Dec. 8, 1970 C. C. BEER 3,545,026

BRUSH

Filed May 9, 1968 2 Sheets-Sheet 1

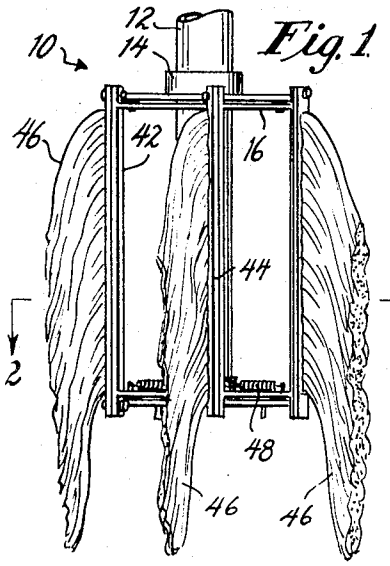


Fig. 1.

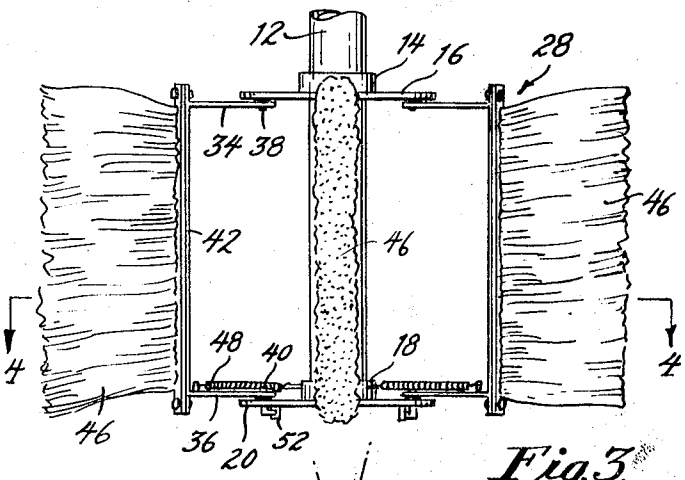


Fig. 3.

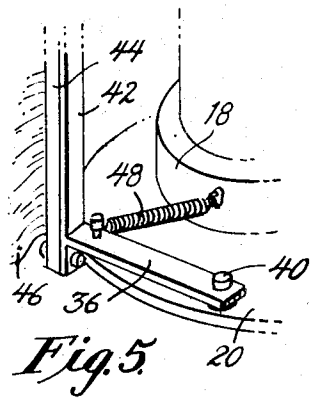


Fig. 5.

