United States Patent [19]

MacFarland

[11] **3,790,987**

[45] **Feb. 12, 1974**

[54] **DRIVE MEANS FOR VACUUM CLEANER**

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[73] Assignee: **The Scott & Fetzer Company,** Cleveland, Ohio

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[21] Appl. No.: **299,345**

[52] **U.S. Cl.** **15/392,** 15/328

[51] **Int. Cl.** **A47l 5/30**

[58] **Field of Search** 15/328, 350, 389, 391, 392

[56] **References Cited**

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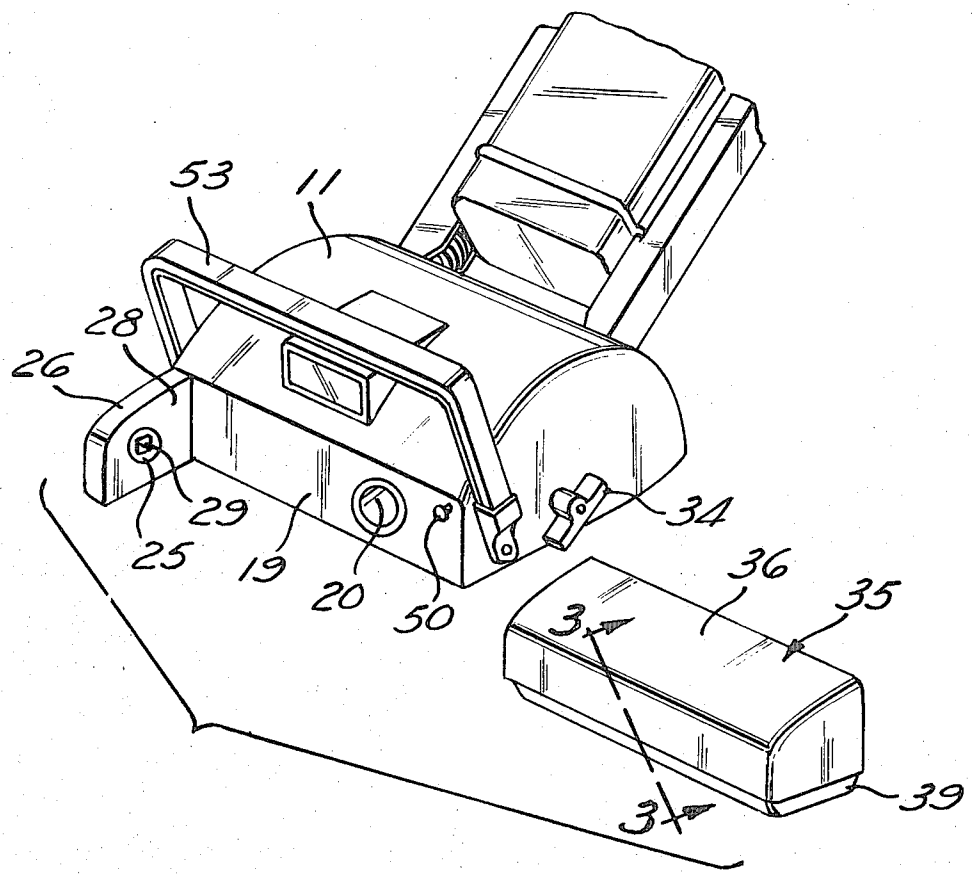
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Primary Examiner—Harvey C. Hornsby
Assistant Examiner—C. K. Moore
Attorney, Agent, or Firm—McNenny, Farrington, Pearne & Gordon

[57] **ABSTRACT**

A vacuum cleaner having a motor housing to which powered attachments may be directly mechanically coupled without the use of drive belts as the mechanical coupling between the motor housing and the powered attachment. The motor housing encloses a motor fan unit and a drive belt which couples the motor to a drive socket. The drive socket extends through a wall in the housing so that the socket may receive the drive shafts of powered attachments, such as vacuum cleaner brush nozzles, power polishers, rug scrubbers, and power-driven miscellaneous tools. A vacuum inlet extends through the wall in the motor housing and suction hoses may be attached to the inlet for off-the-floor cleaning purposes.

