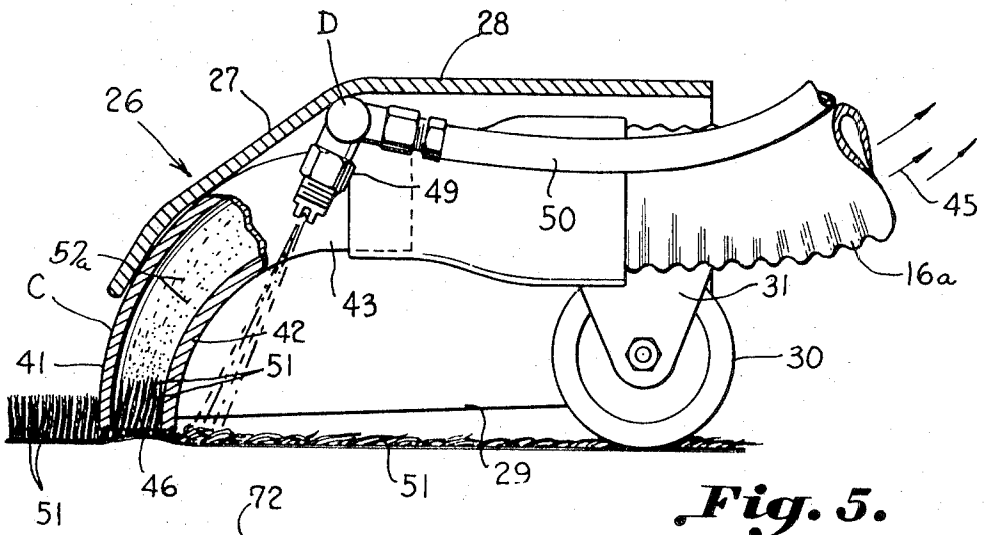


Fig. 5.

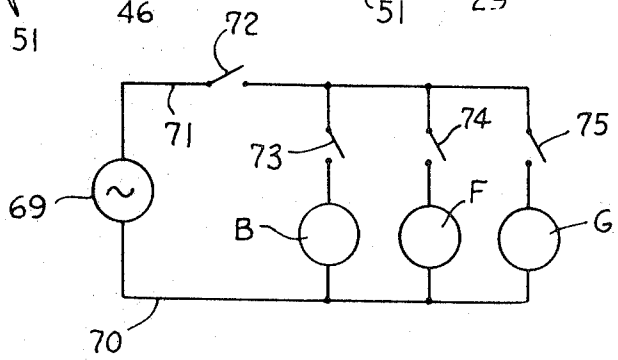


Fig. 6.

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METHOD FOR CLEANING AND PARTIALLY DRYING CARPETS

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Original application Apr. 24, 1969, Ser. No. 818,876, now Patent No. 3,496,592, dated Feb. 24, 1970. Divided and this application Dec. 12, 1969, Ser. No. 889,813

Int. Cl. A47l 7/00

U.S. Cl. 8—158 1 Claim

ABSTRACT OF THE DISCLOSURE

A unitary and portable apparatus for cleaning and partially drying carpets having a cleaning head including a sprayer positioned ahead of a suction nozzle for spraying a cleaning medium on a carpet closely adjacent the nozzle as the head is moved across the carpet. The suction nozzle draws the used cleaning solution and foreign matter from the carpet. The used cleaning solution and foreign matter are deposited in a suction tank provided with a high velocity centrifugal blower which evacutaes air therefrom, creating circulation of a large volume of air through the nozzle and tank. A centrifugal pump continuously removes the spent solution and foreign matter from the suction tank. A liquid cleaner is continuously injected in a pressurized source of hot water connected to the nozzles on the cleaning head for supplying a continuous flow of cleaning medium thereto.

This is a division of application Ser. No. 818,876, filed Apr. 24, 1969, now Pat. No. 3,496,592, issued Feb. 24, 1970.

