May 5, 1970 HIDEYA KOSHIYAMA 3,509,590

VACUUM CLEANER

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FIG. 1

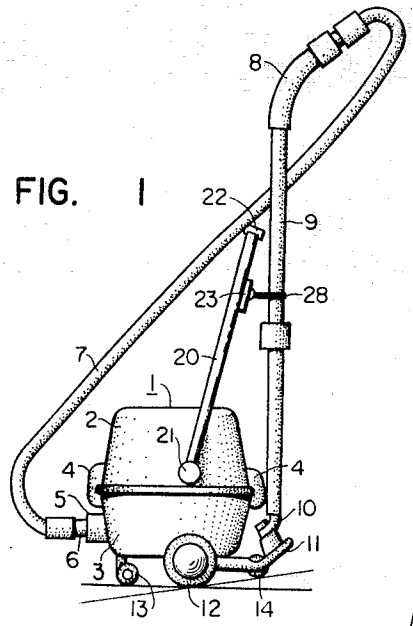


FIG. 2

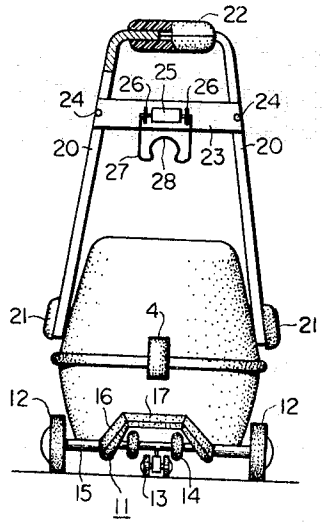


FIG. 3

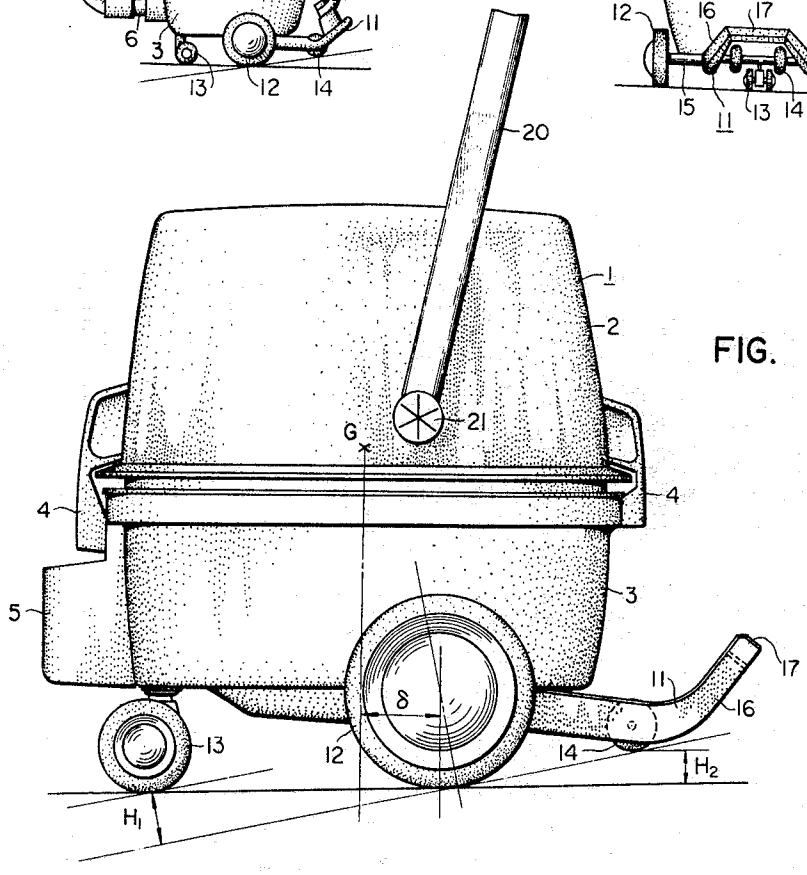


FIG. 4

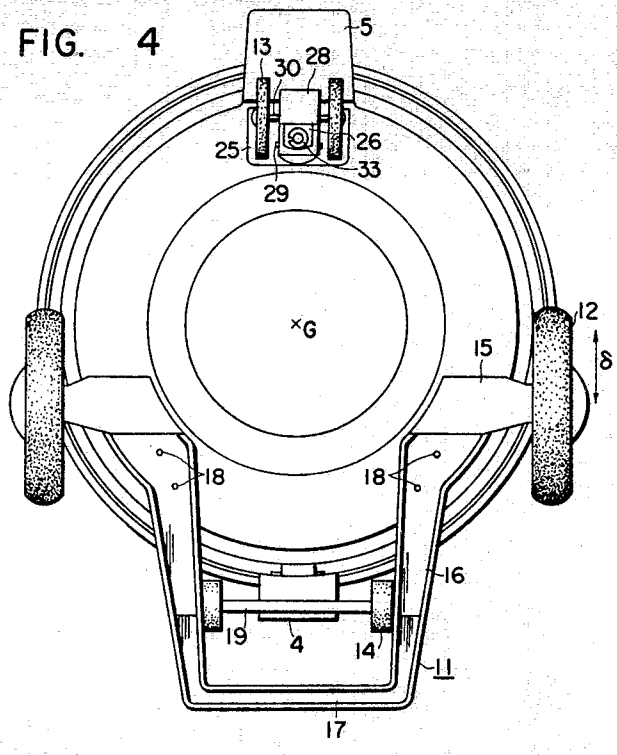
