Feb. 21, 1950 P. HEFTLER 2,497,885

CARPET SWEEPER

Filed Oct. 4, 1940

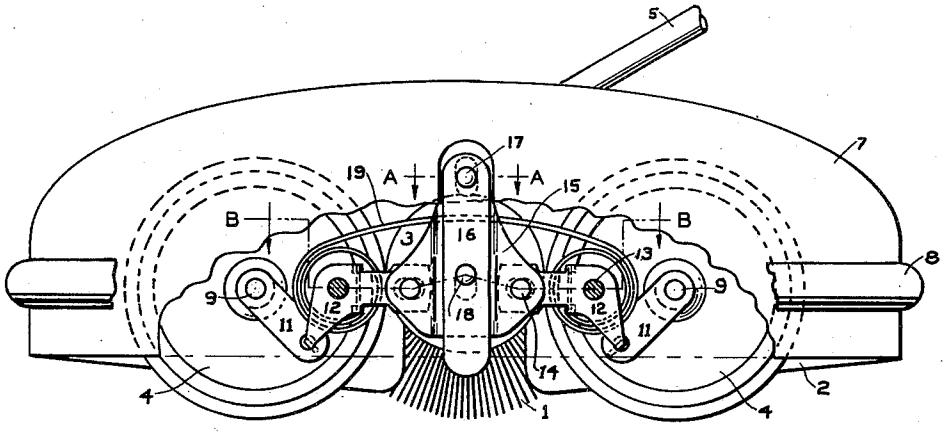
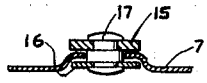
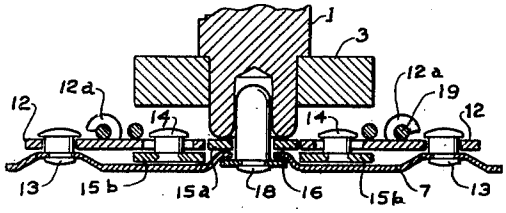


FIG. 1



SECTION A–A

FIG. 2



SECTION B–B

FIG. 3

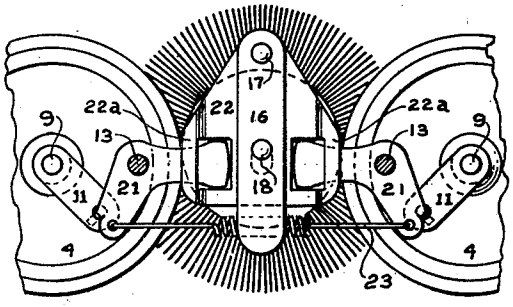


FIG. 4

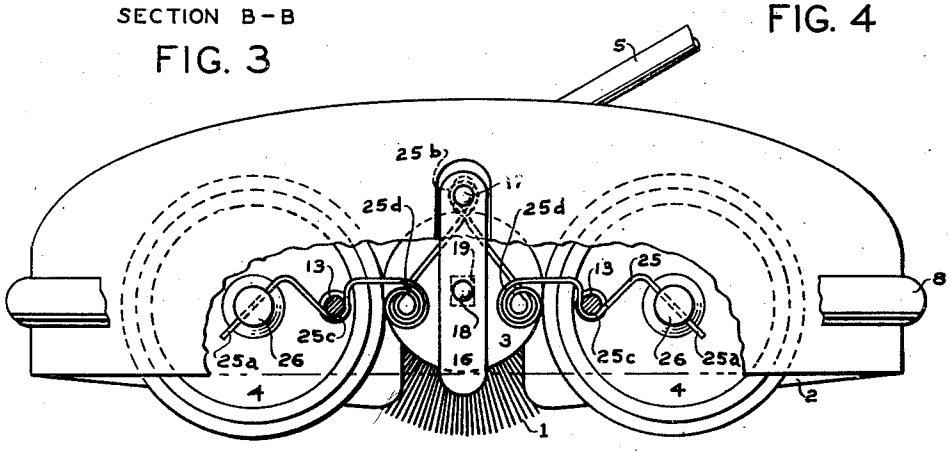


FIG. 5

Paul Heftler

Patented Feb. 21, 1950 2,497,885

UNITED STATES PATENT OFFICE

2,497,885

CARPET SWEEPER

Paul Heftler, Chicago, Ill.

