Jan. 5, 1932. W. B. NORDHEM 1,839,582

VACUUM CLEANER

Filed July 2, 1930

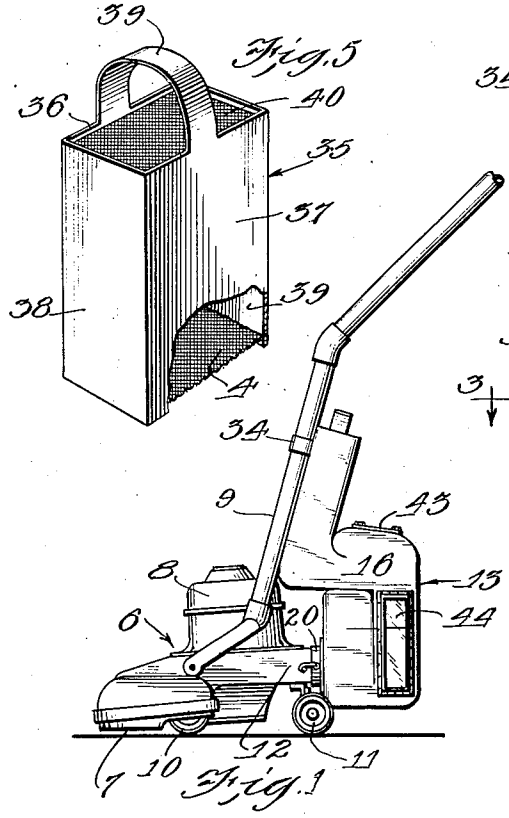


Fig. 1

Fig. 5

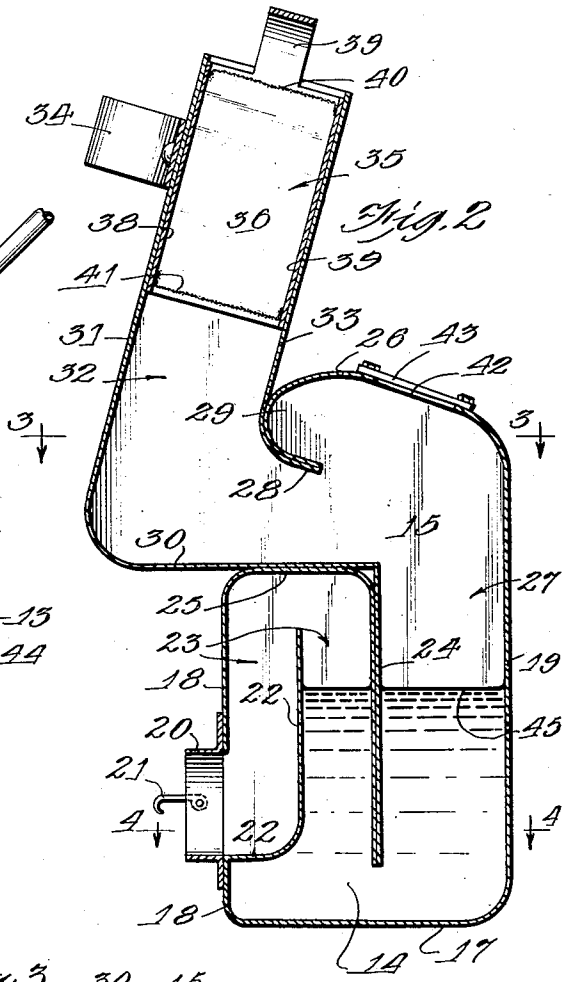


Fig. 2

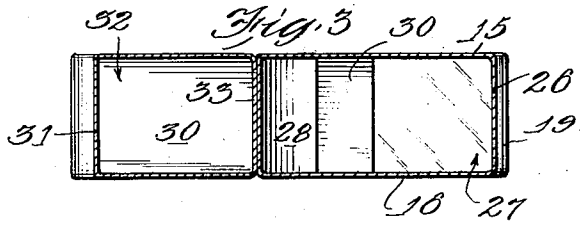


Fig. 3

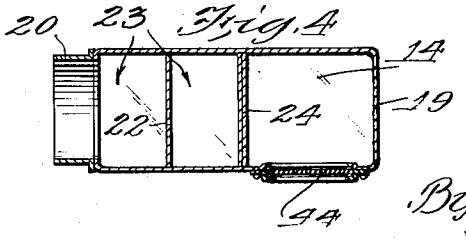


Fig. 4

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UNITED STATES PATENT OFFICE

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VACUUM CLEANER

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This invention has to do with improvements in vacuum cleaners and the like. The invention herein disclosed has reference particularly to improvements in the construction and arrangement of the dust catcher used for trapping and eliminating the dust and other material delivered by the vacuum cleaner.

One object of the invention is to provide a dust catcher for the above purpose which is so constructed that the dust and other foreign matter is caught and eliminated by means of a water or other liquid bath. That is to say, the trap serves to remove the foreign matter from the air by the use of a water bath.

In connection with the foregoing, it is an object of the invention to provide a construction in which the dust catcher is a self-contained unit which can be attached to and removed from the body portion of the vacuum cleaner in much the same manner as in the case of dust catchers in the form of dust bags such as have been previously used. In connection with the foregoing, it is an object to provide a construction which can be readily attached to or removed from the discharge portion of the vacuum cleaner proper.

Another feature of the invention relates to the provision of a construction which is so formed and shaped that it naturally conforms to the general contour of vacuum cleaners of standard and well known design. In this connection, it is an object to so shape the parts that they will readily conform to the natural position of the handle by which the vacuum cleaner is moved and guided about; and at the same time, the shape of the parts is such that the dust and other foreign matter is trapped to best advantage without excessive removal of water or moisture from the dust catcher.

A further feature of the invention relates to the provision of an arrangement in which the passage of the air through the device is such that free water and excess moisture are rejected from the air and are returned back into the trap.

A further feature in connection with the foregoing is the provision of means for removing the last traces of free water from the air being delivered, said means taking the form of screens, the position of which can be conveniently adjusted so as to secure the best possible operation.

