Nov. 15, 1966 C. L. McIVER 3,284,832

WINDOW CLEANING DEVICE

Filed April 16, 1964

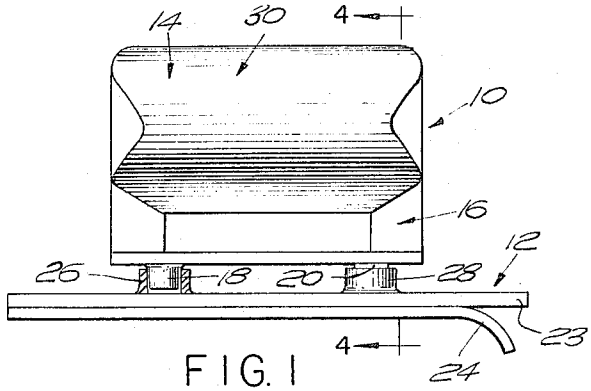


FIG. 1

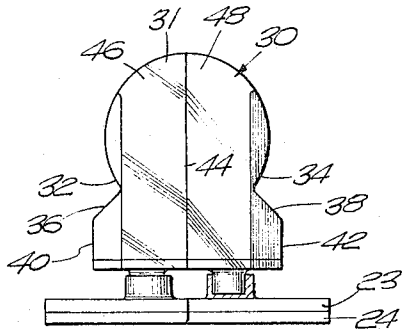


FIG. 2

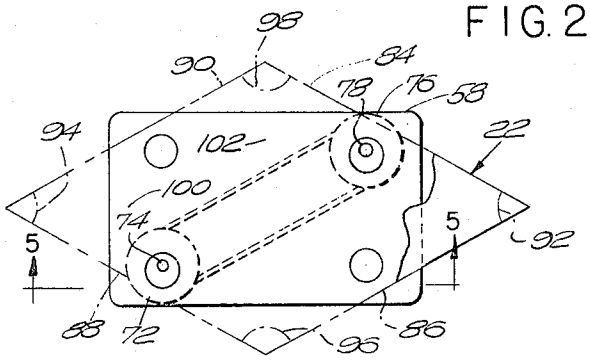


FIG. 3

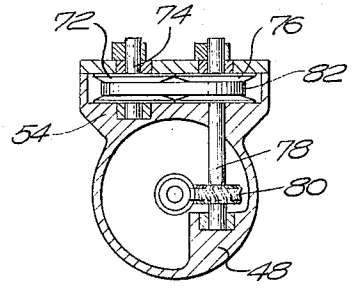


FIG. 4

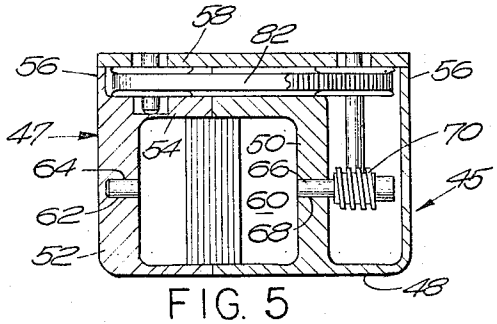


FIG. 5

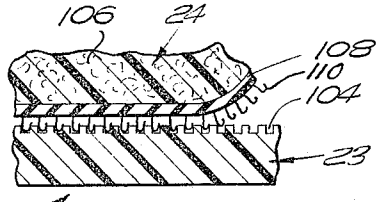


FIG. 6

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WINDOW CLEANING DEVICE

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The present invention relates to cleaning devices and, more particularly, to hand held cleaning devices particularly adapted for the cleaning of windows of buildings, vehicles, etc. with reduced physical effort and improved efficacy.

Primary objects of the present invention are: to provide a novel window cleaning device of the foregoing type having a housing, which compactly presents a manual grip and encloses a motor drive, and a cleaning head, which conveniently is oscillated by the motor drive and is accessible to a window to be cleaned, when the manual grip is held by an operator; to provide a cleaning device of the foregoing type in which the cleaning head is simply mounted on and driven by a pair of eccentric journals, which rotate in unison in response to a so-called timing belt; to provide a cleaning device of the foregoing type in which the cleaning head is diamond shaped to provide at least one vertex that defines an angle of less than 90° for easy access to window corners; and to provide a cleaning device of the foregoing type in which the cleaning head includes a relatively durable rigid plate and a relatively disposable porous pad that are are joined at an adherent interface, which permits the pad to be stripped from the plate with ease but to adhere firmly to the plate during operation.

Other objects of the present invention will in part be obvious and will in part appear hereinafter.