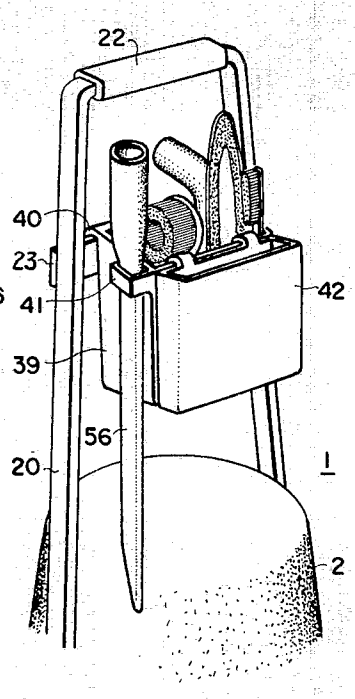


FIG. 10



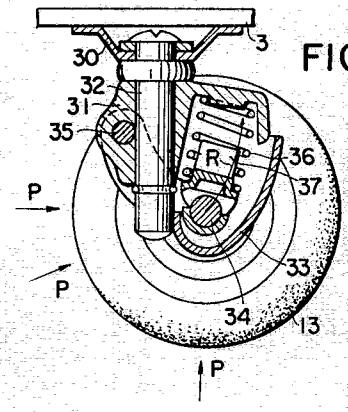


FIG. 9

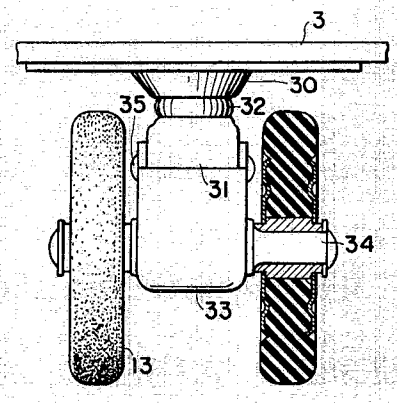
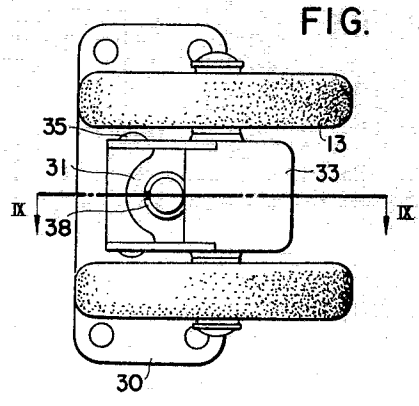


FIG. 7

FIG. 8



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FIG. 5

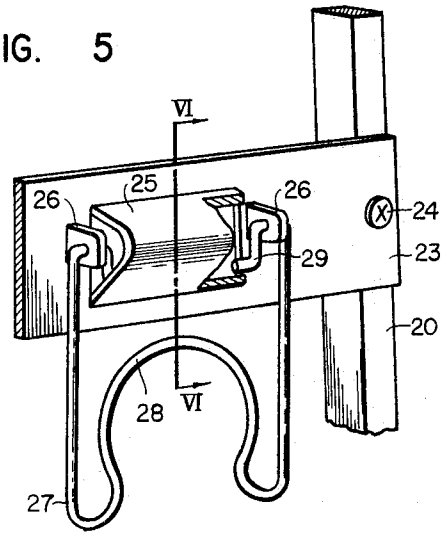
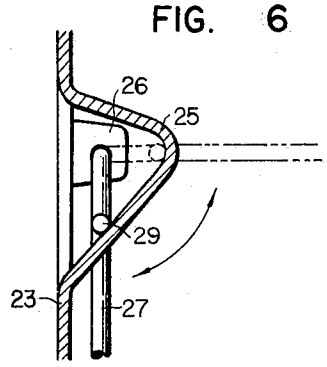