This invention relates to a carpet cleaning apparatus and method, wherein a supply of cleaning medium is continuously mixed and sprayed on the carpet which is then subjected to the action of a suction nozzle through which a large volume of air is ciriculated, causing the foreign matter in the carpet to be drawn out with the used cleaning medium and continuously deposited at a remote location.

The most commonly used method of cleaning carpets has been shampooing. This usually consisted of applying the shampoo on the carpet and using a mechanical scrubber to agitate the carpet and shampoo to create a foam. The foam was allowed to dry on the carpet which took approximately a day, depending on the environmental conditions. The foreign matter in the soiled rug settled down in the piles of the carpet during this shampooing operation and little of it was removed from the carpet. After a carpet had been shampooed several times it reaches a state wherein the build-up of residue left from the shampoo itself, and the foreign matter is so great that shampooing is no longer effective.

Another method of cleaning carpets incorporates discharging a jet of pressurized steam having a cleaning solution mixed therewith, into the carpet and subsequently withdrawing the foreign matter and cleaning solution from the carpet. Such apparatus usually incorporates a pair of tanks mounted on a frame. One of the tanks contains clean water and means which heats the water and supplies such to the spray nozzle. The other tank receives the spent cleaning solution and foreign matter picked up by a suction nozzle. One problem with such an apparatus is that the water that is used must be manually hauled to the tank, mixed by hand with detergent, and the dirt and spent cleaning medium manually removed from the other tank. As a result, it requires two operators to run the apparatus during the cleaning operation. One of the operators pulls the cleaning head,

while the other operator carries water to the apparatus, mixes cleaning medium, and removes the spent cleaning solution and dirt from the other tank.

Another problem with such a device is that the opening in the suction nozzle is approximately ¼" and when it is used for cleaning carpet, such as is generally referred to as "shag" carpet or long pile carpet, it does not do a satisfactory job. One theory of why such does not do a satisfactory job is that when the piles are lying down and the suction nozzle drawn thereover, it will only clean the exposed side of the pile. In addition, the pile remains lying down after the cleaning operation.

Still another problem of such as apparatus is that frequently the steam will wet the backing on the carpet, and if such is on a hardwood floor, possibly damage the floor. Furthermore, the nozzles must be drawn parallel with seams that are taped or the small nozzle will separate the joints. This becomes a problem with inexperienced operators in that frequently they will pull the cleaning head across such seams, pulling the carpet away from the tape used to join the pieces of carpet. One theory as to why such separates the seams is that the steam or hot water is applied too far ahead of the suction nozzle allowign such to penetrate the backing of the carpet, removing the adhesive off the tape. Another theory as to why such separates the seams is that since the nozzle opening is approximately ¼" wide when the cleaning head is pulled across the seams a concentrated suction force is applied at the joint causing the edge of the following piece of carpet to be pulled away from the other piece of carpet.

A further problem with a known form of cleaning apparatus is that as the solution builds up within the vacuum tank the possibility of foam generated during the cleaning operation interfering with the vacuum pump is greatly increased, since the volume for air and foam within the vacuum tank is decreased as the water level rises. When cleaning carpets which have been previously shampooed with a lot of pressurized steam of solution, foam is generated unless there is an anti-foaming agent therein. Even when there is an anti-foaming agent therein, it is not always effective, and there is a build-up of foam within the discharge tank, which will eventually cause the suction motor associated therewith to be shut down.

Still another problem with cleaning apparatus which utilizes a lot of pressurized steam or hot water and a pair of tanks is maintaining the spray nozzles clean from dirt and grit. Normally, an operator will drain the spent cleaning solution and foreign matter from one tank and manually carry such in a bucket to a drain and deposit such therein. He will then fill the same bucket with clean water and dump such into the water tank on the apparatus. If the bucket is not completely clean before he fills such with clean water the residue and foreign matter is dumped into the water tank and works itself into the nozzles on the sprayer stopping such up. This requires the cleaning apparatus to be shut down until the nozzles can be cleaned.