6 Claims, 5 Drawing Figures



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2 Sheets-Sheet 1

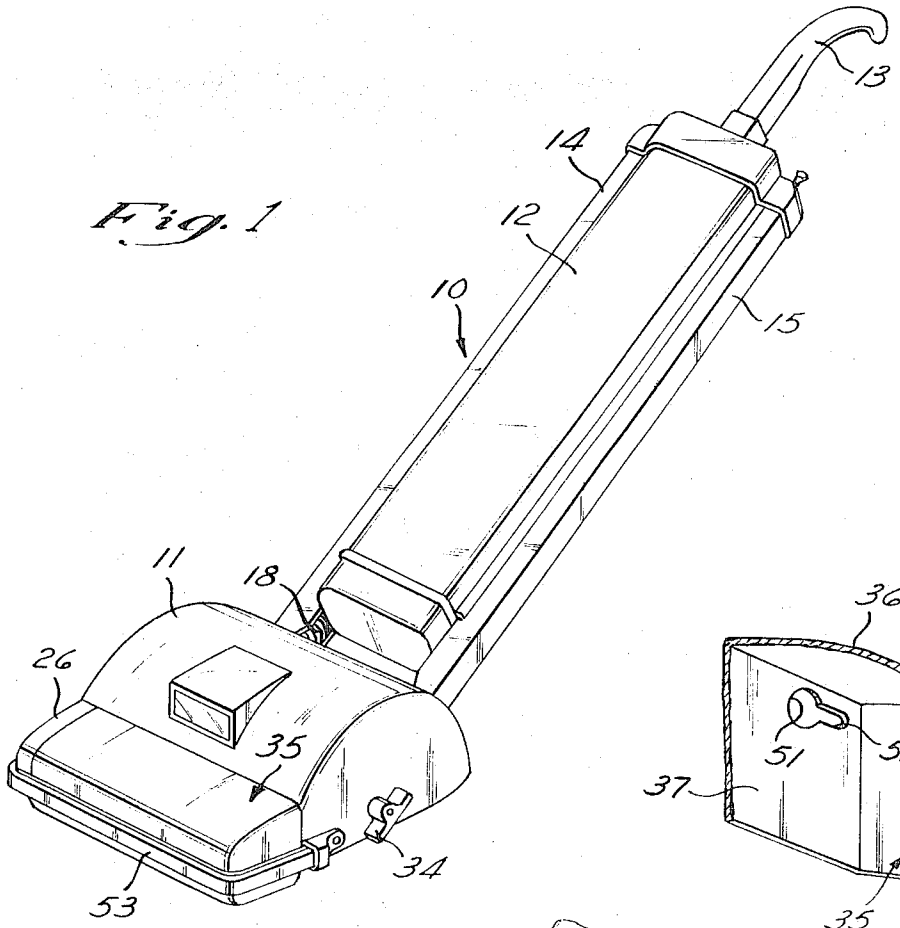


Fig. 1

Fig. 3

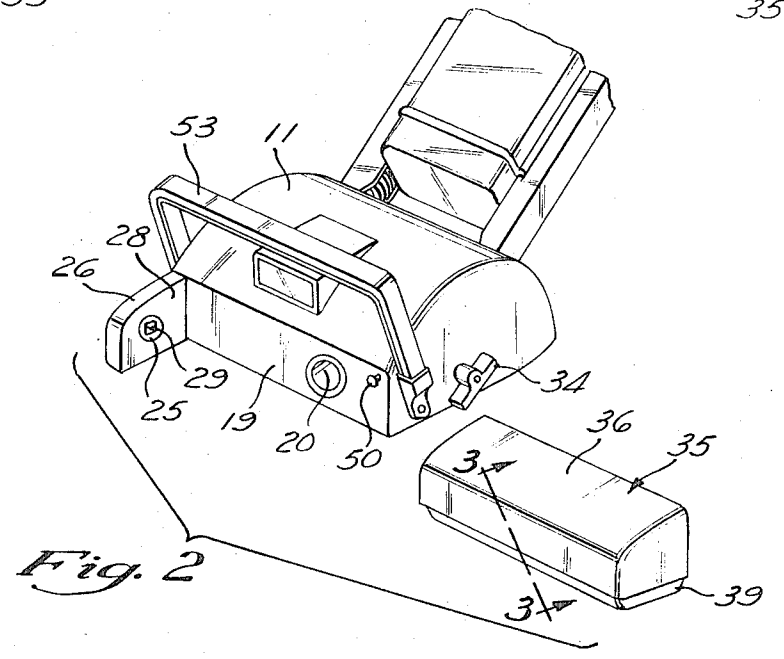


Fig. 2

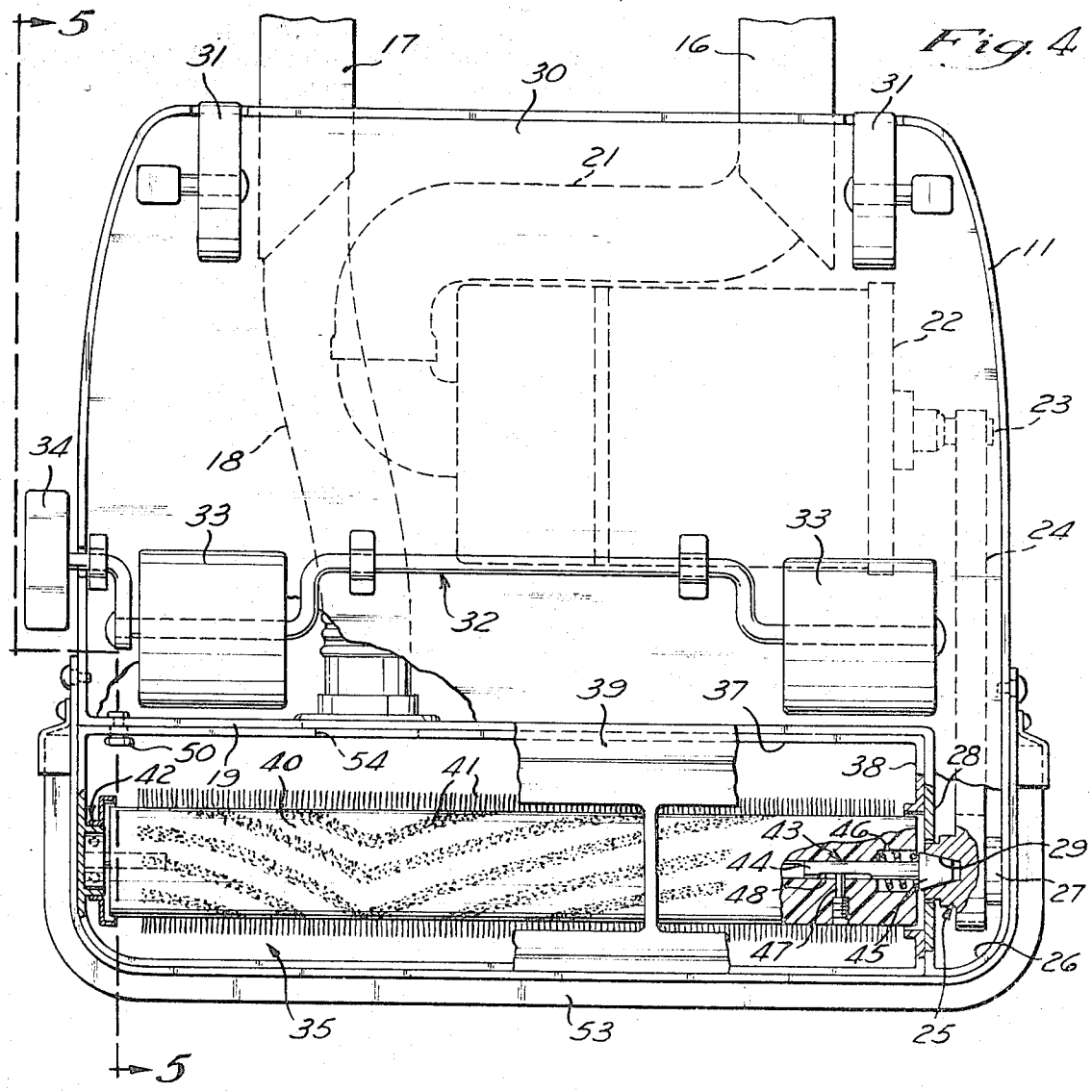

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Fig. 4

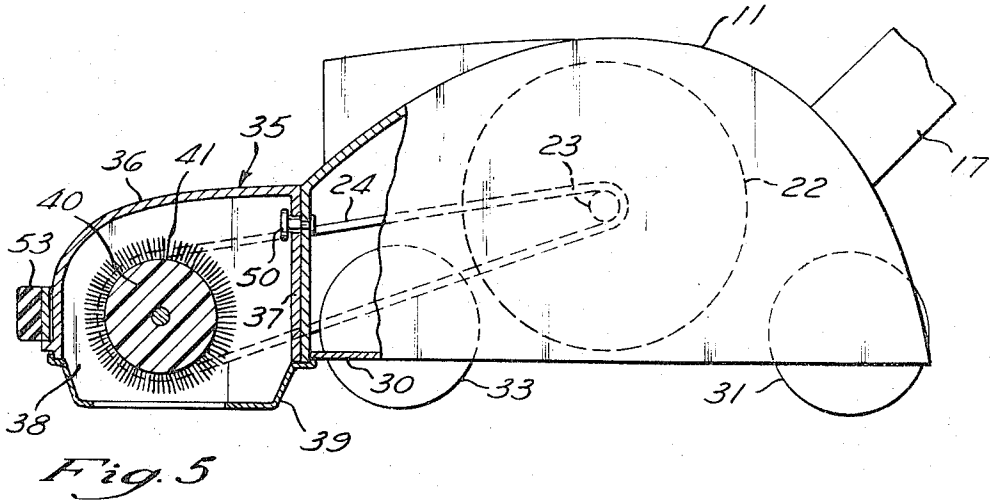

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Fig. 5

DRIVE MEANS FOR VACUUM CLEANER

BACKGROUND OF THE INVENTION

A widely used vacuum cleaner today is the type which includes a motor housing which may be detachably coupled to various on-the-floor powered cleaning attachments, various off-the-floor cleaning attachments, or various powered tools. An example of such a vacuum cleaner is shown in U. S. Pat. No. 2,538,464, granted to MacFarland. In the MacFarland patent there is disclosed a fan casing having a suction inlet and a fan shaft projecting outwardly through the inlet. A suction nozzle may be detachably connected to the fan casing inlet by attaching the upper loop of a twisted belt to the shaft so that the lower loop of the belt will drive a brush shaft provided in the suction nozzle. The upper belt loop is