Jan. 2, 1962 R. DESCARRIES 3,015,123

VACUUM CLEANER WITH WHEELED UNDERCARRIAGE

Filed Oct. 16, 1959 4 Sheets-Sheet 1

FIG. 1

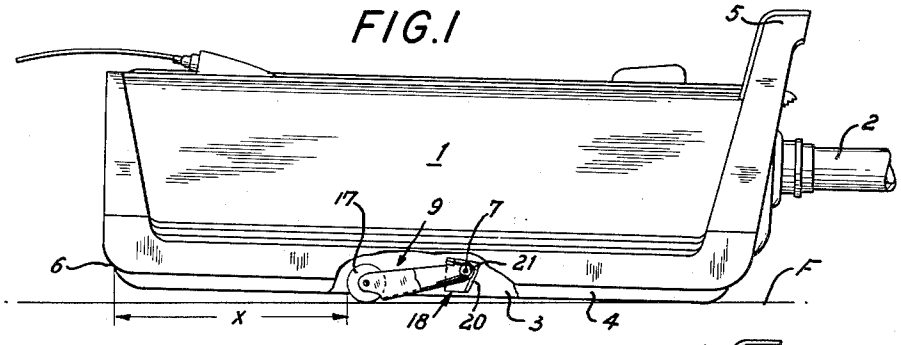



FIG. 2

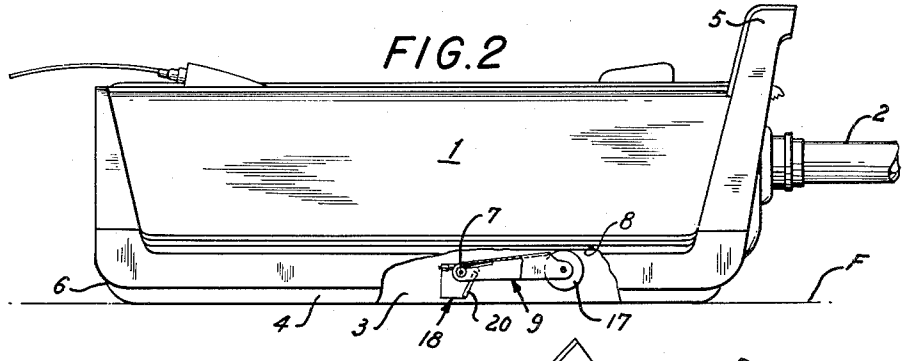
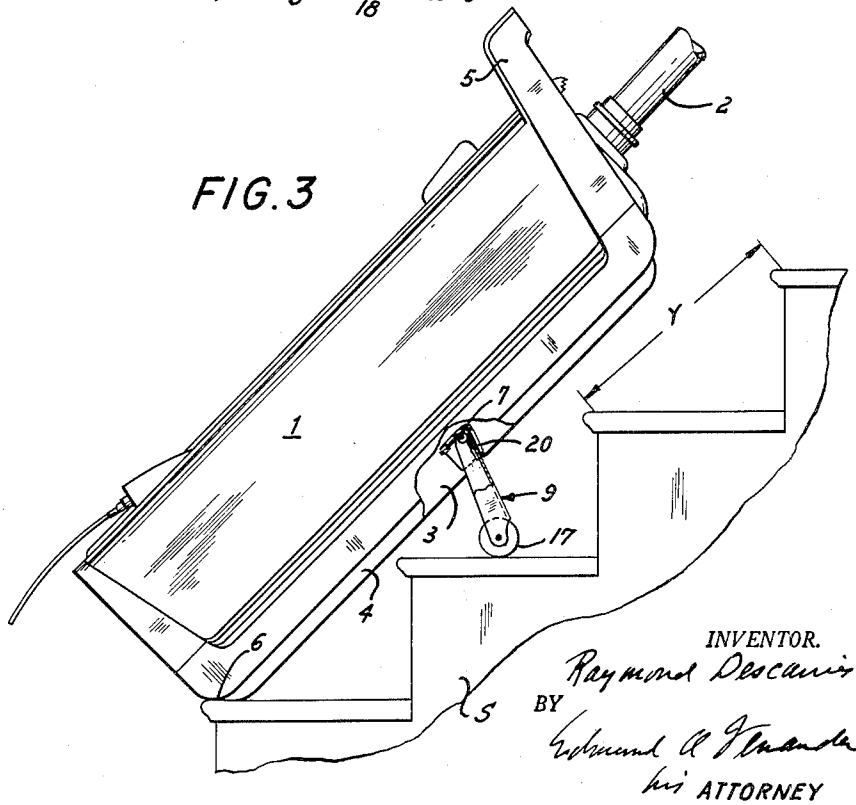