A further feature of the invention relates to the provision of an arrangement such that danger of water working its way back into the vacuum cleaner is practically eliminated.

Another feature is to provide a cleaning opening through which the water and entrained dust and foreign matters may be readily removed from time to time and new water introduced.

Other objects and uses of the invention will appear from a detailed description of the same which consists in the features of construction and combinations of parts hereinafter described and claimed.

In the drawings:

Figure 1 shows a side elevation of a conventional form of vacuum cleaner having applied thereto a dust catcher embodying the features of the present invention;

Figure 2 shows a vertical section through the dust catcher itself on enlarged scale as compared to Figure 1;

Figure 3 shows a horizontal section on the line 3—3 of Figure 2, looking in the direction of the arrows;

Figure 4 shows a horizontal section on the line 4—4 of Figure 2, looking in the direction of the arrows; and

Figure 5 shows a perspective view of the adjustable screen element, a portion thereof being broken away to more conveniently illustrate the construction of the same.

Referring first to Figure 1, the vacuum cleaner is designated in its entirety by the numeral 6. It is provided with the usual suction or inlet portion 7, the driving motor 8, and the handle 9 by means of which it is moved about and guided over the floor. In the construction illustrated, wheels 10 and 11 are provided for giving easy traction to the vacuum cleaner.

The air blast carrying with it the entrained dust and other foreign matter is delivered out through a connection 12 of the vacuum cleaner. This connection is generally circular in form; and heretofore it has been cus-

tomary to receive the air blast from said connection into a bag or the like which is attached to the end of the throat 12 and connected thereto in any convenient manner. It has also in the past been customary to support the end of said bag by means of a hook or the like connected to an eyelet on the handle 9.

According to the present invention, I eliminate the bag aforesaid and substitute in place therefor a dust catcher unit designated in its entirety by the numeral 13. The same includes a compartment or pocket 14, which constitutes a water bath or trap through which compartment and water the air current is compelled to travel, the dust and other foreign matter being taken into the water and thereby effectively removed from the air.

