March 20, 1945. M. L. RUBIN 2,371,918

CARPET SWEEPER

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Fig. 1

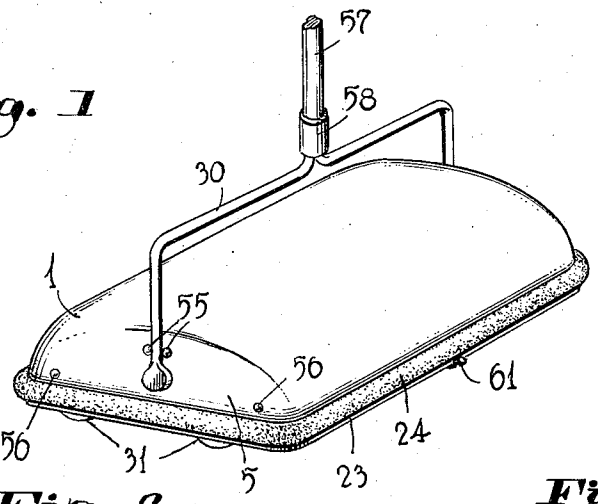


Fig. 2

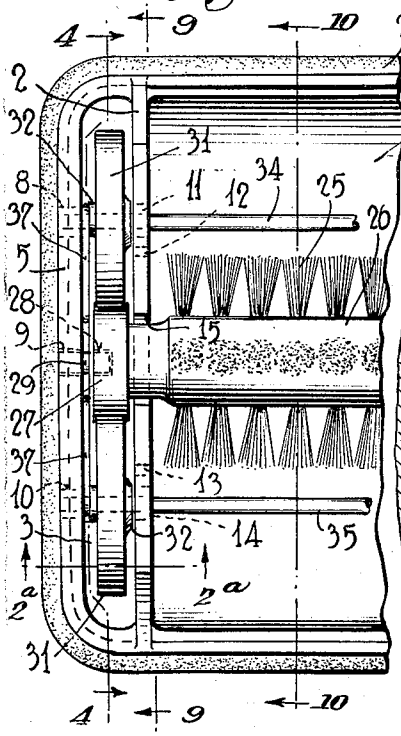
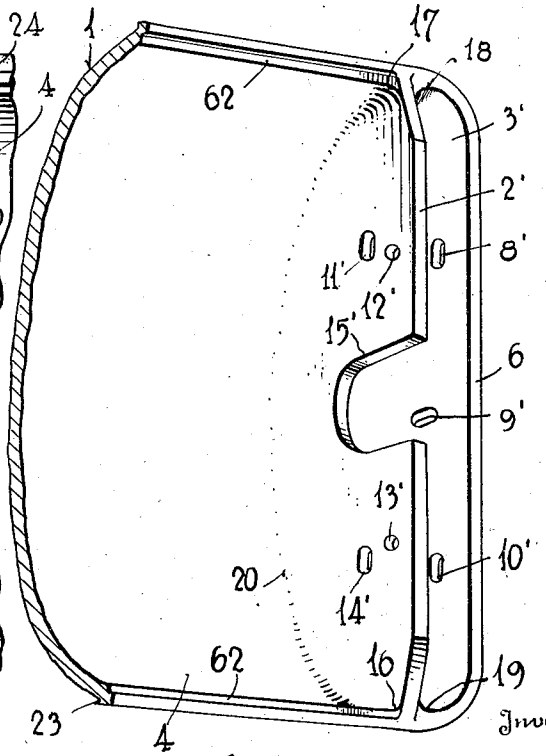