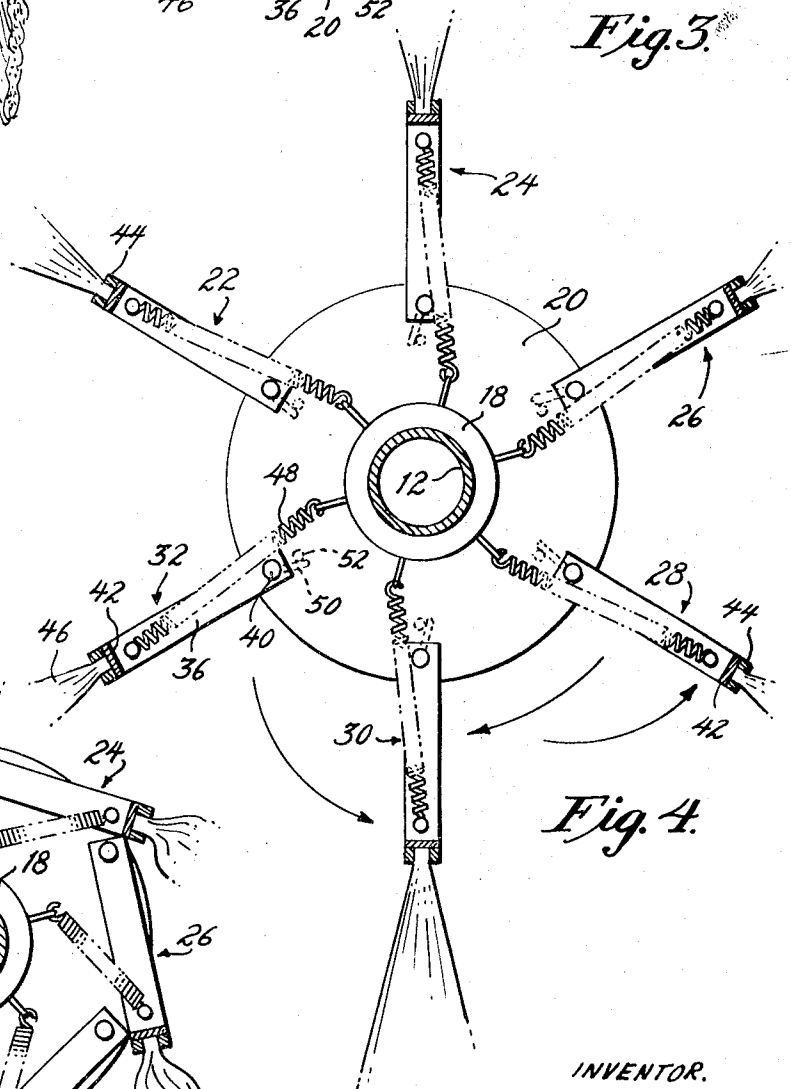


Fig. 4.

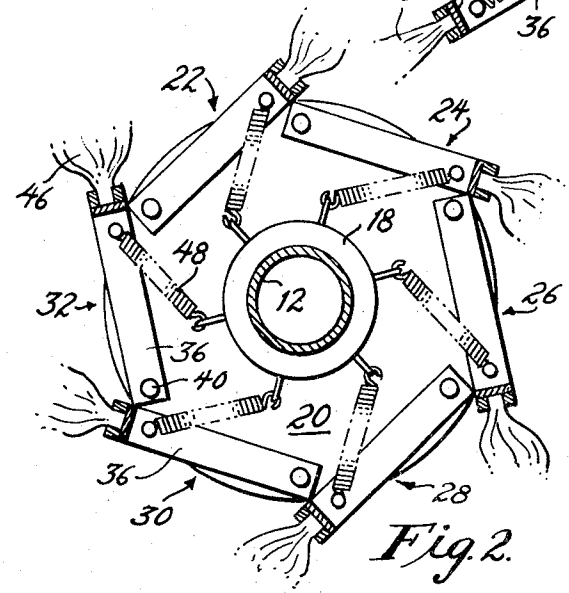


Fig. 2.

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BRUSH

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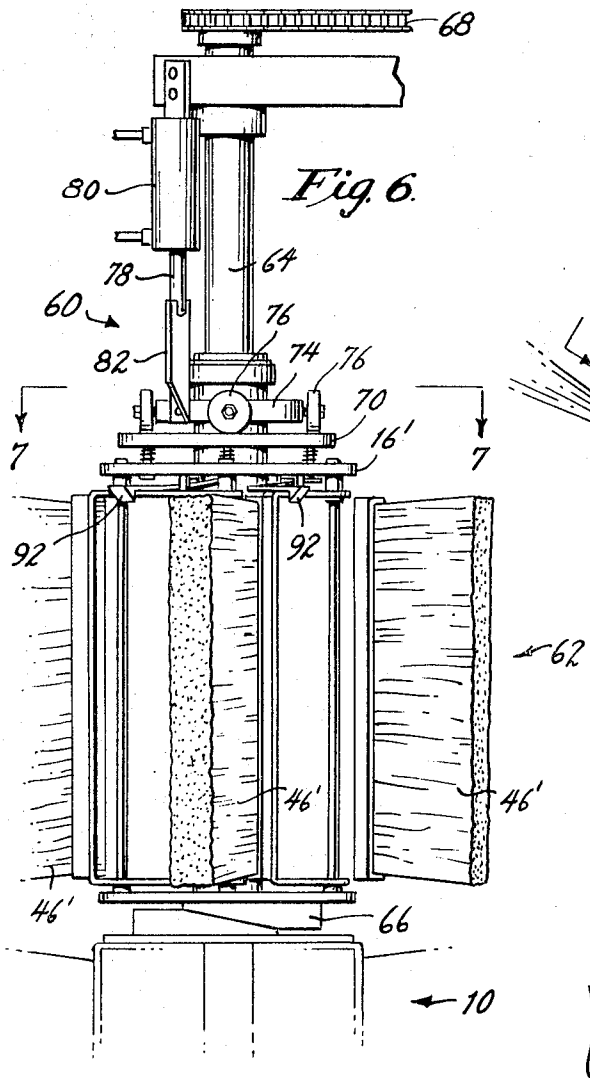


Fig. 6.