Application October 4, 1940, Serial No. 359,731

24 Claims. (Cl. 15—41)

1

This invention is a brush adjusting mechanism for carpet sweepers. It is of the type known as a "high-low brush control," which has been an important feature of most of the carpet sweepers sold in the United States since 1928. This general type of mechanism is much older than that, since it was patented by Drew (U. S. Patent No. 391,129) in 1887. About 1927, the first of a series of patent applications showing more complicated high-low mechanism was filed by Pullen. The high-low mechanisms that were actually put on the market were not the one shown by Drew but were some of the more complicated ones designed by Pullen and shown in his patents.

The principal object of the present invention is to make a good high-low brush control mechanism which is almost as simple as the original Drew mechanism. This is done by making a few simple but not obvious changes in Drew's mechanism.

Another object of this invention is to provide a simple high-low brush control mechanism which can be enclosed by an end plate or cover on the carpet sweeper but which will still let the brush be removed easily. In the early Drew and Pullen mechanisms, the linkages were mounted on springy end bars which could be sprung out to release the brush, but an end cover is too stiff to allow this simple way of getting the brush out to be used. Pullen has designed a good mechanism (U. S. Patent No. 1,786,864) for releasing the brush, but it has the disadvantage that the entire drag of the sweeper on the carpet, both the drag of the wheels and the drag of the brush, is transmitted to the case through the brush pivot slides, and the friction which this causes in the slides interferes with the free up-and-down movement of the brush. One of the objects of this invention is to avoid most of this friction by transmitting the drag of the sweeper to the case through swinging arms, which operate with much less friction than slides.

The principal feature of the invention is the way in which the springs and levers of the brush control mechanism are connected to the wheels. In the original Drew design, the wheel axles were fixed to the levers, and the wheels could not adjust themselves in and out so as to bear upon the brush pulley with the right pressure. In the Pullen designs, the levers can slide endways and thus let the wheels adjust themselves, and the springs are connected to the wheels independently of the levers. In this invention, the

2

springs are connected to the levers or form the levers themselves, and the connection of the levers to the wheels is through either sloping links or sloping sliding connections acting at angles of about 45° to the horizontal so that they press the wheels against the brush pulleys with the right pressure and yet let the wheels adjust themselves.

Another feature of the invention is a brush pivot carrier that lies on the inside of the end cover and which has fastened to it an upright blade spring that lies on the outside of the end cover and carries the brush pivot. The blade spring, being on the outside of the end cover, can be bent out to draw the brush pivot out from the end of the brush to let the brush be removed.

Still another feature of one form of the invention is a peculiar spring which acts also as a pair of levers to transmit motion from the wheels to the brush pivot.

These various features and other important details are shown in the drawings, in which:

Figure 1 is an end view, with parts of the bumper and end cover broken away, of a sweeper made with one form of the invention;

Figures 2 and 3 are sections on a slightly larger scale and taken on the lines A—A and B—B in Figure 1 and looking down;

Figure 4 is an end view of a brush control mechanism like the one on the sweeper shown in Figures 1 to 3 but having a different spring and a slightly different way of connecting the levers to the brush pivot carrier; and

Figure 5 is an end view like Figure 1 but showing a third form of the invention.

The first sweeper—Figs. 1 to 3

The general arrangement of this sweeper is like that of most other sweepers. The brush 1 is in a case 2, and each of its ends projects through a slot in the end of the case and carries a friction pulley 3. The pulley lies between two wheels 4 at the end of the case, and these wheels support the sweeper on the floor and drive the brush as the sweeper is pushed about by its handle 5. The handle is pivoted to the case just above the brush in the usual way, so this detail is not shown, nor are the dust pans, which lie inside of the case in the usual position at either side of the brush.

