United States Patent

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[54] **SQUEEGEE VACUUM PICKUP UNIT FOR MOBILE WINDOW WASHER**
9 Claims, 11 Drawing Figs.

[52] U.S. Cl. **15/302,** 15/320, 15/374, 15/401
[51] Int. Cl. **A471 1/00**
[50] Field of Search 15/103, 302, 320, 321, 322, 401, 1.7, 353, 375

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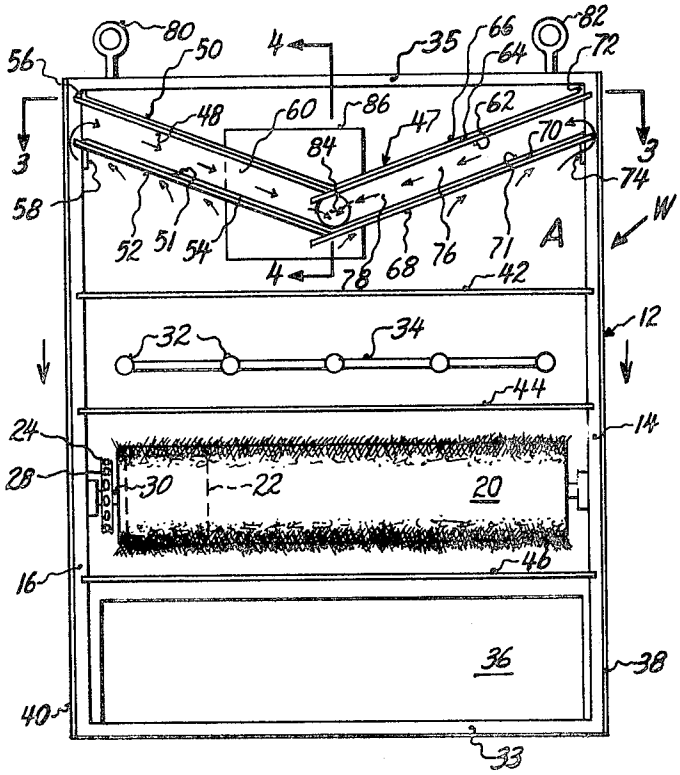
ABSTRACT: The disclosure relates to a vacuum squeegee pickup for a window washer device including a housing having suction means connected thereto, the housing further having a mouth with first and second spaced flexible elongated means on said mouth, the housing connected to the device and disposed with the flexible elongated means positioned obliquely with respect to the direction of travel of the device.



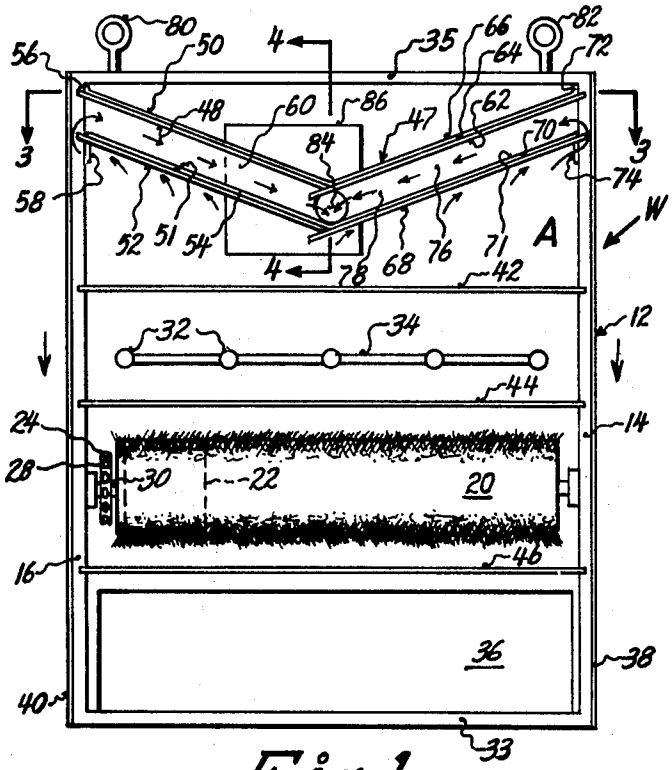


Fig. 1.

