Nov. 23, 1943. A. A. DAVIS 2,334,733

SUCTION CLEANING APPARATUS

Filed July 29, 1942

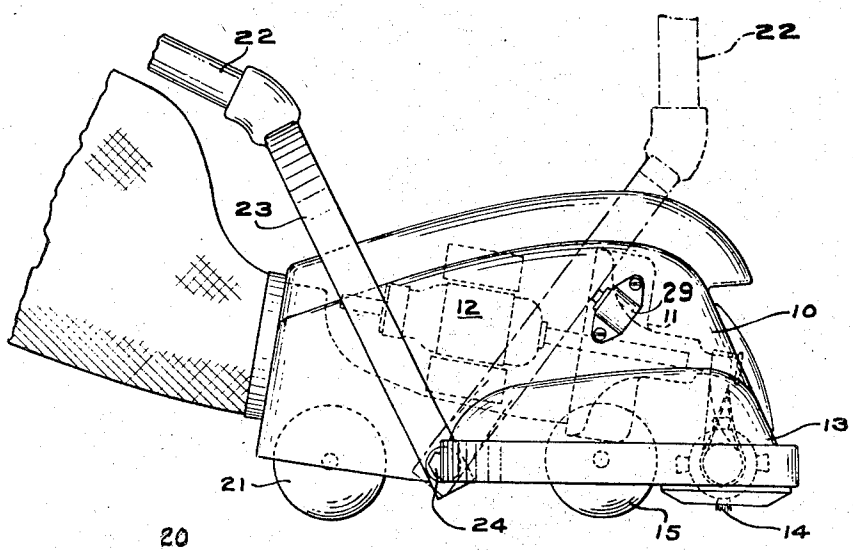


FIG. 1.

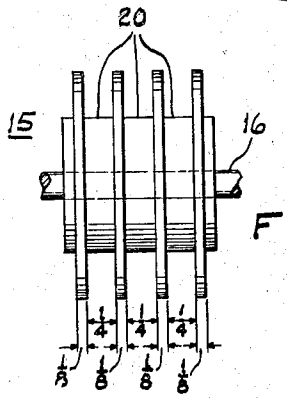


FIG. 3.

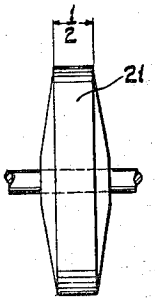


FIG. 4.

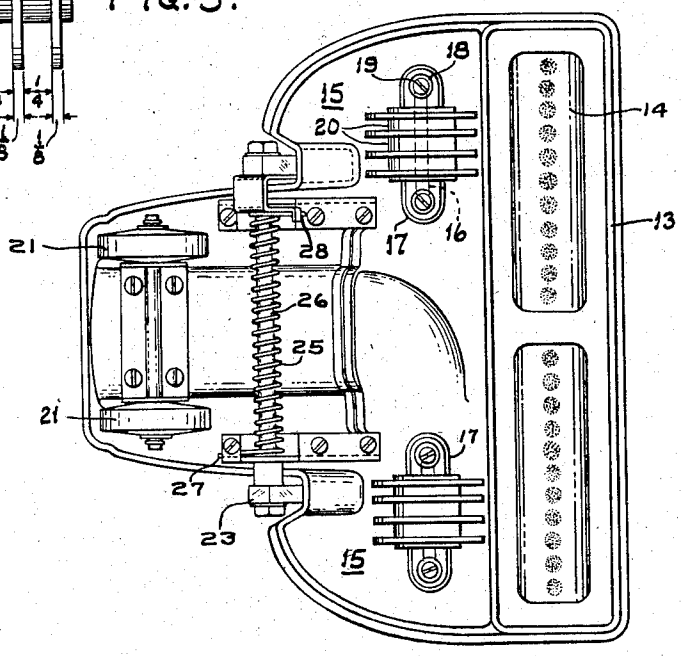


FIG. 2.

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SUCTION CLEANING APPARATUS

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7 Claims. (Cl. 15—16)

My invention relates to a suction cleaner for carpets and other floor coverings, and it has for an object to provide an improved cleaner.

A further object is to provide front wheels which support the front end of the cleaner without unduly submerging in the nap of the carpet, thereby maintaining the nozzle in proper relation to the surface of carpets of different thicknesses without the necessity of effecting manual adjustment for the various thicknesses.

Another object is to reduce bouncing of the cleaner as it is moved over the carpet in cleaning operation.

These and other objects are effected by my invention as will be apparent from the following description and claims taken in accordance with the accompanying drawing, forming a part of this application, in which:

Fig. 1 is a side elevation of a suction cleaner in accordance with my invention;

Fig. 2 is a bottom plan view thereof;

Fig. 3 is an enlarged detail view of one group of front wheels; and

Fig. 4 is an enlarged view of one of the rear wheels.