FIG. 3




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VACUUM CLEANER WITH WHEELED UNDERCARRIAGE

Filed Oct. 16, 1959 4 Sheets-Sheet 2

FIG. 4

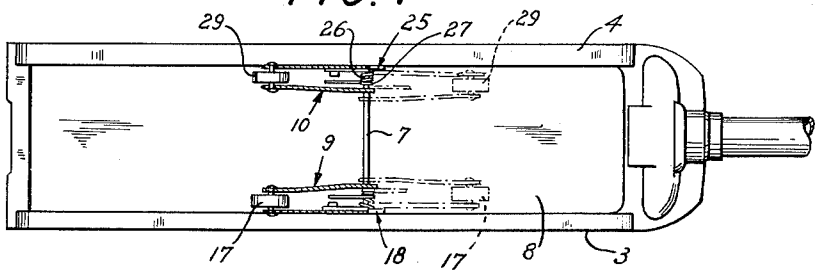



FIG. 5

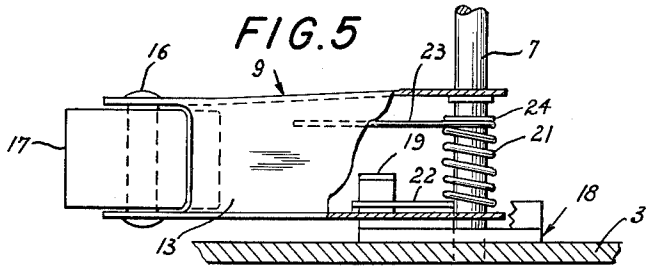
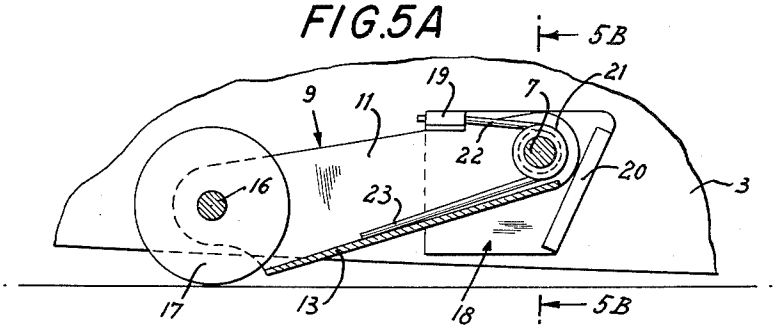



FIG. 5A



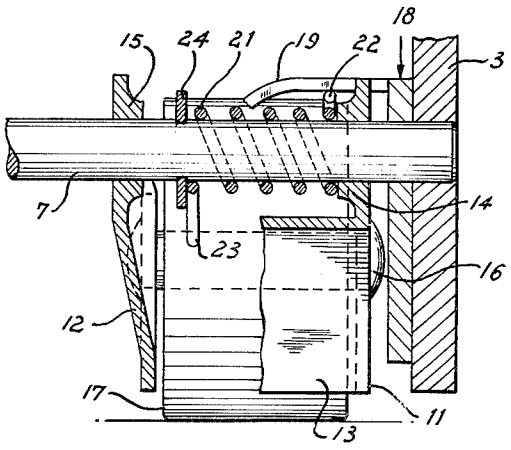




FIG. 5B

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Jan. 2, 1962 R. DESCARRIES 3,015,123