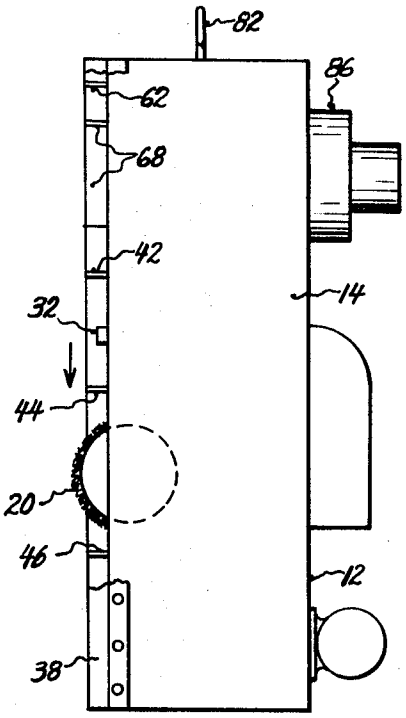


Fig. 2.

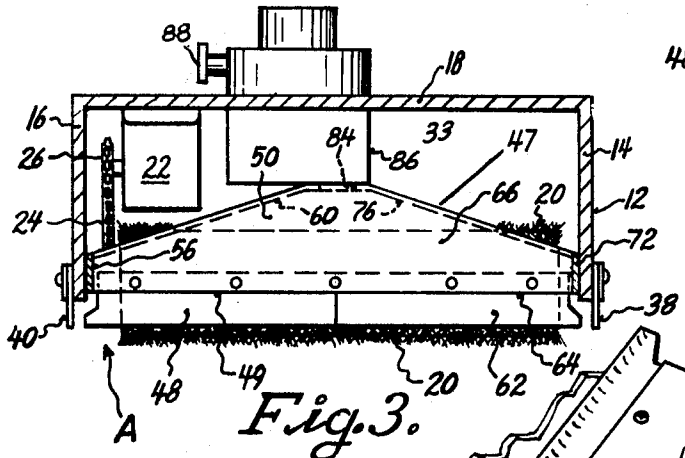


Fig. 3.

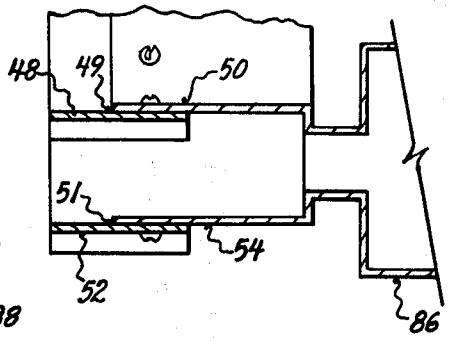


Fig. 4.

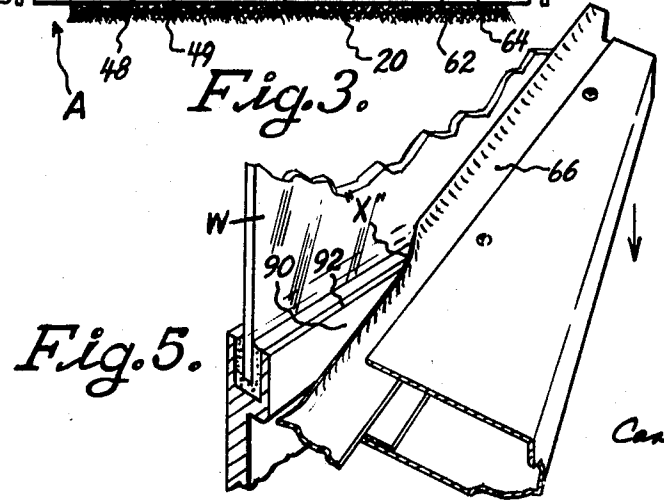


Fig. 5.

