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[54] **INTAKE SEAL FOR TANK VACUUM CLEANER**

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Related U.S. Patent Documents

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[52] **U.S. Cl.** **15/327.2**; 15/327.6; 15/353; 285/7

[58] **Field of Search** 15/327.2, 327.6, 353, 15/352, 327.1; 285/7

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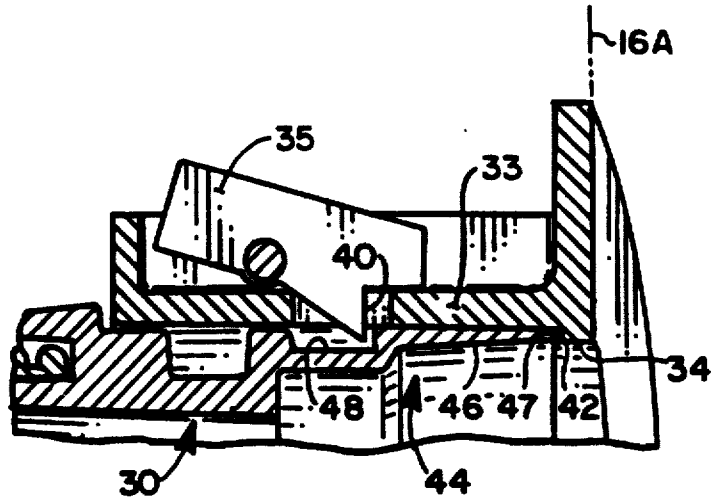
[57] **ABSTRACT**

An adapter, mounted on the cylindrical sidewall of the vacuum cleaner tank, provides a receptacle for a rigid connector on which a flexible vacuum hose is sealingly mounted. The leading edge of the connector insert is beveled. A corresponding beveled surface is formed on the inner wall of the receptacle to engage and seal with the beveled leading edge of the connector to form a continuous, peripheral seal immediately adjacent to the wall of the tank so that when the vacuum motor is turned on, a positive force is generated to increase the effectiveness of the seal.