FIG. 6



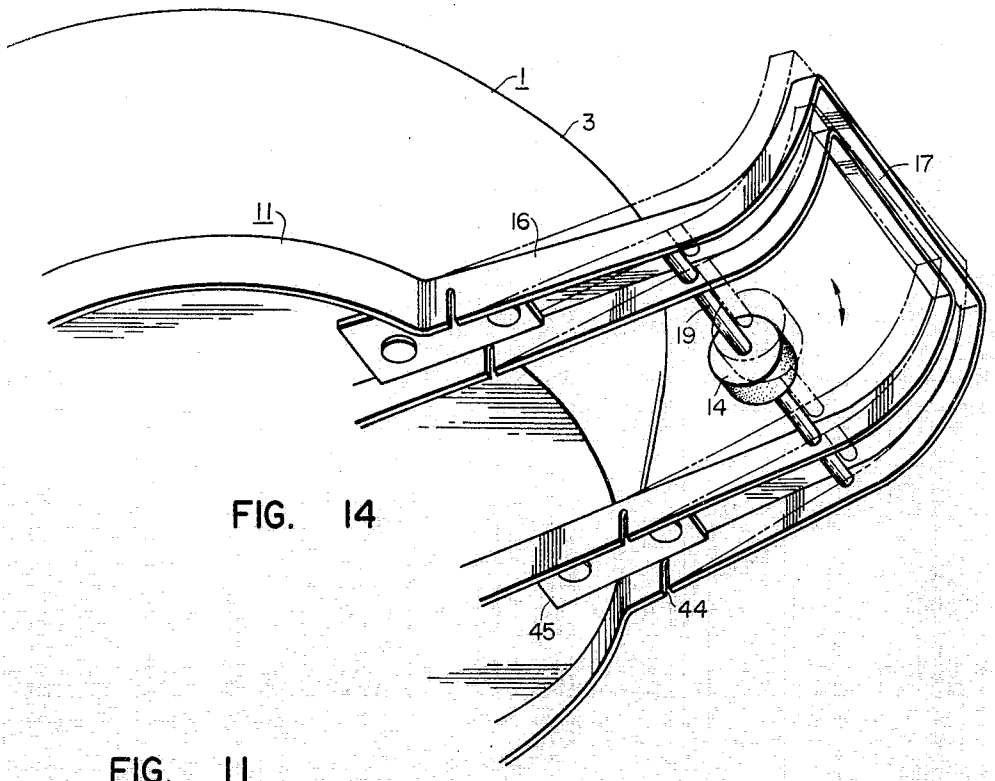
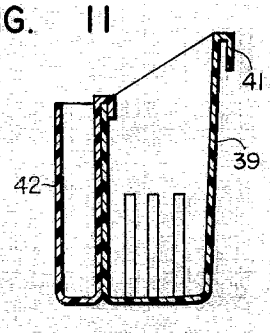