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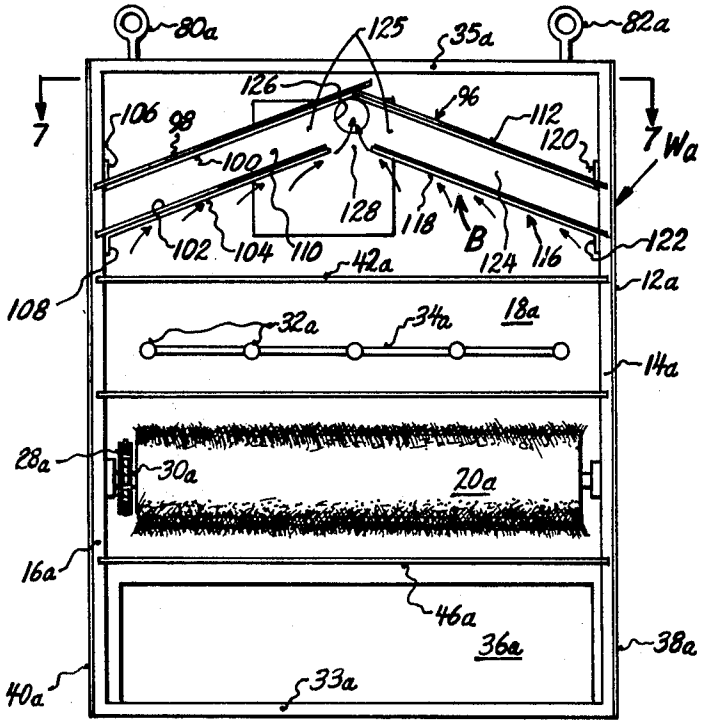

Fig. 6.

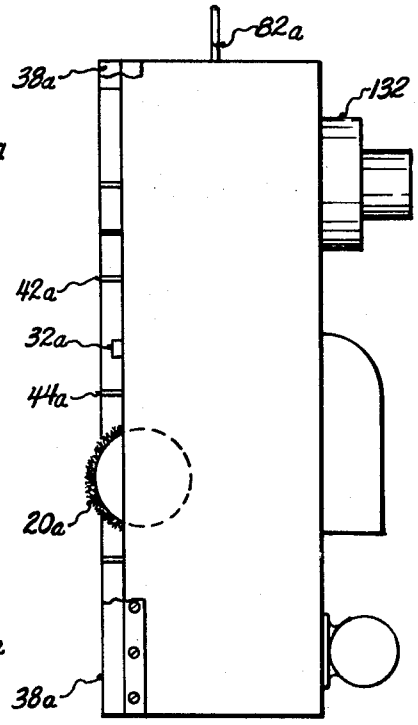

Fig. 8.

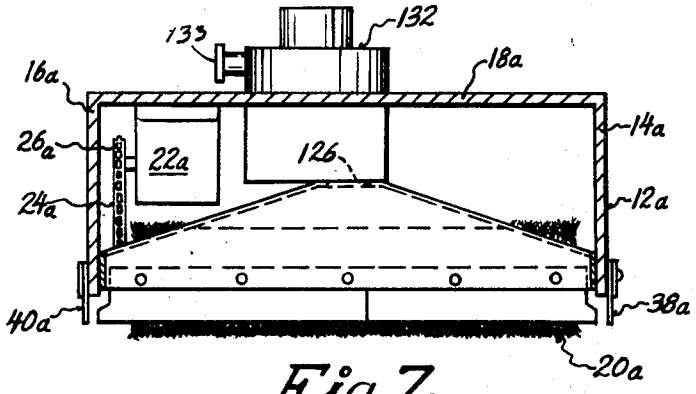

Fig. 7.