Referring to the drawing in detail, I show a cleaner body 10 in which there is mounted a fan 11 and a motor 12 for driving the same. At its front end, the cleaner body is also formed with a conventional nozzle 13 extending transversely of the cleaner and communicating with the inlet of the fan 11. A brush roll 14 driven by the motor 12 may be provided in the nozzle 13 in a well-known manner.

The body 10 is provided with two groups of front wheels 15 disposed adjacent and just rearwardly of the nozzle 13 on a common axis extending parallel to the nozzle and transversely of the cleaner. In accordance with the present invention, each front wheel is relatively narrow, inasmuch as I have discovered that the supporting capacity of a wheel is not proportional to its width, but that the supporting capacity, per unit area of contact with the supporting surface, decreases as the width becomes greater. Accordingly, I make each wheel relatively narrow, the wheels 15 of the illustrated embodiment having a tread which is ⅛ inch wide. I have also found that the supporting capacity of a group of wheels varies with the spacing of the wheels, and that the maximum support is obtained when adjacent wheels are spaced substantially ¼ inch apart, and that substantially maximum support is obtained when they are spaced not less than $\frac{3}{16}$ inch and not more than $\frac{5}{16}$ inch apart. Accordingly, the adjacent wheels 15 of the illustrated embodiment are spaced ¼ inch apart. The wheels may be spaced in any suitable manner, as by washers or spacers 20. However, it will be apparent that the wheels 15 and the spacers 20 of each group may be made as an integral structure. Each group of wheels is mounted on the cleaner body in any suitable manner; for example, it may be mounted on a spindle 16, the ends of which are received in recesses formed in projections 17 and retained therein by washers 18 and cap screws 19.

The cleaner is also provided with two rear wheels 21 mounted on the body 10 adjacent the rear end thereof on a transverse axis parallel to the axis of the front wheels 15. The rear wheels 21 may be of the same diameter as the front wheels 15 and each rear wheel 21 may have a tread whose width is equal to the sum of the tread widths of each group of four front wheels 15, which, in this case, is ½ inch. The axes of the front and rear wheels are so located on the body of the cleaner that the mouth of the nozzle 13 is disposed slightly above the plane of the bottom of the front and rear wheels, so that the mouth of the nozzle will be disposed slightly above the surface of the carpet.

A handle 22, formed with a fork 23 at its lower end, is pivoted to the cleaner body by means of a shaft 26 on a horizontal axis indicated at 24 and extending parallel to the axes of the front and rear wheels. The axis 24 is preferably disposed in or slightly below the plane including the axes of the front and the rear wheels and also preferably slightly rearwardly of the midpoint therebetween.

A spring 25 is provided to counterbalance the weight of the handle 22. In the present embodiment, the spring 25 is a helical or torsional spring wound about the shaft 26 to which the handle fork 23 is connected. One end of the spring 25 is fixed relative to the cleaner body at 27, and the other end biases the lever at 28. The action of the spring is to bias the handle forwardly, or in clockwise direction, as seen in Fig. 1, relative to the cleaner body 10.

An electric switch 29 is mounted on the cleaner body 10 in such position as to be engaged by the handle 22 when in its foremost position. This switch is adapted to open the electric circuit to the motor 12 when it is thus engaged by the handle or its fork 23. For simplification of illustration, I have shown the switch 29 as mounted on the exterior of the cleaner body 10, but it will be apparent that any arrangement may be used

whereby the switch is contacted and opened by some part movable with the handle when the latter is moved to the forwardmost position.

To operate the cleaner, the handle **22** is engaged and moved rearwardly to the region of the full-line position indicated in Fig. 1. The cleaner is then moved back and forth by means of the handle **22** over the carpet or other floor covering to be cleaned. The cleaning operation of the cleaner is substantially the same as that of previous cleaners. The brush roll **14** is rotated and agitates and sweeps the surface of the carpet. The fan **11** creates a suction which draws the carpet up against the mouth of the nozzle to be engaged by the brush roll. The suction draws the dust-laden air into the nozzle, from which it flows to the fan and then to the dust bag in the usual manner.

In the operating position of the handle as referred to, the torsion spring **25** exerts a turning moment between the handle and the cleaner body, which tends to tilt the cleaner body in the direction to raise the front end thereof, or counterclockwise as seen in Fig. 1. This biasing shifts some of the weight from the front wheels to the rear wheels, so that, in normal operation, the rear wheels carry at least twice as much of the weight of the cleaner as do the front wheels. Because the form of the front wheels gives them greater supporting capacity, as described above, the front wheels are able to carry the reduced weight imposed on them without unduly submerging in or penetrating the nap of the carpet. In other words, the front wheels contact the carpet near the surface thereof and thus maintain the nozzle sufficiently above the surface of the carpet to provide effective cleaning thereof. Accordingly, the cleaner may be used on carpets of different thicknesses without the necessity of manually adjusting the same.