VACUUM CLEANER WITH WHEELED UNDERCARRIAGE

Filed Oct. 16, 1959 4 Sheets-Sheet 3

FIG. 6

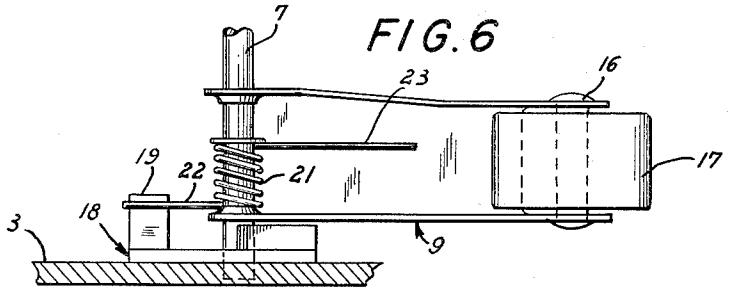



FIG. 6A

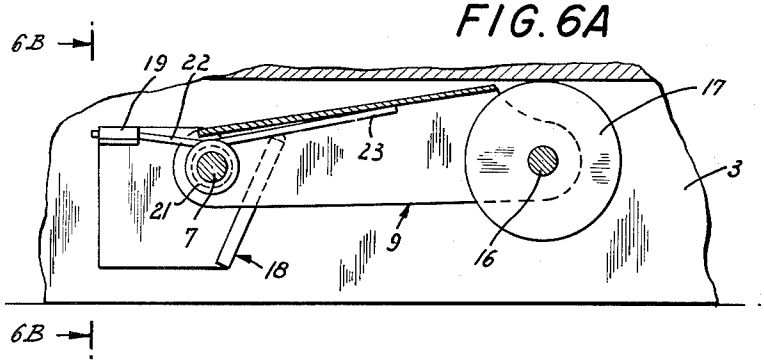



FIG. 6B

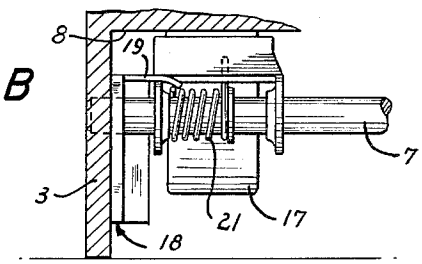
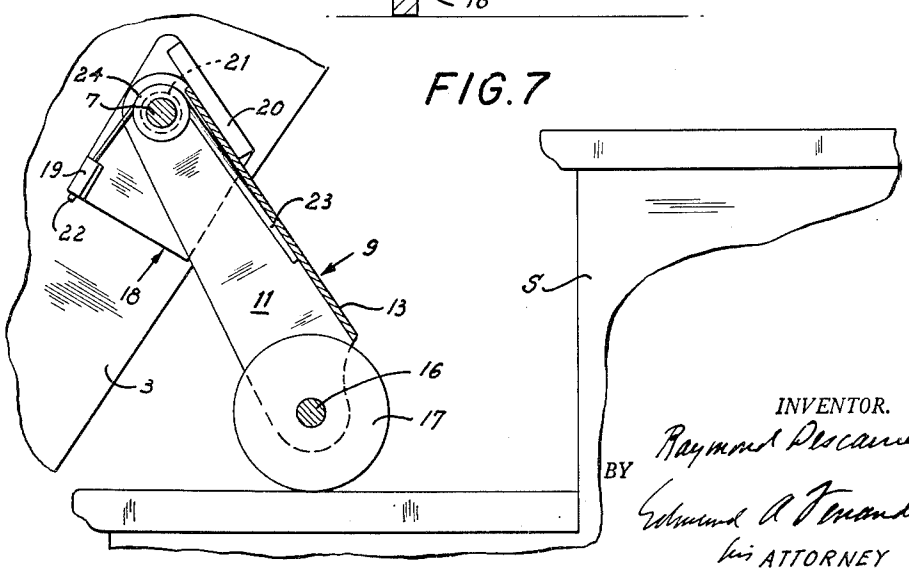



FIG. 7




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Jan. 2, 1962 R. DESCARRIES 3,015,123