applied to and removed from the fan shaft by an adjustable belt-engaging member on the nozzle that is movable from a position clear of the belt into engagement with the belt and to a position overlying the outer end of the fan shaft so as to support the upper loop of the belt clear of the fan shaft so that the belt is supported wholly by the nozzle in a position such that the fan shaft is free to move out of or into the upper belt loop as the nozzle is detached from or attached to the fan casing and that is movable from its belt-supporting position to re-engage the belt with the fan shaft.

This principle is employed to attach other floor treating powered attachments to the projecting fan shaft. This principle is also employed to attach powered tools to the fan casing. Examples of such powered tools may be found in U. S. Pat. Nos. 2,563,541; 2,748,543; 2,948,091; and 2,954,652.

Although the drive arrangement shown in the foregoing patents has proved to be an acceptable arrangement, certain disadvantages are inherent in such an arrangement. One such disadvantage is the fact that the fan eye is exposed when the power-driven accessory is detached from the motor housing. If the motor is turned on with the fan eye exposed, the user may accidentally touch the exposed fan blades. Another disadvantage is the fact that, although the belt and its lifter are designed for easy manipulation, some users find it difficult to remove the belt from and place the belt on the fan shaft. A further disadvantage is the fact that a twisted belt must be employed to drive the powered accessories. Since the belt is twisted, a reinforced belt may not be used, since the reinforcing members within the belt would quickly wear out. Therefore, unreinforced belts have been used, with consequent short life.

SUMMARY OF THE INVENTION

This invention overcomes many of the difficulties associated with prior art drive and mounting arrangements for powered vacuum cleaner accessories. This invention provides a motor housing having a horizontally mounted motor which drives a socket by means of an untwisted power belt. The socket extends through the motor housing so that power-driven attachments may be affixed to the socket and to the motor housing. To hold the power-driven accessory in place on the motor housing, a pivoted bumper guard is provided to clamp the accessory firmly in place.