The invention accordingly comprises the components and interrelationships which are exemplified in the following disclosure. For a fuller understanding of the nature and objects of the present invention, reference should be had to the following detailed description, taken in connection with the accompanying drawing, wherein:

FIG. 1 is a side elevation with parts in section of a preferred device embodying the present invention;

FIG. 2 is an end elevation of the device of FIG. 1;

FIG. 3 is a bottom plan view with parts broken away of the device of FIG. 1;

FIG. 4 is a sectional view turned upside down of the device of FIG. 1, the section being taken along the line 4—4 of FIG. 1;

FIG. 5 is a sectional view of the device of FIG. 1, the section being taken substantially along the line 5—5 of FIG. 3; and

FIG. 6 is a view, in an exaggerated cross-section, of the adherent interface between components of the device of FIG. 1.

Generally, the illustrated device comprises a hand held housing **10** and an oscillatory cleaning head **12**. Housing **10** includes a casing, the upper portion of which defines a manual grip **14** by which the device may be readily held. The remaining portion **16** of housing **10**, in combination with grip **14**, encloses a drive mechanism (to be described below), which causes rotation of a pair of eccentric cams **18**, **20**, that project from the housing. Cleaning head **12** is diamond shaped in profile as suggested partly broken away and partly in phantom lines at **22** in FIG. 3. Cleaning head **12** includes a backing plate **23** and a cleaning pad **24**, both of the same triangular shape. Cleaning pad **24** contains a cleansing agent of suitable, preferably silicone, composition. Projecting upwardly from backing plate **23** are a pair of journals **26**, **28**, which rotatably receive cams **18**, **20**. Accordingly, rotation of cams **18**, **20**, in response to the drive mechanism within housing **10**, results in oscillatory motion of cleaning head **12** and consequently of cleaning pad **24**.

As shown best in FIGS. 1 and 2, manual grip **14** includes a longitudinally developed surface **30**. In cross-sectional profile, surface **30** has an outward round periphery **31** having inwardly directed portions **32**, **34**. These extremities continue with outwardly flared portions **36**, **38** and reversely flared portions **40**, **42**, which constitute the remainder of the housing above designated **16**. As shown in FIG. 2, housing **10** is developed symmetrically about a longitudinally extending central plane **44**. The forward and rearward portions of the housing are defined by forwardly and rearwardly intersecting converging planes **46**, **48**, the forward and rearward apex lines of which fall in center plane **44** and the remaining boundaries of which are defined in conjunction with contiguous portions of grip **14**, outwardly flared portions **36**, **38** and reversely flared surfaces **40**, **42**.

As shown in FIG. 5, housing **10** is constructed of a forward casting **45** and a rearward casting **47**. Forward casting **45** includes an outer wall portion **48** and an inner mounting portion **50**. Rearward casting **47** includes an outer wall portion **52** and an inner mounting portion **54**. Wall portions **48**, **52** extend downwardly to provide an open rim **56**, against which a closure plate **58** is removably abutted and affixed (by such means as screws and tapped bores, not shown, for clarity). Mounted within the region defined by wall portions **48**, **52** and support portions **50**, **54** is a motor **60**. The shaft of motor **60** has a rearward extremity **62** that rotates within a bore **64** in wall portion **52** and has a forward extremity **66** that projects through a bore **68** in support portion **50**. Keyed to the forward extremity of shaft **66** is a worm gear **70**. As is best shown in FIG. 4, a recessed driven gear **72** is journaled at one corner of closure plate **58** on a short shaft **74**, one end of which rotatably projects into a bore in support portion **54** and the other extremity of which projects through a bore in closure plate **58**. Rotatably mounted at the opposite corner of closure plate **58** is a recessed driving gear **76** on a long shaft **78**, the inner extremity of which is journaled in wall portion **48** and the outer extremity of which projects through a bore in closure plate **58**. Keyed to shaft **78** is a gear **80**, which meshes with worm gear **70**. Gears **72** and **76** are connected by a so-called timing belt **82**, which is a flexible endless gear. The teeth of timing belt **82** mesh with the teeth of gears **72** and **76** and the outer face of timing belt **82** is smooth. Timing belt **82** is composed of an elastomeric material such as rubber and is reinforced by at least one endless flexible steel band that encircles gears **72** and **76** within the elastomeric material of the timing belt. Connected to the outer extremities of shafts **74** and **78** are the pair of eccentrics **18**, **20**, mentioned above. Cleaning head **12**, in profile, is a tetragon having equal sides **84**, **86**, **88** and **90**, a pair of acute apex angles **92**, **94** and a pair of obtuse apex angles **96**, **98**. Acute apex angles **92**, **94** are connected by a major axis **100** and obtuse apex angles **96**, **98** are connected by a minor axis **102**, which axes are perpendicular to each other. Preferably, acute apex angle **94** is less than 60° in order to permit the corresponding apex of cleaning pad **24** to readily be accessible to the corner of any ordinary window being cleaned. It will be observed that major axis **100** is disposed in parallelism to the center line midway between the longitudinal edges of closure plate **58** and that minor axis **102** is disposed in parallelism to the center line midway between the transverse edges of closure plate **58**. As shown in FIG. 6, the underside of backing plate **23** is provided with a multiplicity of catches in the form of minute reticulations **104**. Pad **24** is shown as including a porous fabric **106**, the main outer portion of which is impregnated with a suitable cleansing fluid, preferably a volatile silicone fluid, and the inner surface of