For the above purpose, the present device includes the side walls 15 and 16 which extend for practically its full height. The water bath 14 is established by means of the bottom or floor 17, and the front and rear walls 18 and 19 in conjunction with the side walls 15 and 16. A neck 20 is provided of proper size and shape to be set over the end of the throat 12. Suitable hooks or the like 21 are provided for connecting the parts together so that the dust catcher will be properly retained in place during the operation of the vacuum cleaner.

A partition 22 extends upwardly from the lower side of the neck 20 to a sufficient height to establish a weir at the upper end of the inlet air passage 23. Another partition 24 reaches downwardly to a sufficiently low point to establish an inverted weir beneath which the air current is compelled to travel in order to flow through the dust catcher. A roof 25 connects the upper edges of the front wall 18 and partition 24. By these means the passage 23 is carried up over the weir 22 and downwardly beneath the weir 24.

The rear wall 19 is curved up and forwardly to establish a roof section 26 which constitutes the top of the upwardly extending passage 27. This passage thus extends upwardly from the trap and is carried forwardly on an easy curve. The roof portion 26 just referred to is carried clear forward and down to establish a rearwardly extending lip 28 so that a pocket 29 is formed above said lip and the upwardly flowing current of air is trapped in said pocket 29 and given a swirling action which serves to effectively throw out any free water and cause the same to be precipitated on the inner surface of the roof 26 and lip 28 whence it can drip back towards the trap.

There is a forward extension 30 from the upper end of the partition 24, which extension 30 is then carried up and back on an angle to establish the front wall 31 of a delivery throat 32. The lip 28 is carried up practically parallel to the wall 31 so as to establish the rear wall 33 of the delivery throat 32.

The walls 31 and 33 are given a rearward slant which brings them substantially parallel to the handle 9 so that the delivery throat 32 will naturally extend up parallel to the handle 9 and can occupy a position behind the same when said handle stands in the natural operating position as shown in Figure 1. It is thus possible, if desired, to connect the handle to the upper portion of the wall 31 by means of a loop 34 placed on the front wall 31 in position to embrace the handle and thus hold the dust catcher and handle firmly together.

It will be understood that the passages are of substantially rectangular cross section. This fact is readily evident from examination of Figures 3 and 4. If desired, however, passages of other cross sectional form might be substituted; but the rectangular form lends itself admirably to the present service since it is possible thereby to make use of flat side plates 15 and 16.

If desired, a removable and adjustable screen trap 35 may be provided in the upper portion of the delivery throat 32. This trap 35 is shown in perspective in Figure 5. It includes the side walls 36 and 37 together with the front and back walls 38 and 39 which together provide a telescoping member of such size and shape that it can be readily slipped into the throat 32 and retained therein by friction. Preferably a cross handle 39 extends across between the side walls 36 and 37 and serves as a convenient means for setting the member 35 into place and bringing it into the desired adjustment.

Screens 40 and 41, preferably of fine mesh, are secured across the upper and lower portions of the member 35 so that the air current is compelled to flow through said screen sections.

There is provided an opening 42 in the roof portion 26 through which water can be introduced into the trap, and also through which opening the water and entrapped dust and other foreign matter may be removed from time to time. A cap 43 serves to close said opening in liquid and air tight fashion when the device is in operation.

Preferably, a window 44 is placed in one of the side walls 16 opposite to the passage 27, said window extending up and down a sufficient distance to enable the operator to observe the water level at different times.