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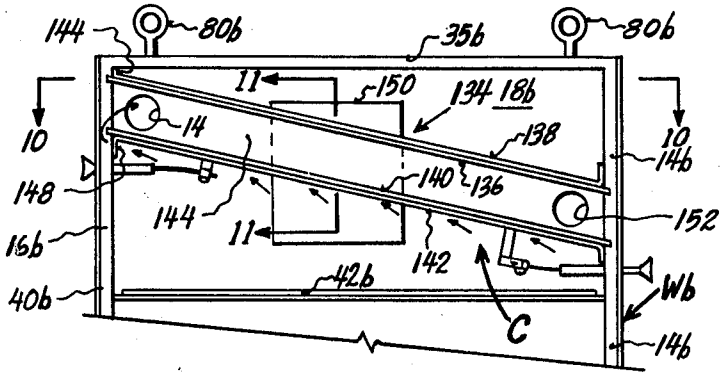

Fig. 9.

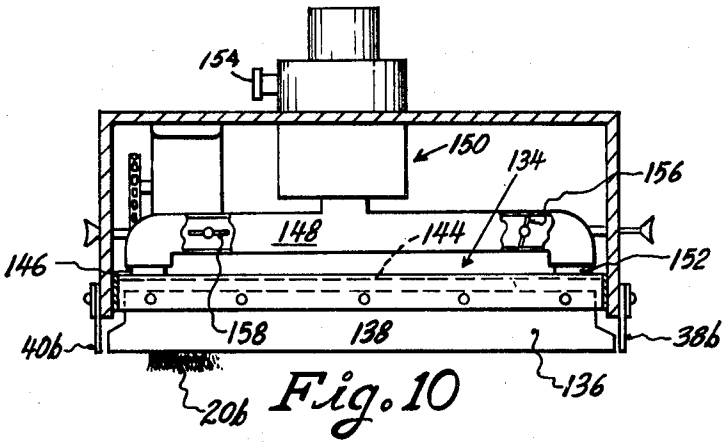

Fig. 10

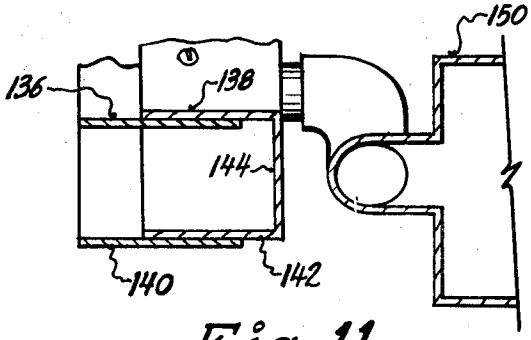

Fig. 11

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SQUEEGEE VACUUM PICKUP UNIT FOR MOBILE WINDOW WASHER

SUMMARY OF THE INVENTION

The invention relates to window washers moved over window and wall surfaces and more particularly to the squeegee unit thereon having a vacuum pickup. It is an object of the invention to provide a squeegee unit having a vacuum pickup between a pair of squeegee blade formations, the squeegee blade formations being mounted on the washer device so that the same are oblique to the direction of travel of the device. With the oblique mounting of the squeegee blade formations the window and wall surfaces are wiped clean and the vacuum picks up the cleaning fluid and dirt. Additionally, the obliquely positioned blades are progressively forced over crossbars, raised portions or depressions such as joints of a window surface which lie normal to the direction of travel of the device. At the point of contract of the blades with the crossbar or the like, the blade edge portions are distorted temporarily out of shape. At the point of distortion of the blade a relatively small opening is formed and due to the small restricted size of the opening a venturilike passage is formed at the crossbar or raised window portion through which air is sucked into the vacuum housing at an accelerated rate which very effectively draws cleaning fluid and dirt at the edge of the crossbar progressively across the bar as the washer travels over the window and wall surfaces. As the blade passes over any raised portion of a window or a depressed portion such as a joint disposed normal to the direction of travel of the device a venturi condition is created with the benefit as outlined above.

These and other more detailed and specific objects will be disclosed in the course of the following specification, reference being had to the accompanying drawings, in which

FIG. 1 is a front elevational view of a window washer unit having a vacuum squeegee pickup embodying the invention.

FIG. 2 is a side elevational view of the device of FIG. 1, a portion of which is broken away.

FIG. 3 is a sectional view on the line 3—3 of FIG. 1.

FIG. 4 is a sectional view on the line 4—4 of FIG. 1.