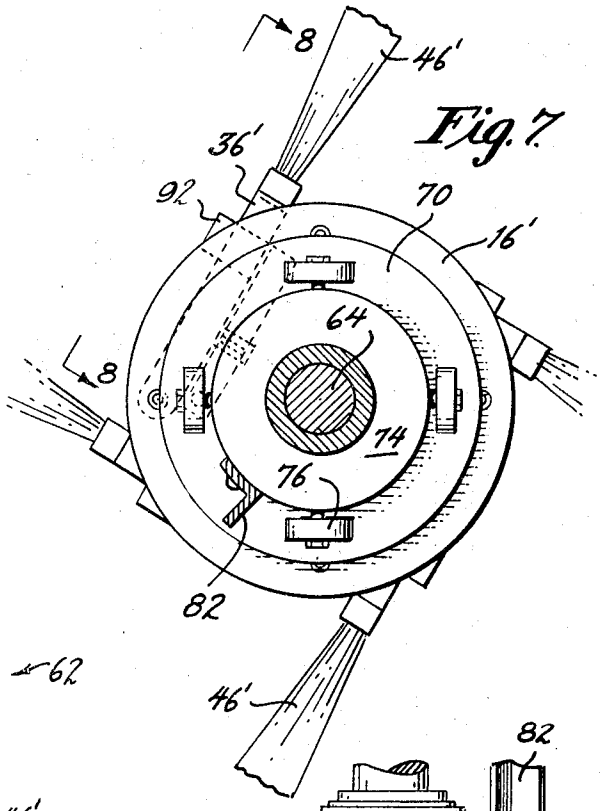


Fig. 7.

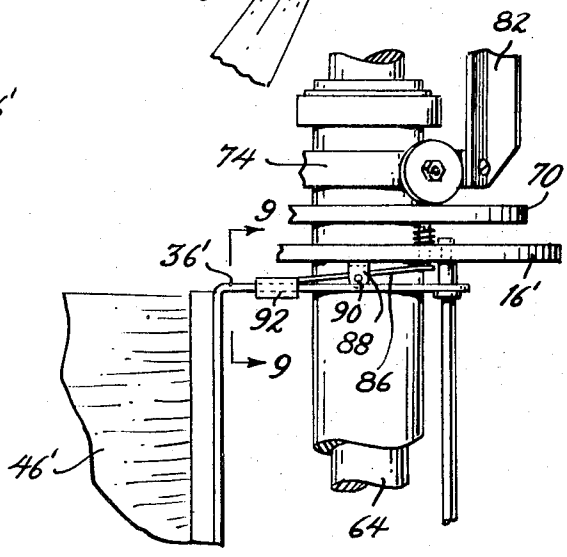


Fig. 8.

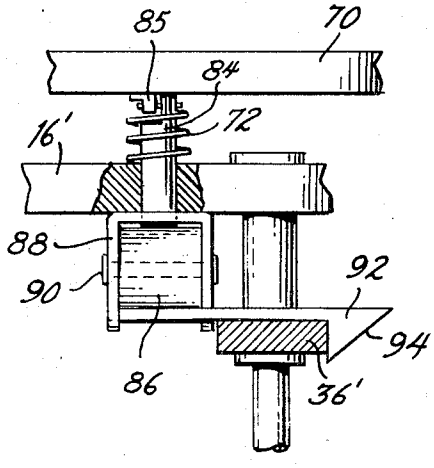


Fig. 9.

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3,545,026

BRUSH

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Filed May 9, 1968, Ser. No. 727,964
Int. Cl. A46b 13/02
U.S. Cl. 15—183 9 Claims

ABSTRACT OF THE DISCLOSURE

A centrifugal force- responsive brush whereby a plurality of brushes on a common shaft are mounted for pivotable movement between retracted and extended positions about axes which are generally parallel to the axis of rotation. If the brush is too close to the article being cleaned, the force of the article on the brushes causes them to partially retract. A brush of this construction can use shorter length bristles and substantially reduce bristle wear. The brushes may be latched in a retracted position.

The present invention relates to brushes of the type mounted for rotation. Brushes of this type are utilized in a variety of environments such as in units designed to wash the exterior of a vehicle. The bristles on such brushes are generally several feet long. Because of the varying contour of the vehicle, some portions of the vehicle will be subjected to a greater length of bristle and hence a greater force than from other portions. This wears the brush as well as the vehicle exterior surfaces. The brush of the present invention overcomes this problem and reduces bristle wear.