FIG. 14

FIG. 11



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FIG. 12

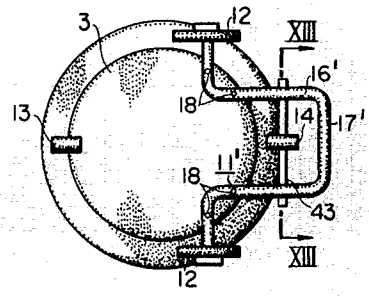


FIG. 13

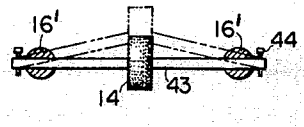


FIG. 16

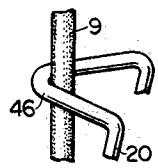


FIG. 15

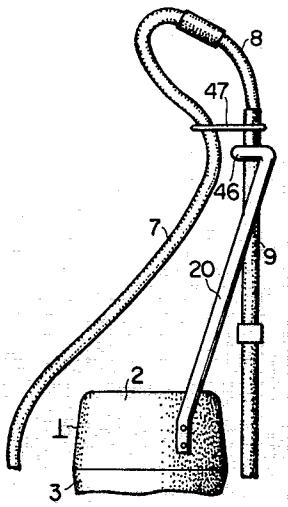


FIG. 17

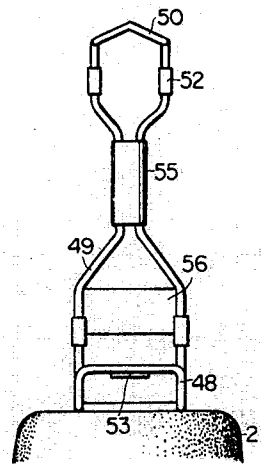


FIG. 18

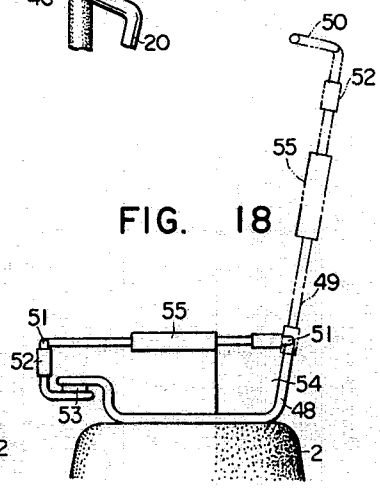


FIG. 19

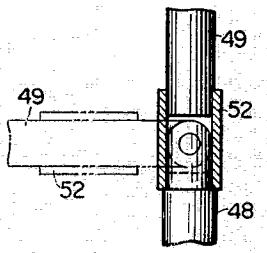
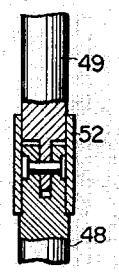


FIG. 20



United States Patent Office 3,509,590 Patented May 5, 1970

3,509,590

VACUUM CLEANER

Hideya Koshiyama, Hitachi-shi, Japan, assignor to Hitachi, Ltd., Tokyo-to, Japan

Filed Jan. 26, 1967, Ser. No. 611,939
Claims priority, application Japan, Jan. 26, 1966, 41/5,775, 41/5,778; Apr. 13, 1966, 41/33,409, 41/33,433; Aug. 12, 1966, 41/75,661; Oct. 4, 1966, 41/92,719
Int. Cl. A47l 5/36
U.S. Cl. 15—323 13 Claims

ABSTRACT OF THE DISCLOSURE

This specification discloses a mobile vacuum cleaner combination including a housing mounted on main wheels and front caster wheels and having a rearwardly extending rest member secured to said casing for preventing tipping and for cooperating with an upwardly extending handle to support the partly flexible, partly rigid air conduit connected to the cleaner. There is also described a foldable handle and various air conduit holding arrangements in association with the handle.

BACKGROUND OF THE INVENTION

The popularity of the canister or tank-type vacuum cleaner over the earlier developed upright vacuum cleaner has increased from year to year due to the greater flexibility and maneuverability of this cleaner arrangement for typical household cleaning to the point where the former equipment is used almost exclusively at the present time. There are, however, certain disadvantages to the canister-type equipment relating to the stability and to the storage thereof.

Presently used equipment generally consists of a nozzle releasably connected at the suction inlet of the cleaner by a flexible hose and, if necessary, various combinations of rigid air pipes, which telescope with one another and interconnect one end of the flexible hose with the cleaner nozzle. The air pipes are ordinarily provided in several sections which interlock with one another by force fit to produce a rigid air pipe of the proper length to facilitate movement of the cleaner nozzle comfortably by a person of normal height. The pipes are made in sections rather than in one piece so that the various lengths may be disassembled for compact storage. However, the storage of these short lengths of pipe and the more cumbersome flexible hose has proven to be very inconvenient due to the shape and configuration of these parts. In addition, while the flexible hose may be manipulated to an extent, due to its diameter and construction it is not capable of compact coiling for storage. It has also been found in practice that while the force fit assembly of the short pipe lengths of the air pipe provides for a rapid assembling of the elements, they have a tendency to work loose during operation of the cleaner causing a separation of the various pipe lengths resulting in a dropping off of the cleaner nozzle.

In addition to the storage problems inherent in the cleaners of known construction, it has been found, especially in connection with canister-type cleaners, that the manueverability thereof over obstacles during the cleaning operation is far from satisfactory. With such equipment, it is the natural practice to pull the cleaner by the flexible cleaner hose; however, due to the fact that the force on the cleaner hose is directed at the end of the cleaner hose well above the body of the cleaner, rapid movement very often results in a pitching of the cleaner body in a back and forth direction causing a toppling or tumbling of the cleaner resulting in damage

to the floor, the cleaner itself, nearby furniture, or combinations thereof.

BRIEF DESCRIPTION OF THE INVENTION

In order to avoid the defects of the prior art, the present invention provides a canister-type vacuum cleaner including a nozzle support bracket secured to the lower surface of the cleaner body and extending rearwardly to provide a support for a pair of auxiliary rear wheels which normally sit above the surface upon which the cleaner is standing and serve to prevent a backward toppling of the cleaner. The rearwardly extending bracket also serves as a rest member for the vacuum nozzle and cooperates with an upwardly extending handle mounted upon the vacuum casing which includes a holder to which the air pipe may be releasably fastened for supporting the air pipe and the flexible hose without disassembly or removal from the vacuum cleaner.