FIG. 5 is a perspective view of a portion of a squeegee blade as it moves over a raised horizontal cross member on a window.

FIG. 6 is a front elevational view of a window washer unit illustrating a further embodiment of the invention.

FIG. 7 is a sectional view on the line 7—7 of FIG. 6.

FIG. 8 is a side elevational view of the device of FIG. 6, a portion of which is broken away.

FIG. 9 is a front elevational view of a window washer unit illustrating a further embodiment of the invention, portions of the washer unit identical to those of FIGS. 1 and 6 being broken away.

FIG. 10 is a sectional view on the line 10—10 of FIG. 9.

FIG. 11 is a sectional view on the line 11—11 of FIG. 9.

Referring to FIGS. 1–5 of the drawing in detail, the window washer W having the vacuum squeegee pickup unit A includes the washer housing 12 formed of the spaced sidewalls 14 and 16 connected by the rear wall 18. Mounted on the housing 12 is the rotatable cylindrical brush 20 driven by the motor 22 through the chain 24 mounted on the gear 26 of the motor and the gear 28 mounted on the end shaft 30 of the brush. Further provided is the plurality of spray nozzles 32 mounted on the liquid supply tube 34 to which a supply of fluid is pumped by conventional means not shown, one form of which is disclosed in application Ser. No. 553,351.

The lower ends of the sidewalls are connected by a bottom wall 33, and the upper ends of the sidewalls are connected by a top wall 35. The numeral 36 designates a tank mounted on the lower end of the housing which contains a supply of cleaning liquid pumped to the nozzles 32 and circulated back to the tank by means such as shown in application Ser. No. 553,351. The housing 12 has mounted on the front edge of the sidewall 14 of the flap 38 and on the front edge of the sidewall 16 the flap 40 which maintain spray and water vapor within the unit. One or more squeegees such as 42, 44 and 46 are connected at the ends thereof to the sidewalls 14 and 16 and extend horizontally across the housing.

The squeegee water vacuum pickup unit A includes as a part of the vacuum housing 47 the first upper flexible blade 48 affixed at its inner edge to the outer edge 49 of the first upper wall 50 of the vacuum unit. The upper wall 50 and the blade affixed thereto are obliquely disposed to the wall 16 and the direction of travel of the washer unit W. Further provided is the first lower flexible blade 52 affixed at its inner edge to the outer edge 51 of the first lower wall 54, the wall 54 being spaced from and parallel to the wall 50. The outer end of the first upper wall 50 has formed thereon the flange 56 which is secured to the wall 16, and the outer end of the lower wall 54 has formed thereon the flange 58 which is secured to the wall 16. The upper wall 50 and the lower wall 54 are connected at the rear edges thereof by the rear wall 60. The blades 48 and 52 form an acute angle relative to the wall 16 and the direction of travel of the unit W.

The numeral 62 designates a second upper flexible blade affixed at its inner edge to the outer edge 64 of the second upper wall 66 of the vacuum unit. The second upper wall 66 and the blade affixed thereto are obliquely disposed to the wall 14. Further provided is the second lower flexible blade 68 affixed at its inner edge to the outer edge 70 of the second lower wall 71, the wall 66 being spaced from and parallel to the wall 71. The outer end of the second upper wall 66 has formed thereon the flange 72 which is secured to the wall 14, and the outer end of the second lower wall 70 has formed thereon the flange 74 which is secured to the wall 14.

The upper wall 66 and the lower wall 70 are connected at the rear edges thereof by the rear wall 76. The blades 48 and 62 form a first or upper following blade and the blades 52 and 68 form a second or lead blade. The blades 48, 62, 52 and 68 together with the walls 50, 51, 66 and 71 and the rear walls 60 and 76 form a suction chamber. It will be seen that the inner end of the first upper blade 50 abuts the second upper blade 62 adjacent the inner end thereof and the inner end of the first lower blade 54 abuts the second lower blade 68 adjacent the inner end thereof. The pair of blades 50 and 54 together with the pair of blades 62 and 68, respectively, form obtuse angles each obliquely positioned with respect to the walls 14 and 16 which walls are parallel to the direction of travel of the washer W over the window and wall surfaces of a building. The disposition of the walls 50, 54, 66 and 70 together with blades 40, 54, 62 and 68 form a V-shaped mouth squeegee opening 78 for the vacuum housing 47 with the apex of the V extended in the direction of travel.