VACUUM CLEANER WITH WHEELED UNDERCARRIAGE

Filed Oct. 16, 1959 4 Sheets-Sheet 4

FIG. 8

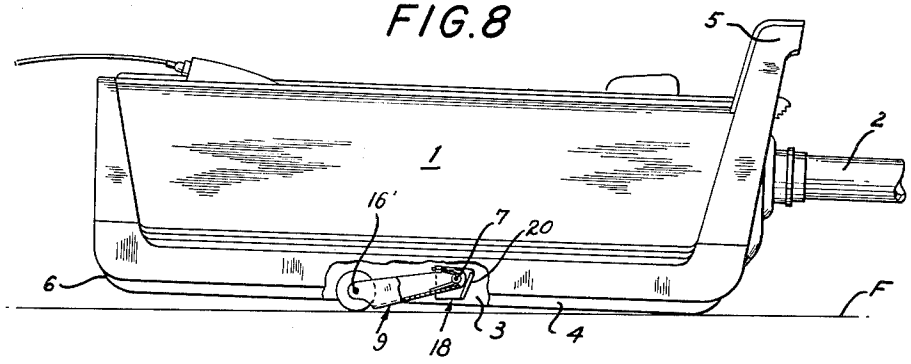



FIG. 9

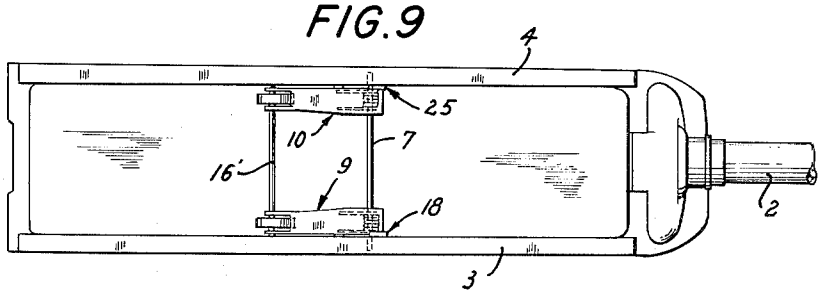
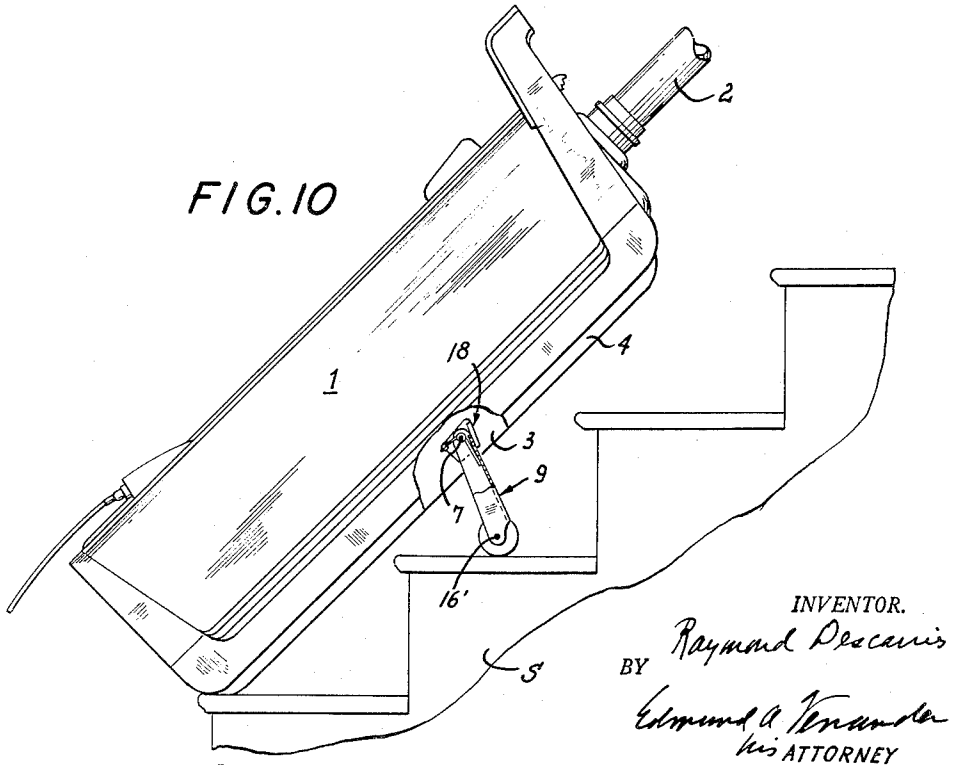



FIG. 10




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1

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# VACUUM CLEANER WITH WHEELED UNDERCARRIAGE

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13 Claims. (Cl. 15—327)

This invention relates to vacuum cleaners and more particularly to so-called tank type vacuum cleaners provided with a wheeled undercarriage to facilitate movement of the device from place to place during use.

Tank type vacuum cleaners are those in which the motor and fan unit, the filter and the dust receptacle are mounted in a mobile housing connected to the cleaning nozzle by a flexible hose, the operator employing the hose as a means for pulling the unit about during use. Such devices are well known and usually have heretofore been provided with one or more pairs of supporting wheels mounted for rotation about a fixed axis so that the unit could be rolled along the floor or the like. While vacuum cleaners of the type referred to have achieved wide acceptance in the trade, there has heretofore been a continuing need for improvement in the undercarriage thereof to provide greater ease in maneuvering the device and, particularly, to allow the vacuum cleaner to be pulled up flights of stairs more readily.

It is accordingly a general object of the invention to devise a vacuum cleaner of the type referred to with an improved wheeled undercarriage.