Fig. 3



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CARPET SWEEPER

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Fig. 4

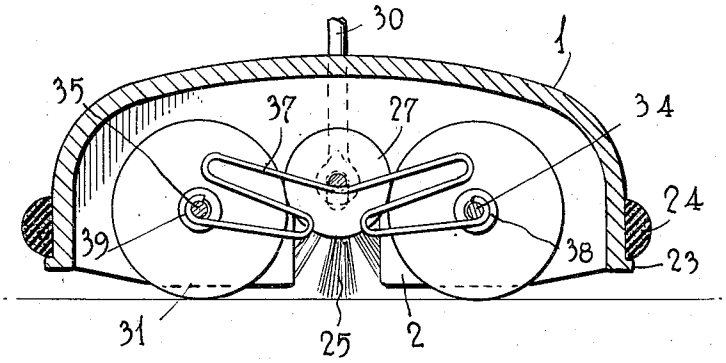


Fig. 5

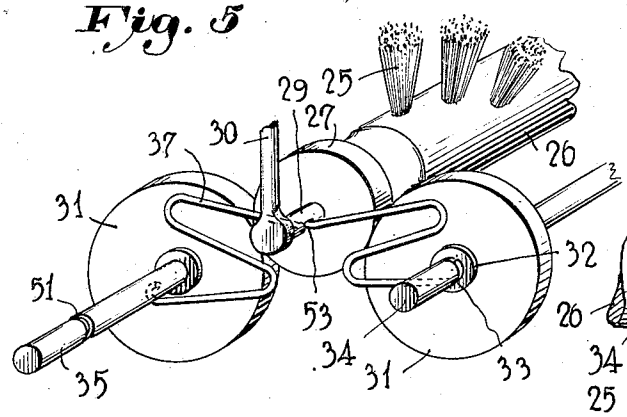


Fig. 2a

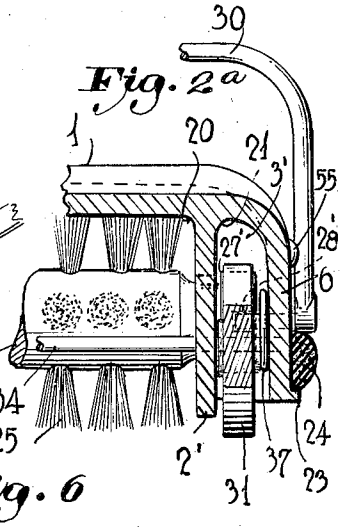
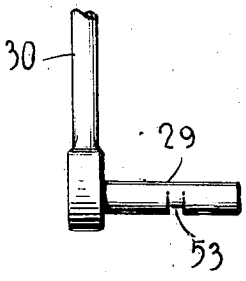