The end of the brush and the wheels, as well as most of the mechanism which connects them together, are enclosed by an end cover 7, and the entire sweeper is encircled by a rubber bumper

8. Both the end cover and the bumper are shown broken away in Figure 1 so that the mechanism inside can be seen.

Each wheel 4 is mounted to turn freely, by means of a ball bearing, on a wheel center or hub 9. The hubs of the two wheels on opposite ends of the case are connected by an axle, which fits into the hubs and keeps the wheels from tipping or twisting to one side. Neither the axle nor the hubs turn with the wheels; the hubs have arms or links 11 riveted to their outer ends to stop such turning because it would cause threads picked up by the sweeper to wind up on the axles inside of the case or make it necessary to enclose the axles in axle tubes.

Each link 11 is hooked loosely onto the outer end of a dog-legged lever 12 that is pivoted on a shoulder rivet 13 fixed to the end cover. The link extends up and out from where it is hooked onto the lever to the wheel hub at an angle of approximately 45° to the horizontal. When the link acts at this angle, it pulls the wheel in against the brush pulley as hard as it pushes it down onto the floor, and the friction between the wheel and the brush pulley is great enough to transmit to the brush pulley the driving force that the wheel gets from its friction on the floor.

The inner end of the lever is made with a short horizontal slot in which there works a pin 14, which is a shoulder rivet, fixed to the brush pivot carrier 15. This pin-and-slot connection makes the brush pivot carrier move up and down with the end of the lever, and it lets the carrier move in a straight line while the end of the lever is swinging about its fulcrum. The lower end of the carrier is guided in a straight vertical path by the ends of the two levers. These ends are cut on arcs of circles whose centers are the pivots 13 of the levers, so the distance between the ends of the levers does not change as the levers swing up and down. The brush pivot carrier is made with a central part 15*a* that fits between the ends of the levers and that has straight parallel vertical edges that engage the ends of the levers. These edges are made by partly shearing the side parts 15*b* of the carrier from the central part 15*a* and jogging the side parts out of the plane of the central part, as shown in Figure 3.

The upper end of the carrier is guided in a straight vertical path by its connection to the blade spring 16. The blade spring lies in a shallow groove pressed into the face of the end cover 7, as shown in Figure 2, and its upper end is connected to the carrier 15 by a double-shoulder rivet 17. The body of this rivet passes through and can slide up and down in a vertical slot in the end cover, and it thus guides the upper ends of both the carrier and the blade spring in a straight vertical path.

The brush pivot 18 is riveted to the lower part of the blade spring 16, and, as shown in Figure 3, it passes through a slot in the end cover 7 and a slot in the center part 15*a* of the carrier and into the end of the brush 1. The slot in the end cover is long enough to let the brush pivot move up and down as much as is needed to adjust the position of the brush properly, and both this slot and the slot in the carrier are long enough to let the brush pivot swing out through them when the blade spring is sprung out to pull the brush pivot out from the brush.

To make this whole brush pivot carrier arrangement work smoothly, the edges of the slot in the end cover must be smooth, the clearances

in this slot must be right, and the ends of the levers and the part of the carrier that they work against must be cut accurately. All this calls for good dies to make the parts. However, if one wants a cheaper construction, all the clearances can be increased, and the groove in the end cover, in which the blade spring slides, can be relied on to guide the parts.

The spring that presses the wheels against the floor is a double-spiral spring 19 with each of its ends fixed to one of the levers 12, and it is stressed so that it tends to turn the levers in the direction to push the wheels down. To fix the ends of the spring to the levers, each of the levers has two fingers 12*a* sheared from its upper and lower edges, and these are bent tightly around the spring, as shown in Figure 3. With this arrangement, the spring is held without any extra parts, such as spring perches. Also, it is stressed equally along most of its length, so it works about twice as efficiently as the cantilever spring usually used in carpet sweepers.

The second sweeper—Fig. 4

The sweeper whose moving parts are shown in Figure 4 is a modification of the sweeper shown in Figures 1 to 3. Its case, end covers, bumper, handle, and dust pans are exactly like those of the first sweeper and are not shown in the figure. The brush 1, brush pulley 3, wheels 4, wheel hubs 9, links 11, lever pivots or fulcrums 13, blade spring 16, blade spring rivet 17, and brush pivot 18 are also exactly like those of the first sweeper. The only parts that are different are the levers 21, the brush pivot carrier 22, and the spring 23.