However, a significant advantage of a cleaner of the type which utilizes a jet of pressurized steam and a vacuum nozzle, is that it removes the foreign matter from the carpet rather than merely moving the foreign matter down within the piles, as takes place in the shampooing method. This is a tremendous advantage especially where the carpet is used around persons who are allergic to certain of the foreign materials in the carpet.

The subject invention contemplates a simplified portable carpet cleaner which carries in a single tank a centrifugal vacuum producing fan for creating a high volume air flow at a cleaning nozzle and a centrifugal pump for continuously carrying off used cleaning medium, together with

means for continuously mixing cleaning medium for direct delivery to the sprayer.

Accordingly, it is an important object of the present invention to provide an improved method and apparatus for cleaning carpets which has a continuous supply of hot water connected thereto, and continuously removes foreign matter and spent cleaning medium to a remote area without manually carrying such.

Another important object of the present invention is to provide a carpet cleaning apparatus wherein foam entrapment is minimized in a collection tank due to the rapid removal of the effluent being deposited in the collection tank from a suction nozzle.

Still another important object of the present invention is to provide a carpet cleaning apparatus wherein there is a continuous injection of cleaning agent into a stream of solution being fed directly to sprayer means carried on a cleaning head for cleaning a carpet and the like.

Another important object of the present invention is to provide a carpet cleaning apparatus which utilizes a cleaning head having a suction nozzle, which is wide enough to allow the piles of the carpet being cleaned to be sucked therein so that a cleaning medium can encompass the piles in order to clean all sides of the pile and leaves the piles standing up after cleaning.

Another important object of the present invention is to provide a carpet cleaning apparatus wherein a suction nozzle is utilized having such a width to allow the piles of the carpet being cleaned to be sucked therein in order that a large volume of air can pass thereabout to aid in cleaning the piles, as well as partially drying the piles.

Still another important object of the present invention is to provide a carpet cleaning method and apparatus, wherein a cleaning head having spray nozzles positioned to direct a stream of cleaning medium approximately ½" ahead of a suction nozzle so as to cause the foreign matter in the carpet to be raised upwards towards the top of the piles of the carpet in order that the suction nozzle can draw such therein during the cleaning operation before such can settle back into the carpet.

Still another important object of the present invention is to provide a carpet cleaning method and apparatus wherein a cleaning medium is sprayed closely adjacent and ahead of a suction nozzle so that the suction nozzle can remove the cleaning medium from the carpet before such penetrates and saturates the base of the carpet.

The construction designed to carry out the invention will be hereinafter described, together with other features thereof.

The invention will be more readily understood from a reading of the following specification and by reference to the accompanying drawings forming a part thereof, wherein an example of the invention is shown and wherein:

FIG. 1 is a side elevational view illustrating a carpet cleaning apparatus constructed in accordance with the present invention,

FIG. 2 is an elevational view taken from the rear of the cleaning head illustrating in particular, the sprayer nozzles,

FIG. 3 is a cross-sectional view of the suction tank forming part of the carpet cleaning apparatus and a partial schematic representation of the system,

FIG. 4 is a sectional view taken along line 4—4 of FIG. 3 illustrating the interior of the suction tank,

FIG. 5 is an enlarged, fragmentary view, partially in section, illustrating a portion of the cleaning head and in particular the suction nozzle and a sprayer head, and

FIG. 6 is a schematic diagram of the electrical system associated with the cleaning apparatus.

The drawings illustrate a unitary and portable apparatus for cleaning and partially drying carpets comprising a carriage which is supported on wheels for easy movement within a cleaning area. A tank A is carried on the carriages and has one end of a vacuum hose communicating therewith. A high velocity centrifugal blower B is carried by an upper portion of the tank A for rapidly evacuating air from the tank, causing a large volume of air to be drawn through the hose. A suction nozzle C is carried by a cleaning head and communicates with the other end of the vacuum hose. A sprayer means D is also carried by the cleaning head for spraying a hot liquid cleaning medium on a portion of the carpet being cleaned adjacent and ahead of the suction nozzle C as the cleaning head is passed over the carpet. A mixing apparatus is provided for mixing a cleaning agent with hot water and includes a container E carried on the carriage for accommodating a liquid cleaning agent. It, also, includes a mixing chamber and a pump F for drawing the cleaning agent therefrom.