Fig. 6

Fig. 7



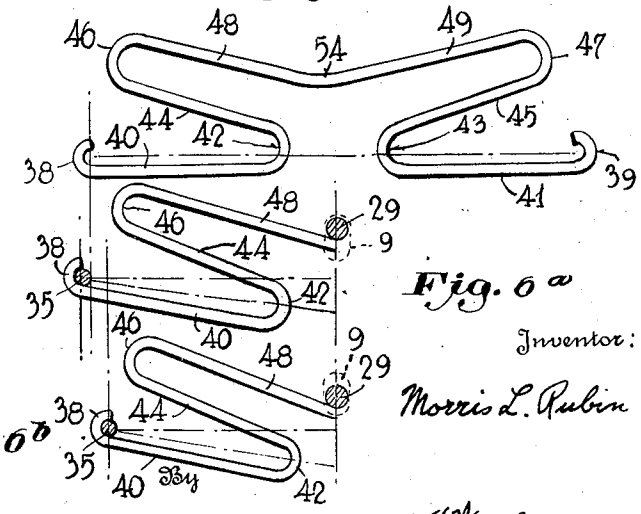


Fig. 6b

Fig. 6a

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Fig. 8

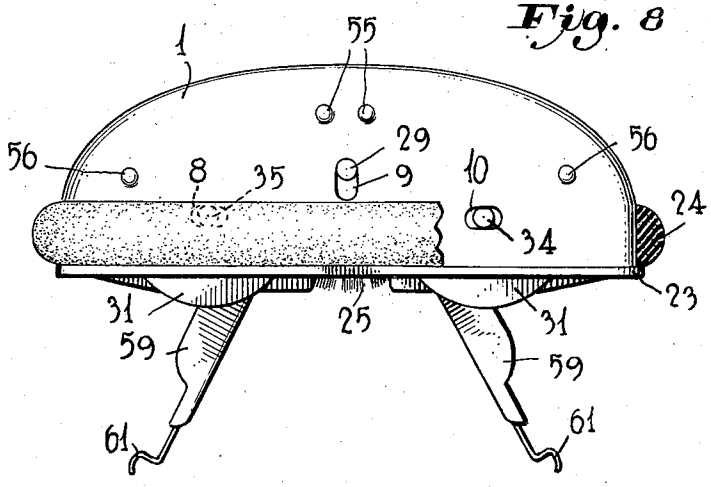


Fig. 9

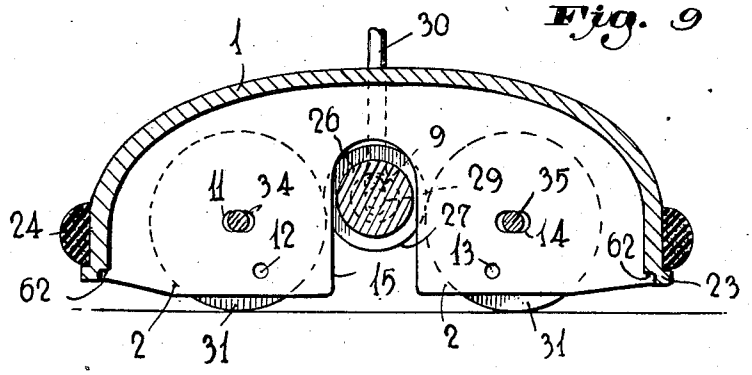


Fig. 10

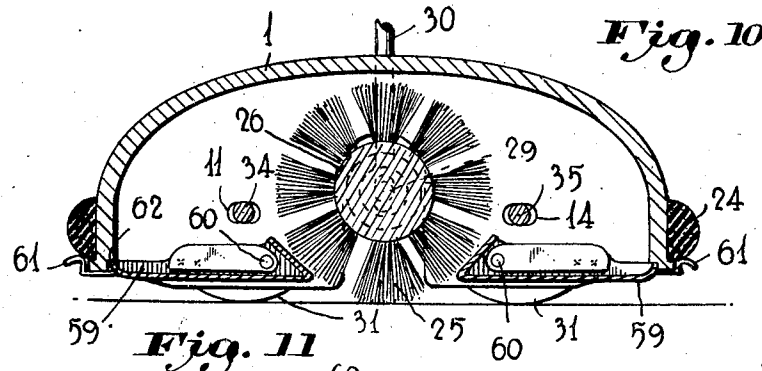
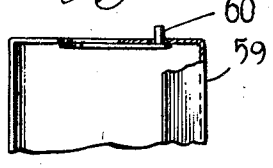


Fig. 11



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Patented Mar. 20, 1945 2,371,918

UNITED STATES PATENT OFFICE

2,371,918

CARPET SWEEPER

Morris L. Rubin, Newark, N. J.

Application February 7, 1941, Serial No. 377,892

10 Claims. (Cl. 15—41)

This invention relates to improvements in apparatus for cleaning surfaces and more particularly to improvements in carpet sweepers.

An object of the present invention is to provide an operating mechanism for carpet sweepers having a simple and highly efficient structure that is peculiarly adapted to function in a casing without providing any particular means for fastening the mechanism to the casing, or for integrally fastening any part of the encased mechanism to any of its other parts.

Another object is to provide a casing or housing for mounting a mechanism of the above type and of such structure that it can be readily formed from molding material in a simple molding operation.

Another object is to provide a casing for mounting the entire cleaning mechanism of a carpet sweeper, with the exception of the bail and handle, in complete concealment in its operative position.

A further object is to provide a carpet sweeper having a minimum number of parts effectively interlocked and supported in operating relation by tension primarily or exclusively.

A still further object is to provide a carpet sweeper that may be readily and easily assembled or disassembled without the assistance of tools or machines.