The brush pivot carrier 22 has a pair of rectangular holes in it, one on each side, and the sides of the holes are exactly vertical and horizontal. The central part of the carrier, which includes most of each of these holes, lies in one plane, and the two side edges 22*a* of the carrier, which include the outer side of each hole, are jogged or offset out of this plane. The two levers 21 lie in the same plane as the central part of the carrier, and their inner ends extend over the offset side edgs of the carrier and into the rectangular holes, just as if the holes were notches in the edge of the carrier.

The upright edge at the end of each lever is curved, with the lever pivot 13 as a center, so the distance between the two upright edges remains constant as the levers swing up and down. The part of the carrier between the two rectangular holes fits in this space between the levers, and thus the lower part of the carrier 22 is guided in a straight vertical path just like the lower part of the carrier 15 in the first sweeper. The upper and lower edges at the end of each lever are also curved but on a much shorter radius than the upright edge so that they form two parts of a circle whose diameter is the width of the end of the lever. This diameter is just a little less than the height of the rectangular hole in the carrier, so the end of the lever fits in the hole with just the proper working clearance in all the positions which it takes as the lever swings up and down and moves the carrier with it.

The offset sides 22*a* of the carrier lie between the end cover and the levers, like the offset parts 15*b* of the carrier shown in Figures 1 and 3, and this keeps the carrier from swinging out of line with the levers.

The spring 23 is a simple tension spring with

long ends that are hooked into holes in the outer ends of the levers. Since these ends are below the fulcrums, the action of the spring is to swing them down and press the wheels down onto the floor.

The third sweeper—Fig. 5

This sweeper differs a little more from the first sweeper than does the second, but its brush **1**, case **2**, brush pulley **3**, wheels **4**, handle **5**, dust pans, end cover **7**, bumper **8**, fulcrum **13**, and blade spring **16** are exactly the same. The chief difference is in the spring **25**, which not only acts as the spring but also as the levers and the links.

The spring **25** extends across the end of the sweeper from one wheel to the other and is connected along its length to five different things at five different points. At its ends, it is connected to the wheel hubs **26**; at its center, it is connected to the blade spring **16** and thus to the brush; and at the two quarter points, between the center and the ends, it is connected to the two fulcrums **13** fixed to the end cover.

The ends **25***a* of the spring are straight and slope down and out at an angle of about 45° to the horizontal through holes drilled crosswise through the ends of the wheel hubs. The wheel hubs can slide up and in on the spring, so any pressure between the wheels and the floor makes the wheels press in on the brush pulley **3** with a pressure that is approximately equal to the pressure on the floor. Thus this sliding connection does practically the same thing, although with a little more friction, as the links **11** in the first two sweepers.

The center **25***b* of the spring is formed into a closed loop which is fixed to the upper end of the blade spring **16** by a double shoulder rivet **17** like the one shown in Figure 2. The spring **25** is on the inside of the end cover **7**, the blade spring **16** is on the outside, and the rivet passes through a vertical slot in the end cover.

Where the spring **25** is connected to the fulcrums **13**, it is formed into bends **25***c* of about 135°, which fit under and up on the inner sides of the funcrums. The parts of the bends **25***c* under the fulcrums carry the weight of the sweeper, which is transmitted through the spring to the wheels, and the parts of the bends **25***c* rising up on the inner sides of the fulcrums transmit to them the outward pull on the ends of the spring that results from the angle at which they act on the wheel hubs. The spring is kept from sliding off the shoulder rivets which form the fulcrums by large heads or flanges on their inner ends.

The spring **25** will work fairly well as both spring and lever if it is made just as it has been described thus far, but it will work better if it has one or more coils **25***d* on each side as close to the center as practical and approximately level with the fulcrums. These coils lie in a vertical plane between the brush pulley and the end cover, and the reasons why they make the spring work better are as follows: As a pair of levers, the spring should not allow the wheels to rise without making the brush move down, and for this purpose the spring should be as stiff as possible. But stiffness in the spring is bad; it makes the sweeper hard to push down onto thin carpets and bare floors. However, if most of the flexibility of the spring is put at or near the center, the parts of the spring around and at either side of the fulcrums, which do most of the lever work of the spring, can be made stiff. The coils **25***d* are the simplest way of making the central part of the spring more flexible while leaving the rest of the spring stiff.