A hose is coupled to a source of hot water for supplying a continuous flow of hot water to the mixing chamber so that the mixing apparatus combines a predetermined amount of cleaning agent to the continuous flow of hot water, producing a hot liquid cleaning medium. Another hose couples the mixing apparatus to the sprayer means D, whereby the cleaning medium is sprayed on the carpet adjacent the suction nozzle causing the foreign matter in the carpet to be raised to the top of the carpet so the suction can draw off the foreign matter, the liquid cleaning medium, and any foam that is produced during the cleaning operation, and deposits such in the tank A. A centrifugal pump G is carried in the bottom of the tank A for engaging the foreign matter, foam and cleaning medium and exhausting such through an exhaust hose. The exhaust hose conveys such to a remote drain, whereby interference with the operation of the centrifugal blower by accumulation of foreign matter, foam and cleaning medium is minimized as a result of the continuous removal by the centrifugal pump.

The carriage upon which the tank A is mounted by any suitable means includes a flat base portion **10** which has a pair of wheels **11** journaled adjacent the rear thereof with a single steering swivel wheel **12** journaled adjacent the front portion thereof. The tank A may be carried on the chassis **10** in any suitable manner, and preferably is cylindrical in shape and has a bottom **13** to which a vertical side wall **14** is attached by any suitable means, such as welding. The top of the tank is open for receiving a high velocity centrifugal blower B. A vacuum hose coupling **15** is positioned adjacent the top of the tank and provides communication with the interior of the tank. A vacuum hose **16** has one end coupled thereto, and the other end coupled to a coupling on the cleaning head. The vacuum hose **16** may be constructed of any suitable flexible material, such as plastic, which is capable of carrying both air and liquids.

The high velocity centrifugal blower B has a downwardly turned flange **17** around its perimeter which fits over the vertical side wall **14** of the tank for completely sealing the tank from the atmosphere so that when the centrifugal blade **17***a* is rotated at a high velocity the air within the tank is readily evacuated. The flow of air from the tank is as shown by the arrows **18** and **19**, and enters a central opening **20** in the base of the blower assembly. The air is discharged through a pair of circular openings **21** positioned in a top **22** of the blower assembly. The motor for the centrifugal blower is carried within a housing **23** and in one particular embodiment is a 2¼ H.P. motor which is rotated at 14,000 r.p.m.'s. This causes an air flow of 170 cubic feet per minute to be withdrawn from the tank A and consequently through the vacuum hose **16** and nozzle C. The importance of the high volume air flow is discussed more fully below.

A screen **23** is positioned below the blower assembly and is recessed into the tank for protecting the blower from lint and the like, which may be sucked into the suction tank A. An additional lint collection screen **24** is carried on an inwardly turned flange **24***a* approximately one-half way up the side wall within the interior of the tank for collecting any lint which may be sucked into the tank. This

is to protect the centrifugal pump G from the lint which may interfere with its operation. If the lint were allowed to pass out of the tank through the exhaust hose **25** coupled to the centrifugal pump G, such could possibly clog up the drain in which the foreign matter is being deposited.