A preferred embodiment of the present invention is illustrated in the accompanying drawings, in which:

Figure 1 is a perspective view of the sweeper showing the exterior surface of the casing in streamlined form, and the bail and a portion of the handle held in upright position;

Fig. 2 is a partial bottom plan view of the carpet sweeper;

Fig. 2*a* is a vertical section of one end of the sweeper taken on a line longitudinally of the casing, on line 2*a*—2*a* of Fig. 2, in the direction of the arrows;

Fig. 3 is a perspective view of one end of the casing showing the interior structure thereof, the operating mechanism of the sweeper being omitted;

Fig. 4 is a sectional view of Fig. 2 in the direction of the arrows on line 4—4;

Fig. 5 is a partial perspective view of the operating mechanism of the sweeper partly disassembled;

Fig. 6 is a plan view of a spring employed in the sweeper;

Figs. 6*a* and 6*b* are partial plan views of the spring and illustrate the relative positions of sections of the spring when in different stages of tension in the sweeper;

Fig. 7 is a fragmentary view of the bail showing the structure of one end thereof insertable through the casing and in an end of a brush roll;

Fig. 8 is an end view of the sweeper with the dust pans in open position and a portion of the bumper removed;

Figs. 9 and 10 are vertical sectional views of the sweeper taken on line 9—9 and 10—10 respectively of Fig. 2 in the direction of the arrows; and

Fig. 11 is a fragmentary view of a dust pan showing a type of means suitable for mounting the pan in the one-piece casing.

Like reference characters refer to similar parts in the different figures of the drawings.

Referring to the drawings, the sweeper illustrated includes a casing 1 within which is housed the operating mechanism. The casing comprises a substantially rectangular open-bottomed box-like structure with a convex or preferably a streamlined top. The interior of the casing is provided with partitions 2 and 2' spaced from either end as shown in Figs. 2 and 3 respectively, the end shown in Fig. 2 being opposite the end shown in Fig. 3 and said ends of the casing being symmetrical. The partitions 2 and 2' divide the interior of the casing 1 into wheel compartments 3 and 3' at either end of the casing and a central dust compartment 4.

The casing is preferably made of plastic or moldable material such as a synthetic resin, although any material of proper strength may be employed. With a synthetic resin it is possible by a simple molding operation to form a casing of the type herein described with relatively thin walls that are light in weight and yet possess considerable strength. In the course of molding the casing, openings or apertures may be provided in the partitions 2 and 2' and in the end walls 5 and 6 whereby certain members of the operating mechanism are supported. No means for attaching such members to the casing are required to be inserted in the plastic material at the time of molding the same. Openings 8, 9 and 10 are provided in the end wall 5, corresponding to openings 8', 9' and 10' in the end wall 6 (Fig. 3). Openings 11, 12, 13 and 14 are provided in the partition 2, corresponding to openings 11', 12', 13' and 14' in the partition 2'. Openings 8, 11, 8' and 11' are in alignment with each other. Openings 10, 14, 10' and 14' are in alignment with each other. Opening 9 is in alignment with opening

9'. Opening 12 is in alignment with opening 12', and opening 13 is in alignment with opening 13'.

Openings 8, 10, 11, 14, and 8', 10', 11' and 14' are elongated slots or are substantially elliptic with their greater axes extending in a horizontal direction for purposes hereinafter indicated. Openings 9 and 9' are also elongated slots with their greater axes extending vertically and in a plane passing vertically through the longitudinal axis of the casing. Open-ended slots 15 and 15' in the partitions 2 and 2' respectively, extending from the edges of the latter toward the top of the casing, have their vertical parallel edges equidistant from the aforesaid plane and sufficiently apart to permit the passage therebetween of the ends of the brush roll as described hereinbelow.

The corners in the casing formed by the partitions and the top are rounded as indicated at 16, 17, 18, 19, 20 and 21. The end walls 5 and 6 extend part of the way vertically upward and then in a continuous curve toward the top of the casing.

The bottom edge of the casing 1 is provided with a ledge or bead 23 that protrudes outwardly and serves as a support for a bumper 24. The bumper 24 may be a relatively narrow band of rubber completely encircling the casing adjacent its edge and of sufficient thickness to serve as a cushion and guard.

The casing in the form described above has structural characteristics that render it particularly suitable for supporting and housing a cleaning mechanism of the type now to be described. The method of assembly and the method of operation will follow the description of the various parts.

A brush 25 having a shaft 26 extending through the slots 15 and 15' in the partitions 2 and 2' respectively, terminates in pulleys 27 and 27' situated in the wheel compartments 3 and 3' respectively. Each pulley is recessed as at 28 and 28' to provide bearings for the ends 29 of the bail 30, which ends pass through the vertically elongated slots 9 and 9' in the end walls 5 and 6 and into the recesses 28 and 28' respectively.