It is a principal object of the present invention to provide a new and improved vacuum cleaner construction which eliminates or otherwise altogether avoids the above-mentioned defects inherent in the conventional cleaner.

It is another object of the present invention to provide a new vacuum cleaner construction having an improved maneuverability and stability of movement.

It is a further object of the present invention to provide a new vacuum cleaner construction providing a cushioning effect during pitching movements thereof so as to prevent tipping and damage to the surface upon which it is traveling and other adjacent objects.

It is still another object of the present invention to provide a new vacuum cleaner construction having a conveniently accessible storage case for cleaning implements and other attachments utilized with the overall combination.

It is another object of the present invention to provide a new vacuum cleaner construction providing means for the simplified and compact storage of accessories without requiring complete disassembly of air hose, air pipes, cleaner nozzle, and associated items.

These and other objects, features and advantages will become more apparent from the following detailed description of the present invention when taken in conjunction with the accompanying drawings, which illustrate the various features thereof, and wherein:

FIGURE 1 is a side view of a cleaner constructed in accordance with the present invention;

FIGURE 2 is a rear view of the back end of the cleaner of FIGURE 1;

FIGURE 3 is an enlarged side view partly cut away of the cleaner of FIGURE 1;

FIGURE 4 is a bottom plan view of the cleaner of FIGURE 1;

FIGURE 5 is a perspective view of a portion of the handle construction of the cleaner of FIGURE 1 showing the air pipe holding means;

FIGURE 6 is a vertical sectional view taken along line VI—VI of FIGURE 5;

FIGURE 7 is a front view of the caster wheel assembly employed in the cleaner of FIGURE 1 at the front end thereof;

FIGURE 8 is a bottom plan view of the caster wheel construction of FIGURE 7;

FIGURE 9 is a vertical sectional view taken along line IX—IX of FIGURE ;

FIGURE 10 is a perspective view of the upper construction of the cleaner of FIGURE 1 showing a storage case for the cleaning elements mounted thereon;

FIGURE 11 is a vertical sectional view of the storage case of FIGURE 10;

FIGURE 12 shows a second embodiment of the present invention having a modified wheel mounting member for the rear wheel combination similar to that of the embodiment of FIGURE 1;

FIGURE 13 is a vertical sectional view of the wheel mounting member of FIGURE 12;

FIGURE 14 shows another modification of the wheel mounting member similar to those of FIGURES 1 and 12;

FIGURES 15 and 16 show views of another modified air pipe holding means similar to that illustrated in FIGURE 5;

FIGURES 17 and 18 illustrate another embodiment of the present invention having a foldable handle for support of the equipment accessories; and

FIGURES 19 and 20 show the handle hinge construction for the embodiment of FIGURES 17 and 18.

DETAILED DESCRIPTION OF THE INVENTION

The same reference numerals have been utilized to identify identical parts in the various views of the drawing wherever possible. While certain specific constructions are described in the following specification and illustrated in the drawings as examples of the present invention, it should be understood that obvious modifications or equivalent constructions can be provided in lieu thereof without departing from the spirit and scope of the present invention.

Referring now more specifically to the drawings, FIGURES 1 through 4 illustrate a canister-type vacuum cleaner **1** including an upper housing casing **2** and a lower housing casing **3** releasably secured to one another by suitable locking members **4** and enclosing standard power equipment, such as a motor, a fan and a filter (not shown) of any suitable construction generally provided for such cleaner units. The lower casing **3** is provided with an air suction inlet **5** at the front end thereof to which one end **6** of a flexible air hose **7** is detachably mounted. To the other end of the flexible hose **7** is connected a nozzle **10** by way of a curved rigid air pipe **8** and a straight rigid air pipe **9**, which may be formed in one or more removable sections. The flexible hose **7** and the air pipes **8** and **9** in combination serve as the air conduit member between the nozzle **10** and the air suction inlet **5** of the cleaner.

The lower casing **3** is further provided with a front caster wheel **13**, a pair of main wheels **12** somewhat larger in diameter than the caster wheel **13**, and a pair of rear auxiliary wheels **14**. A mounting and support bracket **11** is secured to the bottom face of the lower casing **3** for mounting the main wheels **12** and the rear wheels **14**, as seen in FIGURE 4. The bracket **11** includes a pair of transversely disposed arms **15** serving as respective axles for the main wheels **12** and is formed integrally with a U-shaped bracket portion consisting of leg members **16** and cross-member **17**. The leg members **16** are bent upwardly at the rearward ends thereof so that the cross-member **17** extends at an angle to the base or bottom face of the lower cleaner casing **3**, and serves, as will be indicated in greater detail hereinafter, as a support for the cleaner nozzle **10**. The rear auxiliary wheels **14** are supported upon a shaft **19** which is in turn supported between the leg members **16** of the bracket **11**. The bracket **11** may be secured to the lower face of the casing **3** by any suitable conventional fastening members, such as the screws **18**.