The brush of the present invention is structurally interrelated in a manner so as to have a plurality of brush strips. The brush strips are individually supported by a rotatable shaft. Each support permits the brush strips to move between retracted and extended positions. The brush strips are normally biased in any convenient manner such as by a coil spring to their retracted position. Centrifugal force is relied upon to move the brush strips to their extended positions. Substantial contact with the surface to be cleaned causes the brush strips to retract inwardly until an equilibrium position is attained between the effect of the centrifugal force and the effect of contact with the surface to be cleaned. As a result, the same surface areas may be cleaned while using bristles which are substantially shorter in length than those used heretofore.

In one embodiment, the brush is comprised of two sections. A mechanism is provided to latch the brush support members on one section in a retracted position. The latch is selectively operable. Both sections will be operable when washing the sides of vehicles adjacent the door or across the back of station wagons. When washing the fenders or the front of the vehicle, only one section is operable.

It is an object of the present invention to provide a novel rotatable brush.

It is another object of the present invention to provide a rotatable brush which supports bristles for movement between retracted and extended positions.

It is another object of the present invention to provide a novel rotatable brush structurally interrelated in a manner whereby the effective length of the bristles may be substantially reduced without reducing the overall effect of the brush.

It is another object of the present invention to provide a novel rotatable brush which is adapted to have a longer life span.

It is another object of the present invention to provide a novel rotatable brush wherein the bristles may move radially inwardly due to excessive contact with the surface being cleaned.

It is an object to provide a brush having at least two coaxial sections each having bristles mounted for retracted and extended positions while being able to selectively maintain one section in a retracted position.

Other objects will appear hereinafter.

For the purpose of illustrating the invention, there is shown in the drawings a form which is presently preferred; it being understood, however, that this invention is not limited to the precise arrangements and instrumentalities shown.

FIG. 1 is a side elevation view of the brush of the present invention in an inoperative position.

FIG. 2 is a sectional view taken along the line 2—2 in FIG. 1.

FIG. 3 is a view similar to FIG. 1 but showing the brushes in their extended position.

FIG. 4 is a sectional view taken along the line 4—4 in FIG. 3.

FIG. 5 is a partial perspective view of one brush support.

FIG. 6 is a side view similar to FIG. 3, but illustrating another embodiment.

FIG. 7 is a sectional view taken along the line 7—7 in FIG. 6.

FIG. 8 is a view taken along the line 8—8 in FIG. 7.

FIG. 9 is a view taken along the line 9—9 in FIG. 8.

Referring to the drawing in detail, wherein like numerals indicate like elements, there is shown a brush in accordance with the present invention designated generally as **10**.

The brush **10** includes a rotatable shaft **12**. Collars **14** and **18** are fixedly secured to the shaft **12** at spaced points. A set screw or other similar device may be utilized to couple the collars to the shaft **12** in a manner thereby the collars may be rotated for a purpose to be described hereinafter.

A support plate **16** is fixed to the shaft **12** and supports the collar **14**. A similar support plate **20** is fixed to the shaft **12** and supports the collar **18**. As shown, the support plates **16** and **20** are preferably in the form of circular disks and rotate with shaft **12**.

A plurality of brush supports designated generally as **22**, **24**, **26**, **28**, **30** and **32** are pivotably supported by each of the plates **16** and **20**. Each brush support is identical. Hence, only brush support **32** will be described in detail.

Brush support **32** includes an arm **34** pivotably secured to the lower surface of plate **16** for rotation about pin **38**. A similar arm **36** is pivotably secured to the plate **20** for rotation about pin **40**. The arms **34** and **36** are interconnected by a vertical strut **42**. A brush strip **44** is removably coupled to the strut **42** by means of screws, bolts or the like.

Brush bristles **46** are attached to form a part of the brush strip **44** in any conventional manner. A variety of constructions are well known in the art and per se form no part of the present invention. One end of a spring **48** is secured to collar **18**. The other end of spring **48** is connected to a pin on arm **36**. Spring **48** biases the brush support **32** to a retracted position shown more clearly in FIG. 2.

In the extended position of the brush support **32** as shown more clearly in FIG. 4, spring **48** is stretched and the arms **34** and **36** extend radially outwardly with respect to the longitudinal axis of shaft **12**. In order that the brush support does not move past the center point, pin **40** has an extension **50** on the end thereof below member **20** which engages a limit stop **52**. See FIGS. 3

and 4. Between its extended and retracted positions, the brush supports rotate through an arc of approximately 100°.