Floor wheels 31 are provided with spacing hubs 32 on each face, and with a central passage 33 through the axis thereof for axles 34 and 35. The ends of the axles normally hidden by the bumper 24 pass through the horizontally elongated slots in the partitions and end walls, and are flush with the outer surfaces of the end walls. The axle 34 passes through the slots 8, 11, 11' and 8', and the axle 35 passes through the slots 10, 14, 14', and 10', positioning the wheels thereon in the compartments 3 and 3' on opposite sides of the brush pulleys 27 and 27' and in frictional contact therewith.

A spring 37 having the shape of that shown or substantially that shown in Fig. 6 is positioned in each wheel compartment 3 and 3' between the inner surface of an end wall and the outer faces of the wheels 31 and brush pulleys 27 and 27'. The compartments are preferably just wide enough for a spring and the floor wheels and yet permit free rotation of the latter and of the brush pulleys. The springs illustrated are shaped from a single length of steel. All portions of the spring lie in a common plane suitable for vertical positioning in the wheel compartments as indicated above.

The free ends 38 and 39 of each spring are hook-shaped and curl part of the way around the axles 34 and 35 in opposite directions. Although the ends curl upwardly in Fig. 6 they may instead curl downwardly. When a spring is not in tension and in a vertical position, end sections 40 and 41 thereof extend inwardly toward each other substantially horizontally from the hooked ends 38 and 39. The spring curves upwardly in opposite directions from the spaced inner ends of the sections 40 and 41 as at 42 and 43 respectively. From the curved portions 42 and 43, sections 44 and 45 respectively extend outwardly and upwardly at an acute angle with sections 40 and 41. The outer ends of sections 44 and 45 are bowed inwardly and toward each other as at 46 and 47 respectively. The bowed portions 46 and 47 are connected by a so-called saddle portion, a section 48 of which extends downwardly and inwardly from the portion 46 and is substantially parallel to the section 44, and a section 49 of which extends downwardly and inwardly from the portion 47 and is substantially parallel to the section 45. In effect the portion of the spring on the left of the center line (Fig. 6) is substantially S-shaped and the portion on the right is substantially Z-shaped.

Adjacent each end of each axle 34 and 35 is a groove 51 in which the curled ends 38 and 39 of the spring 37 are normally held. The axles extend beyond the grooves 51 into the slots 8, 8', 10 and 10' in the casing 1, and the grooves are so spaced that when the axle ends are flush with the outer surfaces of the end walls of the casing, the said grooves are positioned between the inner surfaces of the end walls of the casing and the wheels 31. The axles 34 and 35 which are otherwise freely slidable through the casing, are held against longitudinal displacement by the spring 37.

Each of the bail-ends 29 likewise has a groove 53 in which the saddle portion 54 of the spring 37 is held when the bail is moved toward a vertical position. The groove 53 extends preferably only part of the way around a bail-end 29 on the under side thereof when the bail 30 is in vertical position. The groove 53 is so positioned that when the bail is in place the groove on each bail-end 29 will at all times be between the adjacent inner surface of the end wall of the casing and a brush pulley 27 and 27', and therefore in the plane of the juxtaposed spring 37, and of the grooves 51 in the corresponding ends of the axles.

Stops 55 and 56 in the form of hemispherical knobs, integrally molded, if desired, from the material of the casing, are provided for the bail and project from the outer surface of each end wall of the casing 1. The stops 55 hold the bail 30 with a handle 57 in a socket 58 in vertical position when the wheels 31 are resting on a horizontal surface. The stop 56 holds the bail between it and the rubber bumper 24.

At each side of the rotary brush 25 is a dust collection pan 59 of the conventional type, hingedly mounted by means of pintles 60 which project into the openings 12 and 12' provided in the partitions 2 and 2' respectively for one of the pans, and into openings 13 and 13' provided for the other pan. The outer edge of each pan is provided with a catch 61 which snaps over the bead 23 thereby maintaining the pan in locked position. When in locked position the outer edge of each pan fits tightly against an abutment shoulder 62 in the edge of the casing 1 extending along the said edge from partition 2 to partition 2'.