The bracket **11** is preferably mounted to the casing **3** at a point behind the center of gravity G of the cleaner, as illustrated in FIGURES 3 and 4, so that the axles **15** for the wheels **12** are located on a line spaced from the vertical line of the center of gravity G by horizontal distance δ toward the rear of the cleaner construction. This distance δ is preferably selected so as to place the center of gravity G of the cleaner at a suitable point between the front caster wheel **13** and the main wheels **12**. In this way, with the cleaner normally supported on a floor by the front caster wheel and the main wheels, a good dynamic balance and resistance against tipping is provided so that the cleaner may quickly recover to the normal state of equilibrium upon being subjected to pitching forces during maneuver thereof. Thus, this embodiment of the present invention provides an especially improved pitching maneuverability which allows the cleaner to move over obstacles on the floor without tipping or critical loss of stability.

The rear wheels **14** are so positioned and dimensioned in comparison with the main wheels **12** that they ride or float above the floor by a certain height H_2 when the cleaner is in its normal equilibrium state of rest, but will contact the floor to provide equilibrium to the cleaner should the cleaner body be pitched backward around the rear wheels **12** to the critical equilibrium point by a distance H_1 where the center of gravity passes through the axle of wheels **12**. Thus, the cleaner is always maintained in a state of equilibrium, either due to the position of the center of gravity of the cleaner construction, or through contact of the rear wheels **14** with the surface over which the cleaner is being pulled. The heights H_1 and H_2 are selected to be approximately 38 to 40 centimeters, respectively, since this range makes possible a traversal of usually encountered obstacles without loss of stability.

A handle **20** is secured to the upper casing **2** of the cleaner **1** by a suitable securing means **21** so as to extend at a slight angle to the vertical in the rearward direction permitting movement of the cleaner by way of a grip **22** mounted at the upper end of the handle **20**. A cross piece **23** is secured to the handle **20** at a point below the grip **22** by means of suitable securing means **24** and is provided, as illustrated specifically in FIGURES 5 and 6, with a protruding or pressed out portion **25** on either side of which a pair of brackets **26** are formed, preferably, by pressing out tabs from the cross piece **23**. A holder **27** for the rigid air conduit **9** formed of a shaped wire having a curved contact portion **28** for clamping around the outer periphery of the conduit **9** is mounted by the end portions **29** thereof in suitable support holes in the brackets **26** on the cross piece **23**. The end portion **29** of the wire holder **27** is provided with a terminal protruding portion engaging frictionally with the inner contour of the protruding portion **25**, as illustrated in FIGURE 6, so as to provide for a spring locking of the holder **27** in the raised or horizontal position.

As illustrated in FIGURE 1, with the holder **27** extending in the horizontal position and the cleaner nozzle **10** supported upon the angular portion **17** of the bracket **11**, the air cleaner conduit **9** may be clamped into the curved contact portion **28** of the holder **27** thereby supporting the conduit in a substantially vertical position with the curved conduit portion extending rearwardly so that the flexible hose **7** is stretched between the air suction inlet **5** and the upper curved end **8** of the rigid conduit. In this way, the flexible hose and the rigid conduit may be stored with the cleaning apparatus without dismantling or removal from the equipment for storage separate from the cleaner casing. This also makes possible a more secure interconnection of the rigid pipe sections, which no longer have to be disassembled for storage, eliminating the annoying separation of these sections during use.

The front caster wheel construction **13** for the embodiment of FIGURE 1, is preferably constituted in the form of a resiliently mounted caster, as shown in FIGURES 7 through 9. In this construction, a base plate **30** is mounted directly to the lower face of the casing **3** by suitable means (not shown) and a support bracket **31** is horizontally rotatably mounted in the conventional snap-locking manner by means of the ring **38** on a shaft **32** secured to the base plate **30**. A pivot shaft **35** extending transversely to the shaft **32** pivotably connects the bracket **31** to a wheel support member **33**, which is mounted on the bracket **33** by means of axle **34**. Resilient support for the wheel is then provided to cushion rotation of the wheel **13** mounted on the rotating bracket **33** by means of a spring **36** in-

serted between the support bracket **31** and the wheel support **33**. With a mechanical force P applied to the front caster wheel **13**, as shown in FIGURE 9, the bearing means **33** yields resiliently in a direction R to buffer the force from the casing **3**. The cushioning effect may be additionally increased by providing a rubber buffer **37** between the axle **34** and a stop portion on the bracket **31**.