Another object is to provide, in a tank type vacuum cleaner, a novel wheeled undercarriage affording greater ease of movement of the vacuum cleaner.

A further object is to provide, in combination in a vacuum cleaner, a wheeled undercarriage effective both as a "stair holder" and to support the device for rolling movement on a floor or like surface.

Yet another object is to devise such an undercarriage also capable of movement to a fully retracted position for storage.

In order that the manner in which these and other objects are achieved in accordance with the invention can be understood in detail, reference is had to the accompanying drawings, which form a part of this specification, and wherein:

FIG. 1 is a side elevational view of a vacuum cleaner constructed in accordance with one embodiment of the invention, with some parts broken away for clarity, illustrating the normal position of the wheeled undercarriage;

FIG. 2 is a view similar to FIG. 1 but showing the undercarriage in inactive or "stored" position;

FIG. 3 is a side elevational view of the device of FIG. 1 with the undercarriage in intermediate, "stair holder" position;

FIG. 4 is a bottom plan view of the vacuum cleaner of FIG. 1 with a portion of the undercarriage in horizontal section;

FIG. 5 is a fragmentary bottom plan view showing one wheeled leg of the undercarriage with its associated mounting and spring means, the leg being illustrated in its normal position, assumed during ordinary use of the vacuum cleaner;

2

FIG. 5A is a side elevational view of the mechanism of FIG. 5;

FIG. 5B is a vertical sectional view, taken on line 5B—5B of FIG. 5A, with some parts shown in elevation;

FIG. 6 is a bottom plan view, similar to FIG. 5, but showing the wheeled leg of the undercarriage in its "stored" position;

FIG. 6A is a side elevational view of the mechanism of FIG. 6 with some parts shown in vertical section;

FIG. 6B is a vertical sectional view, taken on line 6B—6B of FIG. 6A, with parts shown in elevation;

FIG. 7 is a fragmentary side elevational view, partially in vertical section, illustrating one of the legs of the undercarriage in intermediate, "stair holder" position, and

FIGS. 8–10 are side elevational views, like FIGS. 1–3, respectively, of a vacuum cleaner constructed in accordance with a second embodiment of the invention.

Referring now to the drawings, and first to FIGS. 1–7 thereof, it will be seen that the vacuum cleaner provided in this embodiment of the invention comprises an elongated tank or housing 1 adapted to contain the motor, fan, filter and dust receptacle (not shown), in any of the usual fashions well known in the art, and connected to the usual flexible hose 2. According to usual practice, hose 2 is connected to a rigid manipulating tube (not shown) to which the cleaning nozzle is attached.

As will be clear from consideration of FIGS. 1, 5A, 5B, 6A and 6B, housing 1 is provided with dependent, parallel, longitudinally extending side flanges or runners 3 and 4, each flange having a straight bottom edge capable of flush engagement with a floor or other surface when the undercarriage, later described, is in fully retracted position. At its front end, housing 1 is extended upward to provide a handle 5. At the opposite end, housing 1 is provided with a rounded bottom corner portion 6.

In this embodiment, the novel undercarriage of the invention comprises a transverse shaft 7 having each of its end portions mounted in a different one of the flanges 3, 4, shaft 7 extending horizontally when the housing 1 is in its normal position. Shaft 7 is spaced below bottom wall 8 of housing 1. Pivotally mounted on shaft 7 adjacent flange 3 is a leg 9. A matching leg 10 is pivotally mounted on shaft 7 adjacent flange 4. Both legs are fabricated of rigid sheet metal and are U-shaped in transverse cross-section.

Thus, leg 9 has a pair of spaced, parallel side flanges 11, 12 lying in planes at right angles to shaft 7, and a base web 13 lying in a plane parallel to shaft 7. At one end, side flanges 11, 12 are provided with bearing portions 14, 15, respectively, in which shaft 7 is journaled, as will be clear from FIG. 5B. At the opposite end of the leg, flanges 11, 12 carry an axle 16 which extends parallel to shaft 7 and rotatably supports a wheel 17.

Rigidly secured to the face of housing flange 3 adjacent leg 9 is a combination spring retainer and stop member 18. Member 18 has a projection 19, disposed rearward of and slightly above shaft 7, the projection 19 extending inward relative to housing flange 3 and curving downward at its tip. Just forward of shaft 7, member 18 is provided with an upwardly and forwardly slanting stop flange 20 disposed in a plane parallel to shaft 7 and projecting inward with respect to housing flange 3.