To assemble the carpet sweeper, the following procedure may be employed:

The floor wheels 31 are placed in the compartments 3 and 3' to be mounted on the axles 34 and 35. The axle 34 is run through the slot 8 in the end wall 5 of the casing, the central passage 33 of a wheel 31, the slot 11 in the partition 2, the slot 11' in the partition 2', the central passage 33 of a second wheel 31, and the slot 8' in the end wall 6 of the casing 1. The axle 35 is similarly inserted through the slot 10, the central passage of a wheel 31, the slots 14 and 14', the central passage of another wheel 31 and the slot 10'.

Each of the springs 37 is mounted under tension by pulling the curled ends further apart, as shown in Fig. 6a, so that the curled ends enter the grooves 51 in the axles 34 and 35 between the inner surface of an end wall of the casing and the wheel hubs 32. The casing 1, the axles 34 and 35, the four wheels 31, and the two springs 37 are now interlocked in operating relation.

One of the ends 29 of the bail 30 is inserted in the slot 9 in the end wall 5 of the casing 1 and by flexing the bail the other end 29 thereof is inserted in the opposite slot 9' in the end wall 6 of the casing. At this stage the so-called saddles 54 of the springs 37 are positioned between the slots 9 and 9', and the top of the casing 1. To interlock the bail 30 and the other parts thus far assembled, the saddles 54 are sprung into place under the bail-ends 29. This is readily accomplished by successively partially withdrawing the bail-ends 29 from the openings 9 and 9', and in each case depressing the saddle below the bail-ends and then releasing the bail-ends and the springs, thus permitting the saddle of each spring to enter the groove 53 in each bail-end.

The brush 25 is mounted by again flexing the bail 30 and partially withdrawing each bail end successively until, upon release, one bail end enters the recess 28 and the other the recess 28' in the axis of the brush pulleys. The brush 25 is now also interlocked in operating relation with the above assembled parts.

The dust pans 59 are mounted by inserting the pintles 60 of one pan in the openings 12 and 12', and the pintles of the other pan in the openings 13 and 13' in the partitions 2 and 2'. The rubber bumper 24 is stretched over the casing 1 and moved into place against the bead 23.

Sweeping efficiency depends upon the maintenance of frictional driving power between the floor wheels and the brush pulleys in proportion to varying resistance to brush rotation due to both variations in the characteristics of the surface to be swept and the depth or superficiality of the sweeping action desired. For overcoming this varying resistance to brush rotation reliance is conventionally placed upon the elasticity within the limits of the spring material; for controlling the depth or superficiality of the desired sweeping action reliance is conventionally placed upon varying the pressure applied through the handle. Such application of handle pressure ordinarily opposes the superior wedging action of the brush pulleys to the limited elasticity of the springs, forcing the driving wheels apart with a corresponding diminution and virtually total eventual loss of frictional contact between wheels and brush pulleys. This loss is markedly greater between the trailing pair of wheels and the brush pulleys than between the leading pair of wheels and the brush pulleys. The resultant effect under such conditions is an unbalanced reduction and virtually total ultimate loss of sweeping efficiency.

In the improved carpet sweeper herein described, an exactly opposite effect is achieved, that is, sweeping efficiency increases as the pressure is increased. This effect results from the new and improved means by which cooperation between the various parts is made possible. Pressure applied through the handle is transmitted directly to the brush as in the simple manipulation of an ordinary broom except as modified and rendered less abrupt by the counter pressure of the springs. The springs employed have the peculiar property of shortening the distance between the end curls in proportion to the pressure applied downwardly at the central "saddle" point. The peculiar action of the springs is due to the shape thereof. Such action is supplementary to and independent of the limits of elasticity of the material from which the springs are formed.