The rear wheels **14** may also be mounted in a cushioned manner. In accordance with the embodiment of the invention illustrated in FIGURES 1 through 4, the wheel mounting and support bracket **11** may be made of a suitable resilient material, such as a resilient organic plastic, so as to provide a flexing at the time of contact of the rear wheels **14** with the surface over which the cleaner is being moved. The rear wheels **14** are rotatably mounted on a shaft **19** which is secured to the wheel mounting and support bracket **11** at a certain distance from the main shaft **15** of the wheel **12**.

As an added feature of the present invention, a storage carrier **39**, illustrated in FIGURES 10 and 11, for storing various cleaning implements and attachments for the cleaner may be mounted by an integral hook arrangement **40** on the cross piece **23** mounted to handle **20**, which carrier arrangement may be provided with a hanger means **41** for hanging a crevice nozzle **56** and may be further combined with a removable trash box **42**. With this arrangement, the cleaning elements and attachments will always be maintained with the cleaner so that they are always accessible for use and are easily stored with the main cleaner construction. As illustrated in FIGURE 11, the trash carrier **42** may be provided with a pair of hooks for engaging over the front face of the attachment box providing for simplified removal for disposal of the trash therein without requiring a removal of the equipment carrying container itself.

While the embodiment of FIGURES 1 through 4 illustrates the use of two rear wheels **14**, it is also within the contemplation of the present invention that one rear wheel or no rear wheel at all, but only the bracket **16**, may be sufficient for preventing the cleaner **1** from toppling over. An alternative embodiment illustrated in FIGURES 12 and 13 utilizes a single rear wheel **14** mounted by means of a resilient shaft **43** between the legs **16'** of the bracket member **11'**. The cushioning effect of the rear wheel is provided by a flexing of the flexible shaft **43** upon contact of the wheel **14** with the surface over which the cleaner is being moved. In other respects, the bracket member **11'** may be substantially identical to that provided in the embodiment of FIGURES 1 through 4.

In order to increase the resiliency of the wheel mounting member **11** over that provided even by a flexible plastic bracket, a plurality of aligned slots **44**, as illustrated in FIGURE 14 may be provided at the point of support of the bracket **11** at the lower casing **3** of the cleaner. The slots **44** serve to eliminate the rigidity provided by the substantially U-shaped cross section of the bracket at the points where the slots are positioned, and if the bracket is secured to the casing **3** at points on either side of the slots **44**, a flexibility is provided without sacrificing the structural strength of the combination. A flexible shaft **19** with a single wheel **14** may also be included in this combination to provide for maximum flexibility and cushioning of the rear wheel combination.

FIGURES 15 and 16 disclose another embodiment of the present invention including a modified handle construction having an air conduit holder **46** formed as an integral part of the grip portion of the handle **20**. The grip portion is formed into a V-shaped or U-shaped curve to accommodate the rigid conduit **9** and a flexible band **47** is positioned over the looped end of the air duct consisting of the flexible hose **7** and the rigid curved portion **8** of the air conduit so that the resilience of the flexible hose **7** connected to the air suction intake of the cleaner serves to maintain the rigid conduit **9** in firm contact with the curved portion **46** of the handle while the vacuum nozzle **10** is maintained in contact with the upwardly curving support portion of the bracket **11**, in the manner illustrated in FIGURE 1. This arrangement eliminates the need for a separate spring holder for the rigid conduit and permits a positioning of the handle **20** at a greater angle to the vertical for more simplified movement of the cleaner thereby.

Another embodiment of the present invention illustrated in FIGURES 17 through 20 provides for a foldable handle capable of supporting the air conduit for storage and also being compactly foldable during use for simplified manipulation and transportation thereof. The embodiment includes a curved base portion **48** secured to the upper casing **2** of the cleaner **1** in any convenient manner and having an offset terminal portion to which is secured a magnet **53**. The vertically extending rear portion of the base member **48** is hinged to an arm portion **49** provided with a handle grip **55** and hinged at the extreme end thereof to a conduit holding member **50**, similar to that illustrated in FIGURES 15 and 16. Tubular sleeves 52 are provided in the area of each of the hinges **51** and are slipped over the hinges, as illustrated in full lines in FIGURES 19 and 20, to provide for rigid extension of the hinged parts. However, for purposes of folding the handle **49**, as illustrated in FIGURE 18, the tubular sleeves **52** are slipped down from around the hinges **51** and the handle **49** is rotated to a horizontal position with the extreme hinged end formed by the holding member **50** rotated into contact with the magnet **53**. In this position, the handle grip **55** is positioned substantially over the center of gravity of the cleaner casing and serves as a means for transporting the vacuum cleaner assembly. In addition, a cleaning element storage case **54** is suitably secured either to the base member 48 or to the upper casing **2** of the cleaner and serves to provide means for transportation and storage of the various cleaning accessories utilized with the vacuum cleaner equipment. A cover **56** may be mounted on the handle portion **49** in this embodiment so that upon folding of the handle into the retracted position, the cover **56** will form a closure for the cleaning element storage case **54**.