When the device is to be placed in operation, water is introduced substantially up to the level 45 shown in Figure 2. It will be noticed that the cross sectional area of the passage 23 is substantially one-half that of the passage 29. Consequently, the depression of the water level a given distance on the left hand side of the weir 24 will result in raising said level only approximately one-

half as high on the right hand side of the weir 24. It is thus possible for the air current flowing through the passage 23 to depress the water level sufficiently to permit the air to flow beneath the lower edge of the weir 24, whereupon it will bubble up through the water standing at the right hand side of the weir 24 without causing the water to rise an excessive height in the passage 27. As the air bubbles violently up through the water, the dust and other foreign matter will be effectively removed and caught by the water bath so that the air rushing up against the roof 26 will be substantially clean and free of such matter. This air will, however, be heavily laden with water and moisture which will be effectively trapped and thrown out against the curved portion terminating in the lip 28. Consequently, the air finding its way up through the passage 32 will be practically devoid of any free water. Any last traces of free water will be caught on the screens 41 and 40 and will drip back along the walls of the throat 32 and find its way back into the trap.

The accumulation of the dust and other foreign matter will result in the production of a sludge or heavily dirt laden bath which can be removed through the opening 42 when the cover 43 has been removed. The operation of the device can be readily observed at all times through the window 44.

It will be noticed that the arrangement is one which lends itself very advantageously to the present combination. This is because the passages and the weirs are so formed and related to each other that they not only bear the desired relationship to each other but also fit into combination with the essential portions of the vacuum cleaner in a very advantageous manner.

While I have herein mentioned specifically the use of a water bath, it will be understood that other suitable liquids such as oils or the like may be substituted in place of the water if desirable.

While I have herein shown and described only a single embodiment of the features of my present invention, still I do not intend to limit myself thereto except as I may do so in the claims.

I claim:

1. The combination with the discharge connection of a vacuum cleaner, through which discharge connection is delivered a stream of air and entrained foreign matter, said vacuum cleaner having an upwardly and rearwardly extending handle, of means for removing said foreign matter from said stream of air, said means comprising a housing having on one face a forwardly extending connection for attachment to the delivery opening of the vacuum cleaner, and having within said housing an upwardly extending weir, a downwardly extending weir, and providing a passage extending upwardly from said attachment over said first named weir, then downwardly beneath said second named weir, and an upwardly extending return trap passage connected to said passage beyond said second named weir, the return trap passage being of substantially double the cross-sectional area of the downwardly extending passage, the downwardly extending passage and the upwardly extending return trap passage constituting a liquid trap, suitable liquid within said trap submerging the lower portion of the inverted weir, said housing providing an upwardly and forwardly extending passage in connection with the upper portion of the return trap passage, and an upwardly and rearwardly extending delivery passage in connection with the forwardly extending passage aforesaid, said upwardly and rearwardly extending passage lying substantially parallel to the handle of the vacuum cleaner, and a vertically adjustable screen element within the upwardly and rearwardly extending passage aforesaid for the removal of traces of water entrained in the air current, substantially as described.

2. The combination with a vacuum cleaner having a rearwardly extending discharge connection through which is delivered a current of air together with entrained foreign matter, said vacuum cleaner being also provided with an upwardly and rearwardly extending handle, of means for cleaning the air current delivered through said connection and removing entrained foreign matter therefrom, said means comprising a body member having a forwardly extending attachment for connection to the delivery connection of the vacuum cleaner and having an upwardly extending weir and an inverted weir, said body member providing a three-pass trap passage comprising an upwardly extending arm reaching from the inlet connection aforesaid to the upper end of said first named weir, together with downwardly and upwardly extending arms reaching therefrom beneath said inverted weir, suitable liquid in the downwardly and upwardly extending arms aforesaid constituting a liquid trap, said body member also providing a delivery passage reaching from the upwardly extending arm forwardly to a position close to the handle and then upwardly and rearwardly at an angle substantially corresponding to the slope of the handle, a vertically adjustable screen trap in the upwardly and rearwardly extending passage aforesaid, and means for connecting said upwardly and rearwardly extending passage to the handle, substantially as described.