The cleaning head is generally designated by the reference character **26**. The cleaning head is shown schematically in FIG. 3, and in greater detail in FIGS. 2 and 5. It includes a stainless steel housing having a flat top portion **27** which begins slightly above the nozzle C and extends upwardly and rearwardly towards a flat top portion **28**. Opposing side walls **29** extend upwardly from approximately ¼" from the base of the nozzle C to the top portions **27** and **28**. Wheels **30** are suitably journaled on brackets **31** bolted to the side walls **29** for aiding in moving the cleaning head. A handle **32** is pivotally connected to opposite side walls **29** by pins **33** which project outwardly therefrom and engage a flat portion **34** of the handle. The flat portions **34** have their upper ends welded to a tubular U-shaped portion **35**. A flat metallic plate **36** extends between the opposing tubular members **35** adjacent the top of the handle for accommodating a fluid cut-off valve **37** which is suitably attached thereto by bolts **38** and a vacum hose coupling **39** which is attached thereto by U-bolt **40** which extends through the plate and has nuts screwed on the end thereof.

The suction nozzle C is carried adjacent the front of the cleaning head and is secured to member **27** by any suitable means such as welding. The throat of the suction nozzle in one preferred embodiment, is $1\frac{1}{16}$" in width and is 14¼" long. The width of the suction nozzle is important in that it must be wide enough to allow the piles of the carpet being cleaned to be sucked therein. It has been found through experimentation that a width dimension between ½ and 1" is preferably for cleaning "shag" carpet having a pile between 1 and 1½" long. When the width of the nozzle is less than that, such as for example, ¼", as is the case of certain cleaning apparatus now on the market, instead of the air flow sucking the piles up into the nozzle allowing such to remain standing after cleaning, it will leave the piles bent over and lying down. A nozzle constructed having a width dimension between ½ to 1" enables pillation of the piles of a "shag" carpet after cleaning. Pillation is a term generally used in the carpet industry implying that the piles stand substantially upright, or in their original position.

As can be seen, the nozzle is constructed of any suitable material, and has a front and rear wall **41** and **42**, respectively, which taper upwardly and rearwardly, and has a circular nozzle coupling **43** communicting therewith to which a flexible vacuum hose **16***a* is coupled. It is to be understood that the front and rear walls **41** and **42**, respectively, are joined by end walls **44** so that when air is drawn through the vacuum hose **16***a*, such as indicated by the arrows **45** in FIG. 5, a large volume of air flows through the throat **46** of the nozzle. As can be seen, when the cleaning head is pulled rearwardly during the cleaning operation it is supported by the wheels **30** adjacent the rear of the cleaning head and the suction nozzle C adjacent the front of the cleaning head.

A sprayer means D is carried by the cleaning head for spraying a hot liquid cleaning medium on a portion of the carpet being cleaned adjacent and ahead of the suction nozzle C as the cleaning head is passed across the carpet. The sprayer means D includes an elongated tubular member **47** which extends across the cleaning head and is attached thereto, by brackets **48** bolted to opposing side of the cleaning head. The brackets **48** seal the end of the tubular member **47**. Equally spaced along the tubular member **47** are six sprayer heads **49** which communicate therewith so that when the hot liquid cleaning medium is fed through a tube **50** into the tubular member **47** such is sprayed on the carpet in a uniform manner across the cleaning head approximately ½" ahead of the suction nozzle C. For an effective cleaning action it is important that the cleaning medium be sprayed on the carpet approximately ½" ahead of the suction nozzle C so that such remains on the carpet for approximately one second. One theory as to why it is an effective cleaning method is that by spraying the cleaning medium approximately ½" ahead of the suction nozzle such produces a hydrophobic action, wherein assuming that the carpet being cleaned is a synthetic material, the fibres tend to repel the cleaning medium causing such to rise towards the surface of the carpet. As the cleaning medium rises to the surface of the carpet any foreign matter within the carpet rises therewith. If the carpet had been previously shampooed the residue left in the carpet from such shampooing action also rises with the cleaning medium, frequently producing foam. As the foreign matter, any foam that may have been produced, and cleaning medium reaches the top of the piles of the carpet, the suction nozzle C sucks it therein. As can be seen in FIG. 5, as the piles are sucked within the throat of the cleaning nozzle C the cleaning medium **57***a* completely encompasses the piles **51**, cleaning them on all sides. Therefore, after the cleaning head passes over the carpet it is clean and the piles remain standing substantially upright, or in their original state. The further the cleaning medium is sprayed ahead of the suction nozzle the least effective the cleaning action is for the reason that the cleaning medium and foreign matter in the carpet is allowed to settle within the piles **51**, making it difficult to remove such therefrom. Thus, from experience it has been found that it is important that the suction nozzle draw the foreign matter and cleaning medium therein as such floats to the surface the first time. Since a very high volume of air is passing through the throat **46** of the nozzle, such tends to agitate the piles **51** during the cleaning action, as well as aids in producing the pillation effect. As previously mentioned, the centrifugal blower in one particular embodiment, displaces 170 cubic feet of air per minute. This large flow of air also, partially dries the piles **51** during the cleaning operation.