Secured to the top wall 35 of the washer W are the eyes 80 and 82 to which cable means are connected for moving the washer over the window and wall surfaces of a building by means of a powered winch or the like located on the top of the building. The washer may also be moved over the window and wall surfaces by means of drive means such as disclosed in application Ser. No. 553,351, in a vertical or horizontal travel.

At the juncture of the rear walls 60 and 76 of the vacuum housing 47 is the suction port 84 connected to the housing 86 in which is mounted a conventional vacuum motor which produces the suction and vacuum between the blades of the vacuum housing 47 as referred to hereinafter.

As the washer W is moved over the window and wall surfaces of a building the brush 20 and fluid from nozzles 32 cleans the surfaces. The horizontal squeegees 42–46 remove the greater portion of the fluid from the surfaces. The unit A operates as a final and complete squeegeeing and pickup of fluid and dirt from the windows of the building. As the unit A is caused to move as indicated by arrows in FIG. 1, cleaning fluid upon the windows is caused to travel along each of the squeegee blades 52 and 68 as indicated by the arrows in FIG. 1. The fluid moves to the outer ends of the blades 52 and 68 when the suction existing at ends of the blades draws in the fluid. The fluid is sucked through the vacuum housing 47 to

and through the suction port **84** into the suction housing having a conventional motor and suction fan from which it is exhausted through outlet **88**.

When the washer W moves over window surfaces, it encounters horizontal crossbars separating sections of glass or wall or raised or depressed portions such as joints. This poses a problem for a washer with any form of a squeegee blade positioned normal to the direction of travel of the washer unit, for such a blade meets the crossbar, for example, full on with the blades moved over the crossbar simultaneously throughout its length, for both crossbar and blades are parallel. This not only produces a shock effect but the vacuum pickup at the edges of the crossbars is not efficient and dirt and some cleaning fluid remains upon the edges of the crossbar. The dirt that remains may run down upon the window below during the next fall of rain. With the blades disposed obliquely to the line of travel, the same clean the surface. Further, with the present invention the blades of the unit A contact and are rigidly and progressively forced over the cross bar or raised portion of a window at an angle. At the point of contact of the blades with the crossbar **90** of the window, as an example, the blade edge portions are distorted temporarily out of shape whereby the same can be forced over the bar **90**, FIG. **5** in particular. At the point of distortion of the blade at the bar away from the window and bar surfaces an opening "X" is formed, and due to the small restricted size of the opening "X" a venturilike passage is formed at the edge **92** of the bar at "X" through which air is sucked into the housing at an accelerated rate which very effectively draws in dirt and water, which is at the edge **92** of the crossbar, progressively across the bar as the unit A moves over the window and wall surfaces. This is also true of the following blades **48** and **62** as the same obliquely pass over a bar of a window or wall surface. In FIG. **5** the blade **66** is in contact with the window W and bar **90** except as at "X." Due to the oblique disposition of the blades **52** and **68**, water on a window being cleaned is squeegeed and caused to travel outwardly and to the ends of the housing **47** as indicated by arrows in FIG. **1** where it is picked up by suction as described.

FIGS. **6–8** illustrate a further embodiment of the invention in which is shown the window washer W*a* which is identical to washer W except for the vacuum pickup unit B. The identical parts of the washer W*a* bear the same reference numeral as used relative to washer W but accompanied by a lowercase letter *a*.