which has, affixed thereto by a suitable adhesive **108**, a multiplicity of catches in the form of minute filamentary hooks **110**. When cleaning pad **24** is pressed against backing plate **23**, hooks **110** and reticulations **104** become enmeshed. The result is that pad **106** may be simply affixed to backing plate **23** merely by the application of manual pressure but may be stripped therefrom merely by grasping an edge thereof.

In operation, replacement cleaning pads **24** may be simply affixed to cleaning head **12** as desired and a switch (not shown) may be turned on or off as desired in order to control the operation of motor **60** and the consequent oscillation of cleaning head **12**. The intermeshing of hooks **110** and reticulations **104** is such that the cleaning pad and backing plate are held firmly together notwithstanding the large vector forces generated parallel thereto during use but the cleaning pad and backing plate nevertheless may be stripped readily apart. By virtue of the fact that apex angles **92**, **94** are considerably less than 90°, they may be readily projected into the corners of windows being cleaned. By virtue of the arrangement of gears **72**, **76** and timing belt **82**, moving parts in the drive system are kept to a minimum but maximum stability of the system is assured by enabling eccentrics **18**, **28** to be as far as possible from each other, viz at opposite corners of closure plate **58**. Backing plate **23** is composed of a plastic such that bushings **26**, **28** may be flexibly removed from eccentrics **18**, **28**.

The present invention thus provides a simple but efficacious window cleaning device that is of light weight and rugged durability. Since certain changes may be made in the above description and the accompanying drawings without departing from the scope of the invention herein involved, it is intended that all matter contained in the above disclosure be interpreted in an illustrative and not in a limiting sense.

What is claimed is:

1. A window cleaning device comprising a casing, said casing providing a handle portion and a base portion, said handle portion being at least in part uniformly elongated and providing a grip in cross-section, a drive motor within said housing, a pair of gears rotatably mounted at opposite corners of said base portion, a timing belt connecting said gears, a worm gear drive interconnecting said motor and one of said gears, shafts extending from said gears through said base portion, eccentrics on said shafts externally of said base portion, a cleaning head having a backing plate and a cleaning pad, a pair of journals projecting from said backing plate, said eccentrics being seated in said journals, said eccentrics being removable from said journals, said backing plate presenting a multiplicity of catches, said pad impregnated with a cleansing composition, said pad having at one face thereof a multiplicity of catches, said catches being interconnectable, said cleansing head being diamond shaped in cross-sectional profile, said profile being provided with four equal sides, a pair of opposed acute apex angles and a pair of opposed obtuse apex angles, an axis connecting

said opposed acute apex angles and an axis connecting said opposed acute obtuse angles, the axes being perpendicular to each other, the major axis being substantially parallel to the opposed longitudinal edges of said base.

2. The window cleaning device of claim **1**, wherein said motor is largely encompassed by said handle.

3. The window cleaning device of claim **1**, wherein said timing belt is flexible and endless.

4. A window cleaning device comprising a casing and a head, a motor in said casing, a pair of shafts journaled in said casing, the inner end of one of said shafts being driven by said motor, eccentrics on the outer ends of said shafts, journals on said head for receiving said eccentrics, gears affixed to said shafts and a timing belt in mesh with said gears, whereby said motor is adapted to cause oscillatory motion of said head.

5. A window cleaning device comprising a casing, said casing providing a handle portion and a base portion, said handle portion being at least in part elongated and providing a grip in cross-section, a drive motor within said casing, a pair of gears rotatably mounted at opposite corners of said base portion, means interconnecting said gears, means interconnecting said motor and one of said gears, shafts extending from said gears through said base portion, eccentrics on said shafts externally of said base portion, a cleaning head having a backing plate and a cleaning pad, a pair of journals projecting from said backing plate, said eccentrics being seated in said journals, said eccentrics being removable from said journals, a pad impregnated with a cleansing composition, said pad and said backing plate being interconnectable, said cleansing head having a generally angular apex projecting beyond said casing substantially in the direction of elongation of said handle portion, whereby said apex is oscillated for the performance of cleaning the corners of windows.

6. The window cleaning device of claim **5**, wherein said means interconnecting said gears is a flexible, endless timing belt.

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