The inoperative position of the brush **10** is shown in FIG. 1. When shaft **12** is rotated about its longitudinal axis, the brush supports are biased to the position shown in FIGS. 3 and 4 by centrifugal force until the bristles contact the surface to be cleaned, such as the exterior surface of a vehicle in a car washing unit. Contact with the vehicle or other surface to be washed will have a counteracting force on the brush supports tending to make them collapse slightly until an equilibrium point is reached between the centrifugal force acting on the brush and the reaction forces due to contact with the vehicle. Equilibrium is determined by the centrifugal force and the spring whose force can be varied. In this manner, undue wear on the bristles as well as the surface being cleaned will be avoided.

The bristles may be approximately one-half their normal length. The bristles **46** may be made from polymeric materials as well as natural brush bristles. Since the contacting force between the bristles and article being washed depends upon the position of the article with respect to the shaft **12**, the brush has a substantially lesser tendency to wrap itself around portions of the vehicle such as the aerial on the vehicle.

The present invention may be embodied in other specific forms. That is, two or more of the brushes **10** may be mounted on a common shaft. When two or more brushes **10** are mounted on a common shaft the adjustable feature of the spring bias will permit one brush to have its brush supports in their fully extended position while the other is in a partially extended position. This feature gives the entire unit a contour effect which is desirable when cleaning things like a vehicle which has a changing contour.

In FIGS. 6–9, there is illustrated another embodiment of the present invention wherein the brush unit is designated generally as **60**. The brush unit **60** includes a brush designated generally as **62** and a brush **10** as described above mounted on a common shaft **64**. Shaft **64** is provided with any convenient drive mechanism such as the chain drive **68**. The shaft **64** is coupled directly to the brush **10**. Brushes **10** and **62** are mechanically coupled together by clutch **66**.

The brush **62** corresponds identically to the brush **10** described above except as will be made clear hereinafter. A plate **70** is mounted above plate **16'**. Plate **16'** corresponds to plate **16** described above. Plate **70** is slidably received by the bushing surrounding shaft **64**. Springs **72** bias plate **70** upwardly away from plate **16'**. A frame member **74** having wheels **76** at spaced points corresponding generally to the location of the springs **72** is provided. Frame member **74** is likewise slidably supported by the bushing surrounding shaft **64**.

A piston rod **78** has one end connected to the frame member **74** by means of an adapter **82**. The other end of the piston rod **78** extends into the cylinder **80** and terminates in a piston. Conduits are provided for introducing a motive fluid to opposite ends of the cylinder **80** to cause the piston therein and its piston rod **78** to reciprocate in a direction parallel to the shaft **64**.

The springs **72** are prevented from moving laterally by means of pins **84**. Thus, each spring surrounds a pin **84**. Each pin **84** has its upper end coupled on the lower surface of plate **70**. The lower end of each pin **84** is loosely supported by one end of a lever **86**. This loose support permits necessary movement between pin **84** and lever **86**. Each lever **86** is pivotably supported intermediate its ends by a bracket **88** on the lower surface of plate **16'**. Thus, as shown more clearly in FIGS. 8 and 9, the lever **86** may pivot about the axis of pin **90**. Lever **86** is maintained in its clamping position by means of gravity created by the weight of latch **92**.

The end of the lever **86** remote from the pin **84** is provided with a laterally extending latch **92**. The latch **92** overlies the arm **36'** and extends along a side face thereof so as to maintain the arm **36'** in its retracted position.

The brush unit illustrated in FIGS. 6–9 is utilized as follows:

When washing the front of a vehicle or the front fenders of a vehicle, the components will be in the position illustrated. The brush bristles **46'** on the brush **62** will be retained in their retracted position by the engagement between arm **36'** and the latches **92**. When the entire brush unit approaches the side doors of the vehicle, and it is desired to utilize both brushes **10** and **62**, motive fluid is exhausted from cylinder **80** to reciprocate the piston rod **78** downwardly by means of gravity.