The foregoing embodiments have been described in connection with a canister-type vacuum cleaner construction; however, it should be apparent that the principles thereof may also be applied equally well to other types of cleaner constructions, such as the conventional tank-type construction and similar arrangements. It should also be apparent that the operating efficiency and workability of the cleaner in accordance with the present invention is greatly improved over the constructions provided by the prior art and the difficulties enumerated above in connection with the prior art devices is completely eliminated or substantially reduced by the novel features of the present invention. Moreover, due to the simplified construction of the present invention, the cost of manufacture has been greatly decreased, while the speed of manufacture and dependability and durability of construction have been greatly increased.

I have shown and described several embodiments in accordance with the present invention. It is understood that the same is not limited thereto but is susceptible of numerous changes and modifications as known to a person skilled in the art.

I claim:

1. A canister-type movable vacuum cleaner comprising a casing enclosing power equipment for said cleaner;

an air suction inlet provided on said casing for producing a suction in a suction nozzle via air conduit means;

an elongated handle mounted on said casing having a holding member mounted thereon for holding said air conduit means intermediate the ends thereof;

a pair of main wheels and at least one additional wheel mounted on said casing with said additional wheel

being positioned adjacent one end of said casing for movably supporting said casing;

a rest member secured to and projecting from the other end of said casing including a support portion for supporting said suction nozzle; and

at least one auxiliary wheel mounted on said rest member,

wherein said auxiliary wheel is spaced a predetermined distance above the surface upon which the cleaner is supported and a vertical line through the center of gravity of the cleaner passes between said main wheels and said additional wheel when said casing is supported in a first position on said main wheels and said additional wheel, and the vertical line through the center of gravity of the cleaner passes through the vicinity of the axis of said main wheels when the casing is supported in a second position on said main wheels and said auxiliary wheel, so that the cleaner is maintained in an equilibrium condition in either said first or said second positions.

2. The combination defined in claim **1** wherein said holding member includes a pivotally mounted flexible clasp for engaging said air conduit means with said suction nozzle supported on said rest member.

3. The combination defined in claim **2** wherein said holding member further includes a bracket secured to said handle having a pressed out portion in communication with said flexible clasp for locking said clasp in an extended position.

4. The combination defined in claim **1** further including a storage container removably mounted on said handle for storing cleaing elements and a trash container detachably mounted on said storage container.

5. The combination defined in claim **1** wherein said holding member consists of a flexible band mounted over a looped central portion of said air conduit so as to press said conduit against said handle with one end thereof connected to said suction inlet and said suction nozzle end supported on said rest member.

6. The combination defined in claim **5** wherein the end of said handle includes a substantially U-shaped portion for engagement with said air conduit.

7. The combination defined in claim **1** wherein said handle is hinged in first and second places for folding into a horizontal position and magnet means for locking the end thereof so that said handle forms a substantially rigid rectangle.

8. The combination defined in claim **7** further including a storage container mounted on said casing adjacent said handle and a closure means secured to said handle for

closing said container in the folded condition of said handle.

9. The combination defined in claim **1** wherein said rest member is constructed with a substantially U-shaped cross section having a pair of leg members and a cross member.

10. The combination defined in claim **1** wherein said rest member is composed of flexible material.

11. The combination defined in claim **1** wherein said auxiliary wheel is resiliently mounted on said rest member.

12. The combination defined in claim **1** wherein said pair of leg members have at least a pair of slots for increasing the flexibility of said bracket.

13. A mobile vacuum cleaner comprising:

vacuum power means including a casing and a suction inlet therein for producing a suction,

a pair of main wheels and at least one additional wheel mounted on either side of a vertical line through the center of gravity of said casing for support of the cleaner in a first equilibrium position with said additional wheel being positioned adjacent to said suction inlet at one end of said casing,

a suction nozzle and air conduit means for detachably connecting said nozzle to said suction inlet, and

a rest member secured to and projecting from the other end of said casing opposite said additional wheel and including a support portion for supporting said suction nozzle, said rest member being spaced above the support plane of said cleaner in said first equilibrium position by a sufficient distance to provide support for said cleaner in a second equilibrium position on said main wheels and said rest member with the vertical line through the center of gravity of said cleaner passing through the vicinity of the axis of said main wheels.

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ROBERT W. MITCHELL, Primary Examiner

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