Between side flanges 11, 12 of leg 9, a multi-turn torsion spring 21 surrounds shaft 7, the ends of the spring being extended with one end 22 being engaged under projection 19 of member 18 and the other end 23 extending along the inner face of base web 13 of leg 9. It is thus apparent that the spring 21 acts to bias leg 9 toward the position seen in FIG. 6A.

Spaced from side flange 12 of leg 9 and somewhat toward flange 11 is a stop washer 24, the stop washer being fixed on shaft 7 against movement axially of the shaft. Spring 21 is engaged in compression between washer 24 and bearing portion 14 of side flange 11. Thus, as will be clear from FIG. 5, spring 21 normally urges leg 9 toward housing flange 3 and thus tends to maintain a portion of leg 9 in rotational alignment with stop flange 20 of member 18. On the other hand, it will be obvious that, by compressing spring 21, leg 9 can be shifted along shaft 7, from flange 3, to a position to clear stop flange 20.

Rearward pivotal movement of leg 9 brings the edge of side flange 11 of the leg into contact with the bottom surface of projection 19. Thus, projection 19 of member 18 is effective to stop leg 9 in the position seen in FIG. 1, with wheel 17 extending below the bottom edge of flange 3.

A second combination spring retainer and stop member 25, matching member 18, is fixed to housing flange 4. Member 25 and second torsion spring 26 cooperate with leg 10 in the same manner just described with reference to elements 9, 18, 19, 20 and 21. Spring 26, cooperating with stop washer 27, biases leg 10 to a position rotationally aligned relative to flange 28 of member 25. Leg 10 is equipped with a wheel 29.

In normal use, legs 9 and 10 project rearward from shaft 7, and springs 21 and 26 are distorted torsionally by the weight of the housing 1 and the parts of the cleaner carried thereby. As will be evident from FIGS. 1 and 2, the wheels 17 and 29 are disposed rearward of the center of gravity of housing 1 and its associated parts when legs 9 and 10 are in the positions of normal use just described. Hence, the housing 1 tilts forward, so that the front ends of flanges 3 and 4, as well as wheels 17 and 29, engage the floor or other surface F, FIG. 1. When the unit is pulled along the floor or other surface F by the hose 2, the front of housing 1 is pivoted upward, so that flanges 3 and 4 are off surface F and the weight of the unit is supported by wheels 17 and 29. This arrangement allows the cleaner to swivel freely on the two wheels, affording maximum maneuverability and minimum resistance to movement along surface F.

When it is necessary to have the device negotiate a flight of stairs, as indicated at S in FIG. 3, the operator need only pull the same onto the stairs by hose 2. As the flanges 3, 4 slide up the stairs, so that the weight of the unit is no longer supported by legs 9 and 10, springs 21 and 26 become effective to pivot legs 9 and 10 from housing 1, downward and forward, until the base webs of the legs engage their stop flanges, the stop flange for leg 9 being at 20. Legs 9 and 10 now are held in the "stair holder" position seen in FIG. 3, and wheels 17 and 29 engage one stair tread, while rounded rear corner 6 of housing 1 engages the next lower tread, to prevent the unit from descending. As the device is pulled further up stairs S, legs 9 and 10 pivot rearward, against the torsional biasing action of springs 21 and 26, to clear the front edge of each tread. However, whenever the lower rear corner 6 of the housing is brought to rest on one tread, legs 9 and 10 will pivot forward to allow wheels 17 and 29 to bear on the top surface of the next higher tread of the stairway. In this connection, it will be noted that the distance X, FIG. 1, is at least equal to the distance Y, FIG. 3, with the distance Y being taken for normal stairways.

When the vacuum cleaner is stored, legs 9 and 10 can be brought to the "fully retracted" positions seen in FIG. 2 by grasping legs 9 and 10 between the thumb and forefinger of one hand and applying pressure to urge the legs toward each other, causing springs 21 and 26 to be compressed, until the legs 9 and 10 are moved from flanges 3 and 4, respectively, along shaft 7 by distances sufficient to allow the legs to clear their respective stop flanges, so that the springs can then act in torsion to pivot the legs forward and upward until wheels 17 and 29 engage bottom wall 8 of housing 1. It will be noted that bottom wall 8 is spaced above the plane of the bottom edges of side flanges 3 and 4 sufficiently to accommodate the entire undercarriage, including the wheels.



FIGS. 8–10 illustrate a simplified embodiment of the invention wherein the wheeled legs of the undercarriage are capable of occupying either a position of normal use (FIGS. 8 and 9), to support the unit on a floor F or other surface, or a "stair holder" position (FIG. 10), no provision being necessary for pivoting the legs forward of their supporting shaft.