The drive arrangement according to this invention is particularly useful in hardbox upright vacuum cleaners wherein dirt-laden air is drawn from the rug-cleaning nozzle attachment to the interior of a filter box where the dirt is filtered from the air, and then to the fan.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a hardbox upright vacuum cleaner embodying the principles of this invention.

FIG. 2 is a fragmentary view of the vacuum cleaner illustrated in FIG. 1, showing an accessory removed from the motor housing.

FIG. 3 is a cross sectional view of the accessory shown in FIG. 2, the plane of the section being indicated by the line 3—3 in FIG. 2, with certain portions omitted for clarity.

FIG. 4 is a bottom view of the motor housing, partially in section, and with certain portions broken away for clarity.

FIG. 5 is a cross sectional view of the motor housing, the plane of the section being indicated by the line 5—5 in FIG. 4.

DETAILED DESCRIPTION OF THE INVENTION

A vacuum cleaner **10** embodying this invention is shown in FIG. **1**. The vacuum cleaner **10** includes a motor housing **11**, a filter box **12**, and a handle **13**. The filter box **12** is more fully described in copending application Ser. No. 299,217, filed Oct. 20, 1972 and includes a filter for removing dirt-laden air which is picked up by the vacuum cleaner. The filter box **12** is mounted between axially extending ducts **14** and **15**, which are pivotally connected to the motor housing **11** by hinge members **16** and **17**.

A first inlet conduit **18** opens through a front flat wall **19** of the motor housing **11** and is sealed thereto by a gasket **20**. The conduit **18** communicates with the interior of the filter box **12** and conducts dirt-laden air thereto so that the dirt is separated from the air by a filter (not shown but fully described in copending application Ser. No. 299,217 filed Oct. 20, 1972). Clean air is drawn from the filter box **12** through a conduit **21** which leads into the motor housing **11**. The conduit **21** leads into a motor fan unit **22** which is mounted on its horizontal axis within the housing **11** and which exhausts the filtered air drawn through the conduit **21** through a suitable opening (not shown) in the housing **11**.

As may be seen most clearly in FIG. **4**, the motor fan unit **22** is provided with an axially extending drive shaft **23**. A flat, non-twisted, reinforced belt **24** is driven by the shaft **23** and engages a pulley assembly **25**. The pulley assembly **25** is housed within a side extension **26** of the housing **11** and is rotatably supported by a bearing **27**. One end of the pulley assembly **25** opens through a flat wall **28** in the extension **26** and has an axial socket **29** therein. For a purpose which will hereinafter become apparent, the socket **29** comprises a plurality of flat outwardly diverging sidewalls.

The bottom of the housing **11** is closed by a cover plate **30**, which may be removed in order to service the cleaner and, if necessary, change the belt **24**. Rear wheels **31** are provided on the cover **30**, and a front wheel carriage **32** is also provided on the cover **30**. The front wheel carriage includes wheels **33** which may be raised or lowered by a conventional toe-touch control **34**.

A wide variety of vacuum cleaner attachments may be coupled to conduit **18** and/or the socket **29.** In the illustrated embodiment of the invention, a vacuum brush nozzle **35** is coupled to the housing **11.** The nozzle **35** includes a nozzle housing **36** having a flat back wall **37,** a flat sidewall **38,** and an open-bottom mouth. A carpet-engaging shoe **39** is mounted on the open mouth of the brush nozzle by frictionally engaging the nozzle walls surrounding the opening. There is provided within the nozzle **35** a brush cylinder **40** having bristles **41** disposed in helical rows on longitudinally spaced portions of the cylinder. One end of the cylinder **40** is rotatably mounted in a bearing assembly **42** and the other end of the cylinder **40** is driven by the pulley assembly **25.** To this end, there is provided a finger **43** having a shank portion **44** axially aligned with and slidably mounted in the cylinder **40.** A projecting end portion **45** is received within the socket **29** and has tapered faces which cooperate with the socket surfaces. A spring **46** urges the portion **45** into firm contact with the socket **29** and a pin **47** cooperates with a slot **48** in the shank **44** to prevent rotation of the shank **44** relative to the cylinder **40** but to permit axial movement of the shank **44** relative to the cylinder **40.**