In this sweeper, there is no brush pivot carrier to hold the brush pivot from being moved sideways by the drag of the wheels and brush on the floor. Instead, there is a small slider **27** which is riveted to the back of the blade spring by the brush pivot and which slides up and down in the slot in the end cover through which the brush pivot passes.

Other forms of the invention

Three different sweepers have been shown and described here to illustrate the invention, and there are still other ways in which it may be made. Some are shown in a companion patent application Ser No. 420,443, filed by the same inventor on Nov. 26, 1941, and others could be designed by a good engineer with these disclosures to guide him. These various designs include several inventions, some of which can be used independently of the others, and any construction which is described by any one or more of the following "claims" or definitions of the inventions comes under this patent. Also, some of the inventions are covered by the "claims" in the companion application mentioned above, principally the slanting link or sliding connection between the wheel and the rest of the brush adjusting mechanism.

I claim:

1. A carpet sweeper of the character described comprising a casing, floor wheels for the casing, floating axles for the floor wheels, a brush supported for rotation and for vertical shifting movement, and spring means at each end of the casing and having portions interconnected with and pressing downwardly on the brush, portions interconnected with and pressing inwardly and downwardly on the floor wheels, and portions intermediate the points of interconnection with the brush and the floor wheels fulcrumed on the casing whereby said spring means functions to transmit upward and downward movement of the floor wheels to the brush while reversing the direction of such movement.

2. A carpet sweeper of the character described comprising a casing, floor wheels for the casing, floating axles for the floor wheels, a brush supported for rotation and for vertical shifting movement, and spring means comprising a spring carried by and acting on oppositely extending vertically rigid levers located at each end of the casing and having their inner end portions interconnected with and pressing downwardly on the brush, their outer end portions interconnected with and pressing inwardly and downwardly on the floor wheels, and their central portions intermediate the points of interconnection with the brush and the floor wheels fulcrumed on the casing whereby said spring means functions to transmit upward and downward movement of the floor wheels to the brush while reversing the direction of such movement.

3. A carpet sweeper of the character described comprising a casing, floor wheels for the casing, floating axles for the floor wheels, oblique links connected to the floating axles, a brush supported for rotation and for vertical shifting movement, and spring means comprising a spring carried by and acting on oppositely extending vertically rigid levers located at each end of the casing and having their inner end portions inter-

connected with and pressing downwardly on the brush, their outer end portions interconnected with and pressing inwardly and downwardly on the floor wheels through the links, and their central portions intermediate the points of interconnection with the brush and floor wheels fulcrumed on the casing whereby said spring means functions to transmit upward and downward movement of the floor wheels to the brush while reversing the direction of such movement.

4. A carpet sweeper as described in claim 1 and in which the spring means comprises two levers and a spring carried by and interconnecting the levers, the spring being connected to each lever by a torque transmitting connection and having coils encircling the axes of fulcruming.

5. A carpet sweeper as described in claim 1 and in which the spring means comprises two levers and a coil spring carried by and interconnecting the levers and exerting a single direct force on each lever.

6. In a carpet sweeper having a pair of oppositely extending arms mounted on a case member by pivots and connected to a pair of floor wheels, a wire spring having portions curling around the pivots and having end portions each connected to one of the arms at two points spaced along the spring for transmitting bending forces between the arms and the spring.

7. In a carpet sweeper having a frame and a brush pulley located between and driven by frictional contact with a pair of floor wheels, a pair of brush control levers extending out in opposite directions from near the axis of the brush pulley, fulcrums on the frame for the levers, the levers having portions extending lower than the fulcrums, a tension spring connecting those portions of the levers, means connecting the inner ends of the levers to the brush pulley, and links connecting the outer ends of the levers to the floor wheels, the links extending along lines sloping down and in below the brush pulley axis at a great enough angle to the vertical to intersect a short distance below the brush pulley and to force the wheels against the brush pulley hard enough to prevent slipping between them when the sweeper is in use.