Thus, when the brush is forced downward, which ordinarily tends to reduce the frictional contact between floor wheels and brush pulleys, the springs, as illustrated in Fig. 6b, tend to contract (shorten the distance between the end curls) thereby pulling the wheels into firmer contact with the brush pulleys. The two tendencies thus counteract and compensate for each other, maintaining frictional driving power in proportion to the pressure applied through the handle, which in turn is proportional to the intensity of the sweeping action or to the varying resistance to brush rotation offered by the surface to be swept, as indicated above. The springs 37, furthermore, cooperate with the bail stops 55 in holding the bail in a vertical position, and also with the grooves 53 in the bail-ends 29 to prevent withdrawal, under pressure, of the bail-ends from the brush pulley bearings 28 and 28'.

The carpet sweeper described and claimed herein is highly efficient and includes an extremely simplified, easily assembled, operating mechanism consisting of a minimum of interlocking parts effectively supportable completely within a casing in operating relation with each other by tension and without the use of fastening devices such as nails, screws, etc., for attachment to the casing. The casing is especially adapted to molding in one piece and without inserts, particularly useful with the simplified mechanism described and serving to conceal it completely when in operative position.

As is seen from the above, by way of summarizing, the functions of the springs (which are floating springs in the sense that they are not attached to the casing nor integrally to any other of the parts of the mechanism) are multifarious in that they make possible a free-floating mechanism; they provide an interlocking action between the various parts and position in a casing the brush, wheels, and axles in operating relation; they exercise a so-called "shortening" influence responsible for increased rather than lost, driving power proportionate to increased handle pressure; they position the brush centrally in the casing; they permit vertical brush displacement within the casing and independently thereof in direct proportion to handle pressure; they yieldingly urge the wheels toward each other; they modulate the abruptness of handle pressure; they assist in vertically supporting the handle; and they prevent withdrawal of the bail-ends from the casing while in operating positions.

What is claimed is:

1. A carpet sweeper having a casing; floor

wheels arranged in pairs at opposite ends of the casing and having axles transversely movable horizontally in the casing; a bail having its ends extending through the end walls of the casing, and a handle extending from said bail; a rotary brush journalled on the bail-ends and vertically displaceable therewith between the wheels; and yieldable means unattached to the casing and associated with the bail-ends and the axles to maintain the brush in driving engagement with the floor wheels, the said means interlocking the axles and the bail-ends to prevent removal thereof in a sweeping operation.

2. A carpet sweeper having a casing; floor wheels arranged in pairs at opposite ends of the casing and having axles transversely movable horizontally in the casing; a bail having its ends extending through the end walls of the casing, and a handle extending from said bail; a rotary brush journalled on the bail-ends and vertically displaceable therewith between the wheels; the said bail-ends and the said axles having adjacent each end a groove for placement of a spring means, and a spring means having its ends curled in the groove around the ends of the axles in line with each other and the said springs having an intermediate section in a groove in a bail-end, the said spring means maintaining the axles and bail-ends in interlocked position and maintaining the brush in driving engagement with the floor wheels.

3. In a carpet sweeper, a casing, a rotary brush, floor wheels for rotating the brush, axles for said wheels, a bail the ends of which serve as bearings for the brush and said bail-ends each having a flattened surface in a portion thereof positioned outside of the rotary brush-ends; and yieldable means independent of the casing and intermediately frictionally engaging each of the bail-ends at said flattened surface to assist in holding the bail in a vertical position, said means extending between corresponding ends of said axles and normally urging said floor wheels in driving engagement with said rotary brush.

4. In a carpet sweeper having a casing, a rotary brush vertically displaceable in the casing, a bail engaging the brush and a handle extending from the bail, and floor wheels, mounted on an axle on either side of the rotary brush and movable toward and away from the brush, in driving engagement with the latter; a depressible tension member, engaging an axle on either side of the brush and engaging the bail, for maintaining the brush in driving contact with the floor wheels in a sweeping operation, the said tension member extending in a direction from an axle toward the engagement point of the bail with said member to transmit a downwardly directed force applied to the handle and the bail and to convert such force into a horizontal force for tightening the driving contact between the floor wheels and the brush.