With the motor housing **11** in the condition illustrated in FIG. **2,** the brush nozzle **35** is attached to the housing **11** by inserting the head **45** into the socket **29** and by inserting a headed pin **50,** which is provided on the face **19** of the motor housing, into an opening **51** in the side **37** of the nozzle **35** (see FIG. **3**). The nozzle **35** is then pushed toward the extension **26** against the bias of the spring **46** so that the shank of the pin **50** enters a narrow extension **52** of the opening **51.** While holding the nozzle **35** in this position, a hinged gate **53** is pivoted downwardly until it embraces and securely holds the nozzle **35** in position. It should be noted that the gate **53** also serves as a bumper for the vacuum cleaner, and may be covered with a conventional vinyl bumper strip. An opening **54** is provided in the flat rear wall **37** of the nozzle **35,** and the opening **54** cooperates with the conduit so that dirt-laden air may be drawn into the filter box **12.**

Other attachments may be affixed to the motor housing **11.** For example, a powered wax polishing brush may be attached to the motor housing. Such a brush would be attached in a manner similar to the attachment of the illustrated nozzle, but the brush housing would be substantially open to minimize the possibility of drawing wax into the conduit **18.**

Furthermore, it should be appreciated that vacuum cleaning wands may be employed by merely connecting a flexible hose to the conduit **18.**

Various tools may be powered by the vacuum cleaner such as those tools shown in the previously mentioned U.S. patents. Of course, those tools would be modified to eliminate the use of a driving belt and to directly couple the drive to the socket **29.**

The invention is not restricted to the slavish imitation of each and every detail set forth above. Obviously, devices may be provided which change, eliminate, or add certain specific details without departing from the scope of the invention.

I claim:

1. A motor housing unit for a vacuum cleaner comprising a motor-fan assembly for drawing dirt-laden air to filter means and for powering accessories for the vacuum cleaner, a cover enclosing said motor-fan assembly, drive shaft means driven by and extending from said motor, belt means driven by and extending from said drive shaft to coupling means, said coupling means being mounted in a wall of said cover and having a first portion driven by said belt, said coupling means having a second portion extending through said wall and being adapted to drive a powered accessory, said drive shaft means, said belt means, and said first portion of said coupling means all being enclosed by said cover, and means pivotally connected to said cover for releasably holding an accessory to said unit and in coupled engagement with said coupling means.

2. A motor housing unit for a vacuum cleaner according to claim **1** wherein said cover has a forwardly projecting portion which encloses said belt means and said first portion of said coupling means.

3. A motor housing unit according to claim **1,** including means defining a vacuum inlet opening through said cover.

4. A motor housing and cleaning accessory unit for a vacuum cleaner comprising a motor-fan assembly for drawing dirt-laden air to filter means and for powering said accessory, a cover enclosing said motor-fan assembly, drive shaft means driven by and extending from said motor, belt means driven by and extending from said drive shaft to coupling means, said coupling means being mounted in a wall of a forwardly projecting portion of said cover and having a first portion driven by said belt, said forwardly projecting portion enclosing said belt means, said coupling means having a second portion extending through said wall and having a socket therein for driving said accessory, said drive shaft means, said belt means, and said first portion of said coupling means all being enclosed by said cover, said cover having a front wall intersecting said wall of said projecting portion, said accessory comprising a cylindrical brush rotatably mounted within a brush housing, said brush housing having first and second walls respectively cooperating with the front wall of said cover and said wall of said projecting portion, means defining an opening in said second wall, said brush having an end portion projecting through said opening and into said socket so that said brush is rotatably driven by said coupling means, and means releasably holding said accessory to said cover.

5. A motor housing and cleaning accessory according to claim **4,** wherein said means releasably holding said accessory to said cover includes a gate having its ends pivotally connected to said cover and having a portion in surrounding relationship with respect to front and side walls of said accessory.

6. A motor housing and cleaning accessory according to claim **4,** including means defining a vacuum inlet opening through the front wall of said cover and means defining a cooperating opening in the first wall of said brush housing.

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