8. A carpet sweeper of the character described comprising a casing, floor wheels for the casing, floating axles for the floor wheels, a brush supported for rotation and for vertical shifting movement, and a spring at each end of the casing and having portions interconnected with and pressing downwardly on the brush, portions interconnected with and pressing inwardly and downwardly on the floor wheels, and portions intermediate the points of interconnection with the brush and the floor wheels fulcrumed on the casing whereby said spring functions to transmit upward and downward movement of the floor wheels to the brush while reversing the direction of such movement.

9. In a carpet sweeper having a pair of floor wheels, a brush pulley lying between and frictionally driven by said floor wheels, and a rigid end cover lying outside of said wheels and brush pulley, a vertically extending brush pivot carrier assembly, said assembly including a pivot rotatably supporting said brush pulley, said cover and said carrier assembly including means for holding said carrier assembly in a definite path relative to said cover, and a rod spring having five points of connection spaced along its length, the first and fifth of said points being connected to said wheels, the second and fourth of said points being connected to said cover, and the third of said points being connected to said carrier assembly.

10. In a carpet sweeper having a case member, a pair of floor wheels, a brush pulley lying between and frictionally driven by the floor wheels, and a brush pivot supporting the brush pulley and movable up and down with respect to the case member, an elongated spring member having five laterally spaced connecting points, the first and fifth connecting points being connected to the wheels, the second and fourth connecting points being connected to the case member, and the third connecting point being connected to the brush pivot.

11. A carpet sweeper comprising a case member, a brush pivot, means for guiding the brush pivot up and down relative to the case member, a brush pulley journalled on the brush pivot, a pair of floor wheels frictionally engaging the brush pulley between them, a pair of fulcrums on the case member, and a wire spring, the central portion of the spring having a connection to the brush pivot, the end portions of the spring having connections to the wheels, and the intermediate portions of the spring having connections to the fulcrums.

12. A carpet sweeper as described in claim 11 and in which the central connection of the spring comprises a pin member connected to the brush pulley and a portion of the spring fitting around the pin member.

13. A carpet sweeper as described in claim 11 and in which the fulcrum connections of the spring comprise bends in the spring fitting the inner and under sides of the fulcrums.

14. A carpet sweeper as described in claim 11 and in which the outer connections of the spring comprise portions of the spring sloping down and out and slidable with respect to the wheels.

15. A carpet sweeper as described in claim 11 and in which the wheels are mounted on central members and in which the outer connections of the springs comprise portions of the spring sloping down and out and bearing down and in on said central members.

16. A carpet sweeper as described in claim 11 and in which the spring is provided with convolutions between and spaced in from the fulcrums.

17. In a carpet sweeper having a pair of floor wheels, a brush pulley lying between and frictionally driven by the floor wheels, and a rigid end cover plate lying outside of the wheels and brush pulley, a brush pivot carrier mounted on the inside of the cover plate and movable up and down with respect to it, mechanism including a spring and connecting the wheels to the carrier for transmitting weight to the wheels and for transmitting motion from the wheels to the carrier, a blade spring on the outside of the cover plate, the upper end of the blade spring being fixed to the carrier through a vertical slot in the cover plate, the slot forming a slideway for guiding the upper end of the blade spring and the carrier, and a brush pivot fixed to the blade spring near its lower end and projecting through a second slot in the cover plate, the carrier and the blade spring forming an assembly and having means independent of the first slot in the cover plate for guiding the lower end of the assembly in a path that is fixed relative to the cover plate.

18. A device as described in claim 17 and in which the connecting mechanism comprises two levers pivoted on the cover plate and having ends

with arcuate edges working in rectangular openings in the carrier.

19. A device as described in claim 17 and in which the connecting mechanism comprises two levers pivoted on the cover plate and connected to the carrier, and a spring coiled substantially in a plane parallel to the plane of the levers and having its ends fixed to the levers and forming the sole support for the spring.