5. In a carpet sweeper having a casing, a rotary brush vertically displaceable in the casing, a bail engaging the brush and a handle extending from the bail, and floor wheels, mounted on an axle on either side of the rotary brush and movable toward and away from the brush, in driving engagement with the latter; a depressible tension member, having each of its ends engaging an axle on either side of the brush and having an interjacent section in engagement with a bail-end, for maintaining the brush in driving contact with the floor wheels, in a sweeping operation, the said interjacent section of the tension member disposed in relation to the axles to transmit a pulling action to the ends of the member upon forcing said section downwardly in a sweeping operation for effecting a tighter operating engagement of the floor wheels with the rotatable brush to increase the driving force of said wheels.

6. In a carpet sweeper having a rotary brush mounted on an axial support, and floor wheels mounted on axles on opposite sides of the brush and in driving contact with the brush, the said brush being movable with its axial support toward and away from a surface subjected to a sweeping operation and the said floor wheels being movable toward and away from the brush; spring means engaging at each end said axles and having its end portions extending toward each other from the points of engagement with the axles on opposite sides of the brush to points short of the line of displacement of said axial support for said brush, and portions of said spring means adjacent each of said end portions extending upwardly from said latter points and away from said line in a plane with the end portions to opposite ends of an intermediate portion of said spring means which latter portion extends substantially downwardly from said latter ends toward said line and engages said axial support, the said spring means, upon downward pressure of the said axial support for said brush, transmitting a pulling action to the said ends of said spring means and effecting a tighter driving contact between the wheels and the brush.

7. A carpet sweeper having a casing comprising a unitary, one-piece, open-bottomed enclosure; floor wheels arranged in pairs at opposite ends of the casing and having axles transversely movable horizontally in the casing; a bail having its ends extending through the end walls of the casing; and a handle extending from said bail; a rotary brush journalled on the bail-ends and vertically displaceable therewith between the wheels; and yieldable means associated with the bail-ends and the axles to maintain the brush in driving engagement with the floor wheels, the said means interlocking the axles and the bail-ends to prevent removal thereof in a sweeping operation, and the said means, axles, brush, bail and handle being unattached rigidly to the said casing.

8. In a carpet sweeper, the said carpet sweeper having a casing comprising a unitary, one-piece, open-bottomed enclosure, and a sweeping mechanism comprising a handle, a bail, a rotary brush journalled on the ends of said bail, floor wheels, axles for said wheels, and spring means for maintaining the floor wheels and the brush in driving contact, the said spring means engaging the said bail-ends and the axles and interlocking them to prevent removal thereof in a sweeping operation, and each of the aforementioned elements in the said sweeping mechanism, as well as the spring being free from rigid attachment to the said casing.

9. In a carpet sweeper having a casing, floor wheels arranged in pairs at opposite ends of the casing and having axles transversely movable horizontally in the casing, a bail having its ends extending through the end walls of the casing, a handle extending from said bail and a rotary brush journalled on the bail-ends and vertically displaceable therewith between the wheels; tension means extending across the space occupied by the brush from one axle to another, said means having a depressible interjacent section

associated with the bail and having end sections integral with the center section and each removably engaging an axle, and the said interjacent section being disposed in relation to the axles to transmit a pulling action to the said end sections upon forcing the interjacent section downwardly in a sweeping operation by means of the handle and bail, whereby the floor wheels are positively urged into tighter driving contact with the rotary brush.

10. In a carpet sweeper having a casing, floor wheels arranged in pairs at opposite ends of the casing and having axles transversely movable in the casing and longitudinally movable through the casing and the wheel centers, a bail having its ends extending through the end walls of the casing, and a rotary brush journalled on the bail-ends and vertically displaceable therewith between the wheels; a combination detent and spring means comprising a one-piece flexible wire the ends of which engage an axle on either side of the brush in a groove in each axle, the said wire having its end portions extending toward each other from said grooves in said axles on opposite sides of the brush to points short of the vertical line of displacement of the bail-ends, and portions of said wire adjacent each of said end portions extending upwardly from said points and away from said line in a plane with the end portions to opposite ends of an intermediate portion of said wire which latter portion slopes from said latter ends downwardly toward its substantial midpoint which is positioned in a groove in a bail-end, whereby said axles are held against longitudinal movement and said bail-ends are maintained in journalled engagement with said brush, the said spring means, upon downward pressure of the bail, transmitting a pulling action to the ends thereof and effecting a tighter driving contact between the wheels and the brush.

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