3. The combination with a vacuum cleaner having a rearwardly extending discharge connection through which is delivered a current of air together with entrained foreign matter, said vacuum cleaner being also pro-

vided with an upwardly and rearwardly extending handle, of means for cleaning the air current delivered through said connection and removing entrained foreign matter therefrom, said means comprising a body member having a forwardly extending attachment for connection to the delivery connection of the vacuum cleaner and having an upwardly extending weir and also an inverted weir, said body member providing a three-pass trap passage comprising an upwardly extending arm reaching from the inlet connection aforesaid to the upper end of said first named weir, together with downwardly and upwardly extending arms reaching therefrom beneath said inverted weir, suitable liquid in the downwardly and upwardly extending arms aforesaid constituting a liquid trap, said body member also providing a delivery passage reaching from the upwardly extending arm forwardly to a position close to the handle and then upwardly and rearwardly at an angle substantially corresponding to the slope of the handle, and means for connecting said upwardly and rearwardly extending passage to the handle, substantially as described.

4. The combination with a vacuum cleaner having a rearwardly extending discharge connection through which is delivered a current of air together with entrained foreign matter, said vacuum cleaner being also provided with an upwardly and rearwardly extending handle, of means for cleaning the air current delivered through said connection and removing entrained foreign matter therefrom, said means comprising a body member having a forwardly extending attachment for connection to the delivery connection of the vacuum cleaner and the body member also having a three-pass trap passage comprising an upwardly extending arm reaching from the inlet connection aforesaid upwardly establishing a weir, together with downwardly and upwardly extending arms reaching therefrom establishing an inverted weir, suitable liquid in the downwardly and upwardly extending arms aforesaid constituting a liquid trap, said body member also including a delivery passage reaching from the upwardly extending arm forwardly to a position close to the handle and then upwardly and rearwardly at an angle substantially corresponding to the slope of the handle, substantially as described.

5. The combination with a vacuum cleaner having a rearwardly extending connection through which is delivered a current of air together with entrained foreign matter, and also having an upwardly and rearwardly extending handle, of means for removing foreign matter from said current of air comprising a body member providing in its lower portion a liquid trap, there being an inverted weir beneath which the current of air is caused to flow during the operation of the device, said body member also including a forwardly extending attachment for connection to the delivery connection of the vacuum cleaner, said body portion also providing an upwardly and rearwardly extending passage lying substantially parallel to and behind the handle of the vacuum cleaner, the lower portion of said passage being in connection with the delivery end of the liquid trap aforesaid, a downwardly and rearwardly curving lip in said connection serving to receive and deflect the current of air flowing through said connection for the purpose of giving the same a swirling action to throw out entrained moisture, and means for connecting the upwardly and rearwardly extending portion of the device to the handle of the vacuum cleaner, substantially as described.

6. The combination with a vacuum cleaner having a rearwardly extending connection through which is delivered a current of air together with entrained foreign matter, and also having an upwardly and rearwardly extending handle, of means for removing foreign matter from said current of air comprising a body member having in its lower portion a liquid trap, the body member having an inverted weir beneath which the current of air is caused to flow during the operation of the device, said body member also including a forwardly extending attachment for connection to the delivery connection of the vacuum cleaner, said body portion also providing an upwardly and rearwardly extending passage lying substantially parallel to and behind the handle of the vacuum cleaner, the lower portion of said passage being in connection with the delivery end of the liquid trap aforesaid, and means for connecting the upwardly and rearwardly extending portion of the device to the handle of the vacuum cleaner, substantially as described.

7. An air cleaner for the purpose specified, comprising a body member providing in its lower portion a three-pass trap including an upwardly extending inlet passage, a downwardly extending central passage and an upwardly extending return passage, an upwardly extending weir between the first and second mentioned passages, an inverted weir between the second and third mentioned passages, suitable liquid in the second and third mentioned passages establishing a liquid bath, a connection at the inlet end of the first mentioned passage to receive the incoming current of air together with entrained foreign matter, the body member also providing an upwardly and rearwardly extending delivery passage, the lower portion of which is in connection with the upper end of the third mentioned passage, a downwardly and rearward-

ly curving lip in said connection, and an opening, together with a removable closure therefor, in said connection behind the position of the lip aforesaid permitting introduction and removal of the liquid bath and entrained matter when the device is tilted rearwardly, substantially as described.

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