In tests which I have made, I have also found that bouncing of the cleaner as it is moved back and forth during cleaning operation is reduced as the total width of tread of the front wheels is divided into a greater number of separated narrow widths of tread, and that the group of four narrow wheels described herein produces less bouncing than either the relatively wide, single front wheels or the pairs of front wheels of ordinary width heretofore used.

While I have shown my invention in but one form, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various changes and modifications without departing from the spirit thereof, and I desire, therefore, that only such limitations shall be placed thereupon as are specifically set forth in the appended claims.

What I claim is:

1. In a suction cleaner, the combination of a cleaner body having a transversely-extending suction nozzle at the front end thereof, a group of front wheels disposed rearwardly of the nozzle adjacent each end thereof, each group comprising at least three wheels each having a tread that is not more than ¼ inch wide and the treads of adjacent front wheels of the group being not less than $\frac{3}{16}$ inch and not more than $\frac{5}{16}$ inch apart, said front wheels being mounted on said cleaner body for rotation about a fixed axis extending parallel to said nozzle, a pair of rear wheels mounted on the cleaner body adjacent the rear end thereof on a fixed axis parallel to the front wheel axis, and a handle pivoted to said body on an axis parallel to said wheel axes, the front wheels providing sufficient support of the forward part of the cleaner, when the cleaner is in normal operation, to prevent the same from unduly sinking into the carpet nap and thereby maintaining said nozzle in proper cleaning relation to the surface of carpets of various thicknesses.

2. In a suction cleaner, the combination of a cleaner body having a transversely-extending suction nozzle at the front end thereof, a group of front wheels disposed rearwardly of the nozzle adjacent each end thereof, each group comprising at least three wheels each having a tread that is not more than ¼ inch wide and the treads of adjacent front wheels of the group being not less than $\frac{3}{16}$ inch and not more than $\frac{5}{16}$ inch apart, said front wheels being mounted on said cleaner body for rotation about a fixed axis extending parallel to said nozzle, a pair of rear wheels mounted on the cleaner body adjacent the rear end thereof on a fixed axis parallel to the front wheel axis, and a handle pivoted to said body on an axis parallel to said wheel axes, the cleaner being constructed and arranged so that, in normal operation, the rear wheels carry at least twice as much of the weight of the cleaner as do the front wheels, the front wheels providing sufficient support of the forward part of the cleaner, when the cleaner is in normal operation, to prevent the same from unduly sinking into the carpet nap and thereby maintaining said nozzle in proper cleaning relation to the surface of carpets of various thicknesses.

3. In a suction cleaner, the combination of a cleaner body having a transversely-extending suction nozzle at the front end thereof, a group of front wheels disposed rearwardly of the nozzle adjacent each end thereof, each group comprising at least four wheels each having a tread that is not more than ¼ inch wide and the treads of adjacent front wheels of the group being not less than $\frac{3}{16}$ inch and not more than $\frac{5}{16}$ inch apart, said front wheels being mounted on said cleaner body for rotation about a fixed axis extending parallel to said nozzle, a pair of rear wheels mounted on the cleaner body adjacent the rear end thereof on a fixed axis parallel to the front wheel axis, the tread of each rear wheel being substantially as wide as the combined width of the treads of each group of front wheels, a handle pivoted to said body group on an axis parallel to said wheel axes, and spring means exerting a turning moment between said handle and said body in the direction to tilt the front end of the cleaner body upwardly, the front wheels providing sufficient support of the forward part of the cleaner, when the cleaner is biased by said spring means as in normal operation, to prevent the same from unduly sinking into the carpet nap and thereby maintaining said nozzle in proper cleaning relation to the surface of carpets of various thicknesses.

4. A suction cleaner as set forth in claim 1, wherein each front wheel has a tread that is substantially ⅛ inch wide and in which the treads of adjacent front wheels are spaced substantially ¼ inch apart.

5. In a suction cleaner, the combination of a cleaner body having a transversely-extending suction nozzle at the front end thereof, a group of front wheels disposed rearwardly of the nozzle adjacent each end thereof, each group comprising at least three wheels each having a tread that is not more than ¼ inch wide and the treads of

adjacent front wheels of the group being not less than $\frac{3}{16}$ inch apart, a pair of rear wheels mounted on the cleaner body adjacent the rear end thereof, and a handle pivoted to said body intermediate said front and rear wheels, the front wheels providing sufficient support of the forward part of the cleaner, when the cleaner is in normal operation, to prevent the same from unduly sinking into the carpet nap and thereby maintaining said nozzle in proper cleaning relation to the surface of carpets of various thicknesses.

6. A suction cleaner as set forth in claim 1 wherein the treads of all the front wheels are of the same diameter.

7. A suction cleaner as set forth in claim 5 wherein the treads of all the front wheels are of the same diameter.

ARTHUR A. DAVIS.