A mixing apparatus including a container B is carried on the carriage **10** for accommodating a cleaning agent **57**. The container has an inner wall **52** which conforms to the arcuate shaped side wall **14** of the tank, and is joined by a moon shaped outer wall **53**, a top **54**, and a bottom **55**. A vented cap **56** is carried in the top **54** for allowing a cleaning agent **57** to be poured into the tank. Many suitable cleaning agents may be used, and one particular agent that has been found to be satisfactory is an emulsion, sodium tripolyphosphate.

If the carpet which is being cleaned has been shampooed numerous times so that there is a considerable buildup of shampoo therein, it is sometimes necessary that an anti-foaming agent be combined with the cleaning agent or substituted therefor. Any suitable commercial anti-foaming agent can be utilized, and one in particular, is a silicon anti-foaming agent. The cleaning agent **57** is drawn from the bottom of the tank through line **58**, a filter **59**, into an injection pump F. The injection pump F supplies the cleaning agent under a high pressure of approximately 60 p.s.i. into line **59***a* through T-joint **60**, line **61**, into a T-joint **62** which forms a mixing chamber in line **63***a*. A hose **63***b* is coupled to any suitable source of hot water, such as a conventional tap in a motel and the like, and supplies the continuous flow of hot water through a pressure reducing valve **65** to the mixing chamber or T **62**. The pressure reducing valve **65** reduces the line pressure to approximately 15 to 20 pounds p.s.i. Since the pressure of the cleaning agent coming in line **61** is approximately 60 p.s.i., such is injected into the continuous flow of hot water in the mixing chamber forming a cleaning medium. The injection pump F meters a predetermined amount of cleaning agent into a fluid source such as the continuous flow of hot water passing through line **63***a*. Hoses **63***c* and **50** couple the mixing apparatus to the sprayer means D, whereby the cleaning medium is sprayed on the carpet. As previously mentioned, a fluid cut-off valve **37** is inter-

posed between the hoses **63***c* and **50** for controlling the flow of cleaning medium to the sprayer means D. Mounted on the control valve **37** is a temperature gauge **37***a* which indicates the temperature of the cleaning medium passing therethrough. Generally, it has been found that the best results are obtained when the temperature of the cleaning medium is maintained between 140 and 180° Fahrenheit.

The centrifugal pump G is mounted in the bottom of the tank A for removing any foreign matter that may accumulate within the tank. This would be any foam, sludge, dirt and the spent cleaning agent that is collected. The exhaust hose **25** is connected to the centrifugal pump G and conveys such to a remote location, whereby interference with the operation of the centrifugal blower B by accumulating foreign matter, foam and cleaning medium is minimized as a result of the continuous removal by the centrifugal pump. It is noted that the centrifugal pump G has blades **66** therein, which are capable of collecting foam and foreign matter readily. One suitable centrifugal pump that is used is rated to displace 360 gallons of water per hour at a 5′ head.