4 Claims, 1 Drawing Sheet



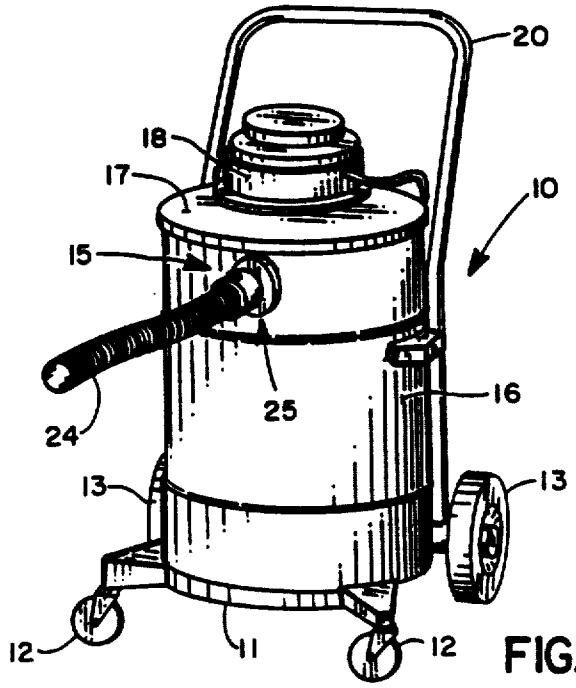


FIG. 1

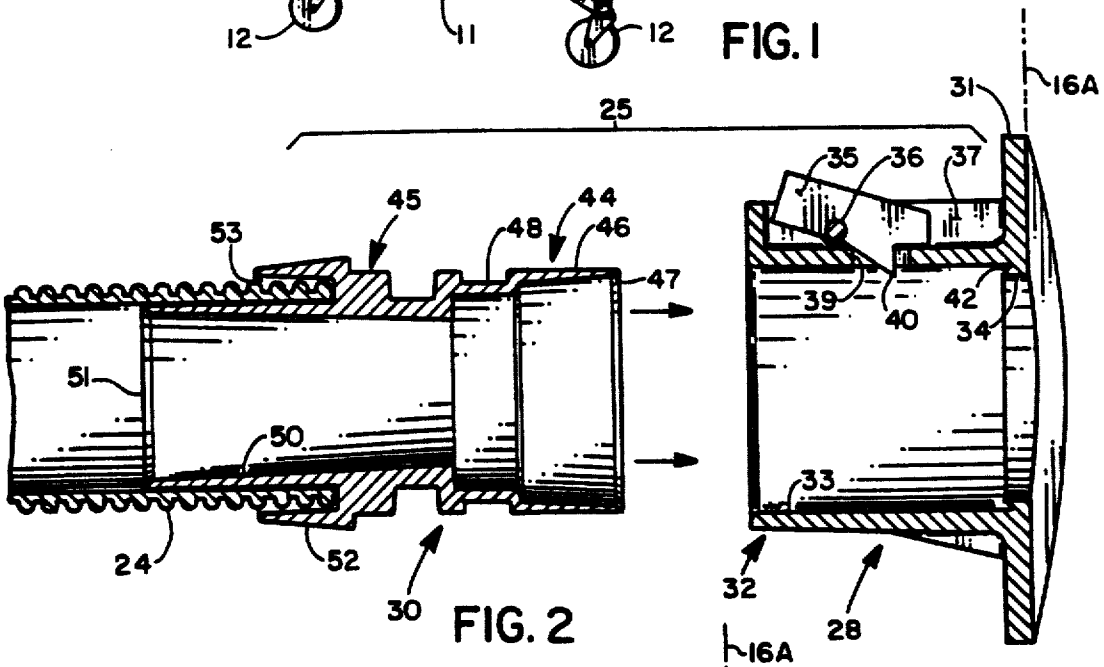


FIG. 2

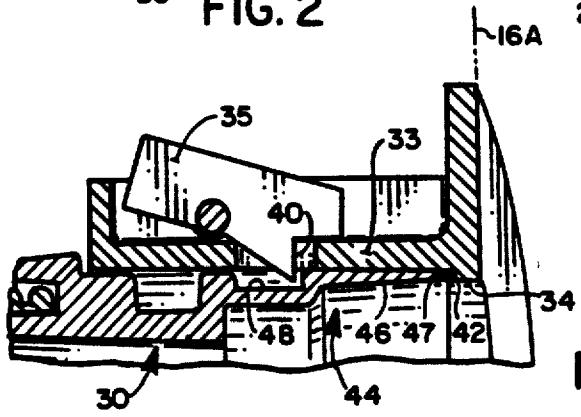


FIG. 3

INTAKE SEAL FOR TANK VACUUM CLEANER

Matter enclosed in heavy brackets [ ] appears in the original patent but forms no part of this reissue specification; matter printed in italics indicates the additions made by reissue.

FIELD OF THE INVENTION

The present invention relates to vacuum cleaners. More particularly, it relates to a seal in the intake assembly of a vacuum cleaner more widely used in industrial and commercial applications or for shop clean-up, as distinguished from domestic use. In such vacuum cleaners, there is a desire to a accumulate a larger amount of debris before the vacuum cleaner has to be emptied, and such vacuum cleaners therefore have a fairly large reservoir for storing debris. Typically, such reservoirs are in the form of a cylindrical drum or tank and have the vacuum motor mounted to a lid which is sealed to the top of the tank. The proximate end of the hose is connected to the drum by means of the intake assembly.

BACKGROUND OF THE INVENTION

Tank vacuum cleaners for commercial or industrial use normally have a fairly large electric motor drawing air to generate the vacuum. The motor may be 1.5 to 2.0 HP, and capable of generating a substantial vacuum. Any leak in the intake assembly between the hose and the tank creates inefficiency and reduces the vacuum at the floor tool, thereby reducing the collection efficiency of the vacuum cleaner. Even where a seal is effected in the intake assembly, the seal has not always been properly located. For example, a seal which is formed upstream of the location of the trigger latch which releases the hose connector will permit leakage through the latch. Any such leakage not only reduces the efficiency of the vacuum cleaner, but it also creates a perception in the mind of the user of an inefficient, leaky and ineffective machine. Therefore, the prevention of leaks at the intake assembly is considered both a functional or use advantage and a sales feature.

SUMMARY OF THE INVENTION

The present invention creates a continuous, effective, peripheral seal between the intake adapter mounted to the vacuum tank and the hose connector. The adapter forms a receptacle in the form of a collar which telescopically receives the hose connector, and the leading edge of the connector is formed into a beveled surface having a frustoconical shape which is inclined radially inwardly of the intake and away from the direction of insertion. In other words, the apex of the cone would be on the axis of the connector and inwardly of its leading edge.