The squeegee water vacuum pickup unit B includes as a part of the vacuum housing **96** the first upper flexible blade **98** affixed at its inner edge to the outer edge of the first upper wall **100** of the vacuum unit. The upper wall **100** and the blade thereon are obliquely disposed to the wall **16***a* and the direction of travel of the washer W*a*. Further provided is the first lower flexible blade **102** affixed at its inner edge to the outer edge of the first lower wall **104**, the wall **104** being spaced from and parallel to the wall **100**. The outer end of the first upper wall **100** has formed thereon the flange **106** which is secured to the wall **16***a*, and the outer end of the lower wall **104** has formed thereon the flange **108** which is secured to the wall **16***a*. The upper wall **106** and the lower wall **104** are connected at the rear edges thereof by the rear wall **110**. The blades **98** and **102** form an acute angle relative to the wall **16***a* and the direction of travel of the unit W*a*.

The numeral **112** designates a second upper flexible blade affixed at its inner edge to the outer edge of the second upper wall **114** of the vacuum unit. The second upper wall **114** and the blade affixed thereto are obliquely disposed to the wall **14***a*. Further provided is the second lower flexible blade **116** affixed at its inner edge to the outer edge of the second lower wall **118**, the wall **114** being spaced from and parallel to the wall **118**. The outer end of the second upper wall **114** has formed thereon the flanges **120** secured to the wall **14***a*, and the outer end of the second lower wall **118** has formed thereon the flange **122** secured to the wall **14***a*. The blades **98**, **102**, **112** and **116** together with the walls **100**, **102**, **118** and **114** and the rear walls **110** and **124** form a V-shaped mouth **125** and suction chamber. The blades **100** and **112** form a following blade while the blades **102** and **116** form a leading blade.

The upper wall **114** and the lower wall **118** are connected at the rear edges thereof by the rear wall **124** which joins the rear wall **110** at the vacuum exit or suction opening **126**. The inner end of the lower blades **102** and **116** together with the inner ends of the lower walls **104** and **118** are spaced to form a vacuum inlet aperture **128** therebetween. The inner end of the upper blade **98** overlaps the inner end of the blade **112** and the inner end of the upper wall **100** joins the inner end of the upper wall **114** to effect a closure wall for the housing **96**. The pair of blades **98** and **102** together with the pair of blades **112** and **116** form obtuse angles each obliquely positioned with respects to the walls **14***a* and **16***a* which walls are parallel to the direction of travel of the washer W*a* over the window and wall surfaces of a building.

At the juncture of the rear walls **110** and **124** whereat the vacuum exit opening **126** is located, there is the conventional vacuum motor mounted in the housing **132** which produces the suction and vacuum between the blades of the vacuum housing **96**.

The washer W*a* operates in the manner the washer W operates as described heretofore. The unit B operates as a final and complete pickup of fluid from the windows of a building being cleaned. As the unit B is caused to move downwardly as indicated by the arrow in FIG. **6**, cleaning fluid upon the window surface is caused to travel upwardly along each of the squeegee blades **102** and **116** as indicated by the arrows in FIG. **6**. The fluid moves to the inner ends of the blades and to the vacuum inlet aperture **128** and where it is sucked into the suction housing **132** having a conventional motor and suction fan from which it is exhausted through outlet **133**. As the blades of unit B are caused to pass over window and wall surfaces the oblique disposition of the same collects the water on the surface and as the blades disposition of pass over a raised crossbar the action is the same as heretofore described with regard to the blades of housing **47** and specifically referred to in FIG. **5**.

In FIGS. **9**, **10** and **11** is illustrated an additional embodiment of the invention wherein the washer unit W*b* is the same as W and W*a* except for the squeegee vacuum pickup unit C. The parts of the washer W*b* that are identical bear the same reference numeral but accompanied by a lowercase letter *b*.

The squeegee water vacuum pickup unit C, includes as a part of the vacuum housing **134** the upper flexible blade **136** affixed at its inner edge to the outer edge of the upper wall **138** of the vacuum unit. The upper wall **138** and the blade thereon are obliquely disposed to the walls **14***b* and **16***b* and the direction of travel of the washer unit W*b*. Further provided is the lower flexible blade **140** affixed at its inner edge to the outer edge of the lower wall **142**, the wall **142**, being spaced from and parallel to the wall **138**. The outer end of the upper wall **138** has formed thereon the flange **44** which is secured to the wall **16***b* and the opposed outer end of the wall is formed with the flange **46** which is secured to the wall **14***b*. The lower wall **142** has formed on one end thereof the flange **148** which is secured to the wall **16***b* and the other end formed with the flange **150** which is secured to the wall **14***b*. The walls **138** and **142** are secured to a rear wall **144** which together with the blades **136** and **140** form a suction cavity.