Here, housing 1, flanges or runners 3 and 4, legs 9 and 10, shaft 7 and members 18 and 25 are identical with the corresponding elements hereinbefore described with reference to FIGS. 1–7. Wheels 17 and 29, however, are supported by a single axle 16' which extends completely across the undercarriage, being carried by both legs 9 and 10, and fixing the legs in position to engage their respective stops 20 and 28. In this embodiment, springs 21 and 26 are simply retained between the side flanges of legs 9 and 10, respectively, no stop washers being employed. Save for lack of capability of movement of the undercarriage to the fully retracted, forward position of FIGS. 6–6B, operation of the embodiment illustrated in FIGS. 8–10 is essentially the same as described with reference to the first embodiment herein discussed.

It will be noted that the stops, one of which is illustrated at 20 in FIG. 8, are oriented to stop legs 9 and 10 in dependent positions in which the legs slant somewhat rearwardly. It is thus apparent that the wheels of the undercarriage will, under all conditions of normal use of the vacuum cleaner, be led over any obstacles which they may encounter.

What is claimed is:

1. In a vacuum cleaner, a housing containing the motor and fan unit of the vacuum cleaner, supporting leg means mounted for pivotal movement about an axis which is disposed horizontally when said housing is in its normal positions of use, said leg means having an end spaced from said axis, a pair of wheels mounted on such end for rotation about an axis parallel to said pivotal axis, means whereby said housing can be moved manually over a floor or the like in a direction at right angles to said axes whereby said wheels engage the floor and facilitate movement of said housing over the floor, spring means connected to said leg means and arranged to pivot the same downwardly and forwardly of said housing with reference to said direction of movement, stop means disposed in the pivotal path of said leg means and located to stop said leg means in a plane extending downwardly from said housing, said spring means being operative to move said leg means into engagement with said stop means when said housing is tilted for movement from the floor and up a stairway and means on said housing rearwardly of said pivotal axis and disposed to engage a stair tread, said last-mentioned means being so located that when the same is engaged with one tread of a stairway and said leg means is engaged with said stop means, said wheels will engage a second, higher tread of the stairway, and said leg means and stop means embodying structure for rendering said stop means ineffective to stop said leg means and for rendering said spring means operable to pivot said leg means past said stop means.

2. A vacuum cleaner in accordance with claim 1 and wherein said leg means comprises a pair of legs, said structure for rendering said stop means ineffective including provisions for mounting said legs for sliding movement so as to be manually disengageable from said stop means, and said spring means is effective to pivot said legs for-

wardly and upwardly from a position adjacent to said stop means to a position adjacent the bottom of said housing for storage.

3. In a vacuum cleaner, an elongated housing carrying the motor and fan unit of the vacuum cleaner and having a hose attachment located forwardly of the housing; two shaft portions disposed at the bottom and intermediate the ends of the housing and coaxially aligned transversely thereof; a pair of spaced, wheeled, supporting legs each pivotally carried by a different one of said shaft portions and each capable of axial movement on such shaft portion; a pair of multi-turn torsion springs each encircling a different one of said shaft portions and each having one end connected to a different one of said legs, said springs being held in torsion and oriented to bias said legs resiliently toward the forward end of said housing, each of said legs having a laterally facing surface; a pair of lateral abutments each carried by a different one of said shaft portions and spaced transversely of said housing from the laterally facing surface of the one of said legs carried by such shaft portion, said springs each being held in compression between one of said lateral abutments and the corresponding laterally facing leg surface and thereby being effective to bias said legs to given axial positions on said shaft portions, and a pair of stops carried by said housing and each disposed for engagement by a different one of said legs as said legs are pivoted by said springs when in said given axial positions, said stops being disposed to retain said legs in positions extending downwardly from said housing, said legs being capable of being freed from said stops by manual compression of said springs to allow the legs to pivot forwardly and upwardly against said housing.

4. A vacuum cleaner in accordance with claim 3 and wherein said shaft portions are so located and said legs are of such length that the wheels carried by said legs are disposed rearwardly of the center of gravity of said housing and its associated parts when said legs are pivoted, against the torsional biasing force of said springs, to positions in which they extend rearwardly along the bottom of said housing from said shaft portions.

5. A vacuum cleaner in accordance with claim 3 and wherein said legs are independent of each other save for their mounting on said housing.