Downward movement of the piston rod **78** causes the frame member **74** to reciprocate downwardly. Movement of the frame member **74** is guided by the bushing surrounding the shaft **64**. As the member **74** moves downwardly, contact with brush **10** is made through clutch **66** causing brush **62** to rotate in its retracted position. When washing the rear of station wagons, motive fluid is introduced into cylinder **80** to reciprocate the piston rod **78** downwardly further than previously causing the wheels **76** acting through the plate **70** to compress the springs **72**. At the same time, force imparted to the pins **84** pivots the levers **86** in a clockwise direction in FIG. 8 so as to raise the latches **92**. As soon as the latches **92** are raised, each of the arms **36'** may pivot to their extended positions due to centrifugal force as described above.

When the arms **36'** move to their retracted position under the influence of springs corresponding to spring **48** described above, the arms **36'** will engage the cam surface **94** on the latches **92** to raise the same whereby the parts may assume the position shown in FIG. 9. Of course, if the piston rod **78** is still in its lowermost position, such camming acting will not occur. When the pressure on the piston in cylinder **80** is released, the springs **72** will raise the plate **70** and frame member **74**, thereby moving the same away from plate **16'**. In doing so, the pins **84** are raised, thereby lowering the latches **92**.

The present invention may be embodied in other specific forms without departing from the spirit or essential attributes thereof and, accordingly, reference should be made to the appended claims, rather than to the foregoing specification as indicating the scope of the invention.

It is claimed:

1. A brush comprising a rotatable shaft, spaced support members on said shaft, brush bristles supported at circumferentially spaced points on said members for movement between retracted and extended positions, said brush bristles being supported from said members by brush supports, said brush supports being mounted for pivotable movement about axes generally parallel to the axis of said shaft to facilitate movement of the brush bristles between extended and retracted positions, and said brush bristles being responsive to centrifugal force so that they move from their retracted positions to their extended positions as a result of centrifugal force.

2. A brush in accordance with claim **1** wherein said biasing means includes a spring biasing said brush supports to a position wherein they are substantially chords of said support members, and said support members being circular, said brush supports being pivotably supported by said members at locations which are closer to the outer periphery of said support members as compared with the axis of rotation of said support members.

3. A brush in accordance with claim **1** including limit stops on said support members, each limit stop being engageable by a support for brush bristiles when the support extends radially outwardly with respect to said shaft.

4. A brush in accordance with claim **1** including a plurality of brush supports circumferentially supported by said members, each of said brush supports supporting

some of said brush bristles, a collar surrounding said shaft, means for releasably coupling said collar to said shaft, and said biasing means including a spring, said spring having one end coupled to said collar and its other end coupled to a brush support whereby the tension of the biasing force may be adjusted.

5. A brush in accordance with claim 4 wherein said collar is disposed above one of said support members and is coupled to each of said brush supports by separate springs.

6. A brush comprising a rotatable shaft, spaced support members on said shaft, a collar surrounding said shaft and being adjustably coupled to said shaft adjacent one of said support members, brush supports extending between and supported by said members at circumferentially spaced points on said members, each brush support being pivotably mounted on said members for movement between a retracted and extended position, spring means connected to said collar for biasing each support member to its retracted position, and each brush support having brush bristles extending radially outwardly therefrom with respect to the axis of said shaft when the shaft is rotating, whereby rotation of said shaft may cause said brush suports and the respective brush bristles to assume a radial position with respect to said shaft due to centrifugal action and thereby assume its extended position, and the axis of pivotable movement of each brush support being closer to the periphery of said support members than to the axis of said shaft.

7. A brush unit comprising a rotatable shaft, first and second sets of spaced support members on said shaft, brush bristles supported at circumferentially spaced points on said first and second sets of support members for movement between retracted and extended positions, means tending to bias said bristles to their retracted position, said brush bristles being responsive to centrifugal

force so that they may overcome said bias and move from their retracted positions to their extended positions as the result of centrifugal force, and selectively operable latch means associated with the first set of support members for selectively latching the brush bristles on said first set of support members in their retracted positions whereby only the brush bristles on said second set will respond to centrifugal force.

8. A brush unit in accordance with claim 7 wherein said last-mentioned means includes a motor device mounted adjacent said first set of suport members, and said motor device being connected to said latch means for selectively operating the latch means while the shaft is rotating so that the brush bristles supported by said first set of support members are free to respond to centrifugal force.

9. A brush unit in accordance with claim 8 wherein said latch means includes a lever pivotably supported intermediate its ends, a pin connected to one end of the lever and extending through a support member of the first set, a plate juxtaposed to said one support member, spring means biasing said plate away from said one support member.

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EDWARD L. ROBERTS, Primary Examiner

U.S. Cl. X.R.

15—21, 104.14, 213