20. In a carpet sweeper having a case member, a brush, a pair of connecting members extending laterally away from the brush axis in opposite directions, pivots securing the connecting members to the case member, a brush pivot carrier assembly including a brush pivot projecting into the end of the brush and two upright portions joined together near their upper ends, the brush pivot being fixed on the lower part of one of said portions, connections between the inner ends of the connecting members and the lower part of the other portion of the carrier assembly for guiding the lower part of the carrier assembly in a path fixed relative to the case member while permitting the ends of the connecting members to turn relative to each other and the carrier assembly, and means for guiding the upper part of the carrier assembly in a path fixed relative to the case member, one of the upright portions of the carrier assembly being springy enough in the plane of the brush axis to permit the brush pivot to be sprung out of the brush.

21. In a carpet sweeper having a pair of floor wheels, a brush pulley lying between and frictionally driven by the floor wheels, and a rigid end cover lying outside of the wheels and brush pulley, a vertically extending brush pivot carrier on the inside of the end cover, a vertical blade spring on the outside of the end cover and having a connection at its upper end to the upper end of the carrier, a brush pivot fixed to the lower part of the blade spring and projecting through a hole in the end cover and rotatably supporting the brush pulley, the carrier and blade spring and brush pivot forming a brush pivot carrier assembly, the connection between the upper ends of the carrier and blade spring passing through a slot in the end cover and forming a means for guiding the upper part of the brush pivot carrier assembly in a definite path relative to the end cover, a lever pivoted to the end cover and connected to the lower part of the carrier for moving the brush pivot carrier assembly up and down, and means for guiding the lower part of the brush pivot carrier assembly in a definite path relative to the end cover.

22. In a carpet sweeper having a rigid end cover, a brush, a vertically extending brush pivot carrier movable up and down on the inside of the end cover, a vertical blade spring on the outside of the end cover and having a connection at its upper end to the upper end of the carrier, a brush pivot fixed to the lower part of the blade spring and projecting through a hole in the end cover and rotatably supporting the brush pulley, the carrier and blade spring and brush pivot forming a brush pivot carrier assembly, the connection between the upper ends of the carrier and blade spring passing through a slot in the end cover and forming a means for guiding the upper part of the brush pivot carrier assembly relative to the end cover, a connecting member extending laterally away from the carrier, a pivot securing the connecting member to the case member, and a second pivot spaced laterally from the first pivot and securing the connecting member to the lower part of the carrier.

23. In a carpet sweeper having a pair of floor wheels, a brush pulley lying between and frictionally driven by said floor wheels, and a rigid end cover lying outside of said wheels and brush pulley, a vertically extending brush pivot carrier assembly, said assembly including a pivot rotatably supporting said brush pulley, guide means on the upper parts of said cover and said carrier assembly for holding the upper part of said carrier assembly in a definite path relative to said end cover, and a pair of levers pivoted to and prevented from sliding relative to said end cover and projecting towards each other, the ends of said levers engaging vertical surfaces on the lower part of said carrier assembly for guiding said carrier assembly relative to said cover.

24. In a carpet sweeper having a case member, a brush, a brush pivot carrier movable up and down with respect to the case member, and a brush pivot on the carrier and supporting the brush pulley, a pair of connecting members extending laterally away from the carrier in opposite directions, and pivots securing the connecting members to the case member and preventing them from sliding, the inner end of each connecting member being formed with an end surface concentric with its pivot and engaging a vertical flat surface on the carrier and with upper and lower surfaces concentric with each other and engaging opposed horizontal flat surfaces on the carrier.

PAUL HEFTLER.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
388,376	Ru Ton	Aug. 21, 1888
600,413	Drew	Mar. 8, 1898
621,639	Drew	Mar. 21, 1899
722,642	Sykes	Mar. 10, 1903
1,433,957	Laidlaw	Oct. 31, 1922
1,786,864	Pullen	Dec. 30, 1930
2,034,025	Cummins	Mar. 17, 1936
2,059,907	Pullen	Nov. 3, 1936
2,171,633	Pullen	Sept. 5, 1939
2,193,182	Pullen	Mar. 12, 1940
2,228,528	Miller	Jan. 14, 1941

FOREIGN PATENTS

Number	Country	Date
441,175	Great Britain	Jan. 14, 1936