6. In a tank type vacuum cleaner, an elongated tank carrying the motor and fan unit of the vacuum cleaner, said tank having a pair of spaced, longitudinally extending, dependent flanges and a hose attachment located forwardly of said tank; a horizontal shaft extending transversely between said flanges intermediate the ends of the tank; a pair of wheeled supporting legs each pivotally mounted on said shaft adjacent a different one of said flanges and each capable of movement along said shaft, each of said legs having a laterally facing surface; a pair of multi-turn torsion springs encircling said shaft and each being torsionally connected to a different one of said legs, said springs being oriented to urge said legs pivotally to forwardly extending positions in which said legs are fully retracted between said flanges; a pair of abutments each spaced axially along said shaft from the laterally facing surface of a different one of said legs, said springs being held in compression each between one of said abutments and the laterally facing surfaces of one of said legs and thereby being effective to restrain said legs to pivot in fixed vertical planes, and a pair of stops carried by said tank at points spaced radially from said shaft, said stops each being located in a different one of said planes so as to be engageable by one of said legs to limit the pivotal movement thereof which can be effected by said springs, said stops being located to retain said legs in positions extending downwardly from said tank, and said legs being capable of being freed from said stops, for movement to said fully retracted positions, by manual compression of said springs.

7. A vacuum cleaner in accordance with claim 6 and wherein said stops are disposed to maintain said legs in identical downwardly and rearwardly extending positions.

8. A vacuum cleaner in accordance with claim 6 and wherein said legs are independent of each other save for their mounting on said shaft.

9. A vacuum cleaner in accordance with claim 6 comprising means limiting rearward pivotal movement of said legs to cause the wheels carried by said legs to extend below said flanges when said legs have been pivoted fully to the rear.

10. In a tank type vacuum cleaner, the combination of an elongated casing carrying the motor and fan unit of the vacuum cleaner, said casing having a pair of spaced, longitudinally extending, dependent runners and a forwardly located hose attachment, and means facilitating movement of the vacuum cleaner over a floor and up a stairway, said means comprising a horizontal shaft extending transversely between said runners intermediate the ends of said casing, a pair of wheeled leg each pivotally mounted on said shaft adjacent a different one of said runners, first stop means effective to limit rearward pivotal movement of said legs to positions in which said wheels carried thereby extend below said flanges and are engageable with the floor whereby a portion of the weight of the vacuum cleaner is supported by said wheels, second stop means effective to limit forward pivotal movement of said legs to positions extending downward from and in a direction toward the rear of said casing, and spring means connected to said legs and urging the same resiliently toward said second stop means, said spring means being so constructed and arranged that the weight of the vacuum cleaner can move said legs toward engagement with said first stop means, said spring means being operative to move said legs from engagement with said stop means toward engagement with said second stop means when the weight of the vacuum cleaner supported by the wheels is decreased by a predetermined amount, and said legs and spring means and second stop means embodying structure for rendering said second stop means ineffective to stop said legs and for rendering said spring means operable to pivot said legs past said second stop means.

11. In a horizontal tank-type suction cleaner, an elongated casing having an inlet and an outlet at its opposite ends for air adapted to be circulated therethrough, lever means, means for mounting the lever means for pivotal movement at the underside of the casing for pivotal movement about a first axis perpendicular to the longitudinal axis of the cleaner, resilient means for imparting movement to the lever means in a downward path from the underside of the casing in a direction toward the inlet, stop means in the path of movement of the lever means to hold the lever means at a first position in which the lever means projects downward from the underside of the casing, and means for rendering the stop means ineffective to hold the lever means at the first position and for rendering the resilient means operable to impart movement to the lever means in a direction toward the inlet to a second position at the underside of the casing.

12. Apparatus as set forth in claim 11 which includes roller means mounted at the outer free end of the lever means for rotation about an axis perpendicular to the longitudinal axis of the cleaner, the lever means being movable in an upward path from the first position toward the underside of the casing in a direction toward the outlet, stop means in the last-mentioned upward path of movement of the lever means to stop the lever means at a third position in which the roller means is operable to engage a floor or other surface when the cleaner is normally positioned horizontally thereon.

13. Apparatus as set forth in claim 12 in which the lever means is movable about the first axis between its first and third positions when the stop means is rendered operable to hold the lever means in the first position in which the lever means projects downward from the un-

derside of the casing, the weight of the cleaner being effective to hold the lever means in its third position against the action of the resilient means when the cleaner is normally positioned on a floor or other surface with the roller means in contact therewith.

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