The rear wall **144** has formed in one end thereof a first suction port **146** which is connected to the suction conduit **148**. The suction conduit is connected to the housing **150** in which is mounted a conventional vacuum motor which produces the suction and vacuum between the blades of the vacuum housing **134**. Formed in the other end of the rear wall **144** is a second suction port **152** which is connected to the suction conduit **148**.

The unit C may be used to pick up and clean in one direction of travel upon window surfaces as indicated by the arrow at the left of FIG. **9** and in the opposed direction of travel as indicated by the arrow at the right of FIG. **9**. When

the unit W*b* is caused to move in the direction of the arrow at the left of FIG. 9, cleaning fluid is caused to travel along the lower blade 140 as indicated by the arrows in FIG. 9. The fluid and dirt comes to outer end of the blade 140 where the suction existing at the outer ends of the blades draws the fluid into the housing 134 and into the suction port 146 where it moves through the conduit 148 to the housing 150 from where it is exhausted out the outlet 154 by means of a conventional motor and suction fan. With the blades 136 and 140 obliquely positioned to the line of travel of the washer W*b* the blades collect fluid on the surfaces to be washed and the same pick up the fluid and water at a window crossbar such as 92 in the manner hereinbefore described.

The unit C may be mounted in a washer unit such as W*b* with the brush and fluid nozzle units as illustrated in FIGS. 1–7 preceding the unit relative to the line of travel of the washer. As a result, the line of travel of the unit C would be in the direction of travel indicated by the arrow on the right of FIG. 9, whereby fluid and dirt would be caused to travel along the blade 136 to the outer end of the blade and be sucked into the suction port 152 and thence through the conduit 148, housing 150 and return line 154. When the unit C is moved in the direction of the arrow at the left of FIG. 9, the suction port 152 is shut off by means of the butterfly valve 156 whereby only the suction port 146 is operated. Similarly when the unit C is in a device for use in the opposite direction the suction port 146 is closed off by means of the butterfly valve 158 with the butterfly valve 156 open. When the butterfly valve 158 is open for operation of the device as in FIG. 9 the valve 156 is closed.

I claim:

1. A device movable over the window and wall surfaces of a building and having means for washing the surfaces, said device having squeegee vacuum pickup means to clean the surfaces, the improvement in said squeegee pickup means, said improvement including in combination:

a. a housing having

b. suction means connected to and communicating therewith,

c. said housing having a mouth,

d. said mouth having a first flexible means along one side thereof,

e. said mouth having second flexible means along another side thereof opposed to and parallel to said first flexible means and spaced from said first flexible means throughout its length with the ends of said first and second flexible means open at each end,

f. said housing rigidly connected to the device and disposed relative thereto with said flexible means thereof positioned obliquely and fixed with respect to the direction of travel of the device in either direction over the building surfaces.

2. The device of claim 1 in which said first and second flexible mean are each a rectilinear blade.

3. The device of claim 2 in which said mouth is V-shaped in formation.

4. The device of claim 3 in which

a. said suction means is connected to said housing adjacent the apex of said V-shaped mouth and

b. said first blades have an opening formed therein adjacent the apex of said mouth and communicating with said housing.

5. The device of claim 2 in which the mouth of the housing is rectilinear.

6. The device of claim 5 in which said suction means is positioned adjacent at least one end of said rectilinear mouth.

7. The device of claim 5 in which said suction means includes two inlets, one of said inlets connected to and adjacent one end of said housing and the other of said inlets connected to and adjacent the other end of said housing.

8. The device of claim 1 in which said mouth is V-shaped in formation.

9. The device of claim 8 in which said suction means in connected to said housing adjacent the apex of said V-shaped mouth.