When the fluid valve **37** is cut off preventing the flow of cleaning medium from passing through the nozzles D, it is necessary to by-pass the flow of cleaning agent **57** being injected in the line **63***a* so as to prevent damage thereto. This is accomplished by allowing the cleaning agent to flow out T **60**, through a line **67** and a pressure relief check valve **68** positioned in the bottom of the tank B. Therefore, when the valve **37** is closed and the pump F continues pumping the cleaning agent is merely circulated through lines **58** and **59***a*, T **60**, line **67**, through check valve **68**, and back into the tank E. The tank E is also provided with a spigot **69** which allows the cleaning agent to drain therefrom.

The electrical switches for the various pumps are illustrated schematically in FIG. 6. The cleaning apparatus may be connected to any suitable 110 volt A.C. power supply designated by the reference character **69**, and the leads **70** and **71** may form part of an extension cord. A series switch **72** is interposed in line **71** for cutting off the power to all of the motors. Each of the motors are wired in parallel with the A.C. source **69**, and have a switch associated therewith for cutting it off. The blower motor B has a switch **73** connected in series therewith. The injection pump motor F has a switch **74** connected in series therewith, and the suction pump G has a switch **75** connected in series therewith. The switches may be mounted in any convenient location on the cleaning apparatus. The chassis is readily maneuvered by a handle **76** mounted on the rear thereof. Since the apparatus is self-contained and requires only a single tank, it can be easily transported from job to job in a station wagon or panel truck.

In summarizing the method of operation, the sprayer D is directly connected through the hoses **50**, and **63***a* through **63***c* to a conventional tap or source of hot water. In other words, in order to make the apparatus operative, it is only necessary to connect hose **63***b* to a conventional hot water tap and plug an extension cord, which is formed by leads **70** and **71**, into any suitable 110 volt A.C. source of electrical power. A cleaning agent from tank E is injected into the stream of water carried in line **63***a* and **63***b* for supplying a cleaning medium to the sprayer D. A sprayer D is mounted on the cleaning head directly ahead of the suction nozzle C. When pulling the cleaning head across the carpet the spray of cleaning medium is directed into the carpet closely adjacent the suction nozzle C so

that the suction nozzle sucks up substantially all of the cleaning medium, any foam that may be produced during the spraying operation, and the foreign matter. The suction nozzle is coupled by means of a flexible hose **16***a* to the suction tank A and as the air is evacuated from the tank A by the high velocity centrifugal blower B the spent cleaning medium, foam and foreign matter are drawn into the tank A. The cleaning medium, foam and foreign matter are continuously removed from the suction tank A by the immersible centrifugal pump G which is carried therein, and deposits such at a remote location which is generally a drain, so as to minimize interference with the operation of the suction tank.

While a preferred embodiment of the invention has been described using specific terms, such description is for illustrative purposes only, and it is to be understood that changes and variations may be made without departing from the spirit or scope of the following claim.

What is claimed is:

1. The method of cleaning a carpet comprising the following steps:

(A) directly connecting a sprayer through a hose to a pressurized source of water so as to feed a continuous pressurized stream of water to said sprayer,

(B) metering a liquid cleaning agent into the stream of water for supplying a cleaning medium to said sprayer,

(C) mounting said sprayer on a cleaning head directly ahead of a suction nozzle,

(D) pulling said cleaning head across said carpet,

(E) directing said sprayer so that the cleaning medium is forced as a spray into the carpet closely adjacent said suction nozzle and so that said suction nozzle sucks up substantially all of said cleaning medium, any foam that may have been produced during the spraying operation, and foreign matter from said carpet,

(F) coupling said suction nozzle by means of a flexible hose to a suction tank,

(G) evacuating air from said tank by a high velocity centrifugal blower drawing said spent cleaning medium, foam and foreign matter into said tank by the circulation of a large volume of air through the nozzle, the hose and the tank while simultaneously spraying said cleaning medium on said carpet, and

(H) continuously removing said foreign matter, foam, and spent solution from said suction tank with a pump communicating with a base portion of said tank and depositing such at a remote location so as to minimize interference with the operation of said suction tank.

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U.S. Cl. X.R.

8—137; 15—321