A corresponding beveled surface is formed on the adapter immediately adjacent the exterior surface of the cylindrical vertical wall of the tank. Thus, when a vacuum is generated within the tank by turning the motor on, that vacuum is communicated to the interior of the connector and to the hose itself. Atmospheric pressure thus forces the hose and the connector inwardly of the adapter and provides a positive force ensuring complete, sealing engagement of the mating, beveled surfaces respectively on the connector and the adapter.

Thus, the present invention forms a complete seal inwardly of the trigger latch or any other breach in the adapter without mechanical camming or screw forces

to effect the seal, and does so under circumstances which increase the sealing force during use (that is, when the vacuum motor is turned on). Moreover, the inventive seal is formed in a manner which does not employ additional components such as O-rings which would increase the cost of materials, the cost of assembly and thus the cost to the end user.

Other features and advantages of the present invention will be apparent to persons skilled in the art from the following description of a preferred embodiment of the invention accompanied by the attached drawing wherein identical reference numerals will identify similar elements in the various views.

BRIEF DESCRIPTION OF THE DRAWING

FIG. **1** is an upper perspective view of a tank vacuum cleaner incorporating the present invention;

FIG. **2** is a vertical cross-sectional view of the intake assembly of the vacuum cleaner of FIG. **1**, taken parallel to the axis of the adapter and showing the connector and adapter in exploded relation a they would be just prior to assembly; and

FIG. **3** is a vertical cross-sectional close-up fragmentary view, taken parallel to the axis of the adapter and intake assembly and showing the improved seal and its location.

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

Referring first to FIG. **1**, reference numeral **10** generally designates a tank vacuum cleaner of a type widely used in industrial and commercial applications. The vacuum cleaner **10** includes a chassis **11** having a pair of caster wheels **12** and a pair of larger rear wheels **13** for facility in moving it about. It also includes a tank **15** having a bottom, a generally cylindrical upright side wall **16**, and a lid **17**. An electric motor **18** is mounted to the lid **17** and draws air from the interior of the tank **15** and exhausts clean, filtered air into the atmosphere. Thus, the refuse is collected within the tank **15**.

A handle **20** is connected to the chassis **11** so that the vacuum cleaner may be moved more readily like a wheeled dolly.

The vacuum cleaner **10** is provided with a hose **24**, the proximal end of the hose **24** being connected to the tank **15** by means of an adapter and intake assembly generally designated **25**. The distal end of the hose may be provided with a conventional pick-up or ground cleaning tool, not shown. As is well-known, the electric motor **18** generates a vacuum within the tank **15**, and that vacuum is communicated through the hose **24** which acts as a flexible conduit, to the pick-up or cleaning tool for suctioning air and debris through the hose and into the reservoir provided by the tank **15** where the refuse, particles and dust are filtered out and collected.

Turning now to the adapter and intake assembly **25**, as seen in vertical, axial cross-section and in exploded relation in FIG. **2**, the intake assembly **25** includes an adapter generally designated **28** and a connector generally designated **30**.

Turning first to the adapter, it includes a radially outwardly extending flange **31** which conforms to the shape of the outer surface of the cylindrical side wall **16** of the tank **15**. That is, in vertical section the flange **31** appears straight, but in horizontal cross-section, it conforms to the curvature of the tank wall **16**. The flange **31**

is mounted to the wall of the tank by any suitable means, and the flange is sealed against the wall to prevent leakage. Immediately outboard (i.e. away from the tank) of the flange **31** is a receptacle generally designated **32** and taking the form of a collar or sleeve. The receptacle **32** includes a generally cylindrical side wall **33** having a slight taper—is, the cross-sectional area of the center of the wall **33** increases slightly when proceeding away from the flange **31** (i.e., upstream relative to the movement of air from the hose). A central aperture **34** in the flange **33** is aligned with a corresponding aperture in the wall **16** of the tank to permit the passage of air and refuse picked up in the resulting airstream.

At the top of the receptacle **32** there is a finger-actuated toggle member **35** rotatably mounted on a pin **36** which may be staked between a pair of adjacent walls extending axially of the receptacle **32** and above the cylindrical side wall **33**, one of which axial walls is seen in FIG. **2** and designated **37**.

An aperture **39** is formed in an upper intermediate location of the generally cylindrical wall **33** through which a latch **40** of the toggle member **35** extends. It is the aperture **39** or its equivalent which had created leaks in prior art intake assemblies.

A sealing surface **42** is located near the inner reach of the cylindrical wall **33** of the receptacle **32**, adjacent the flange **31** and preferably as near to the wall of the tank **16** (schematically illustrated by chain line **16A** in FIG. **2**) as reasonably practicable. The sealing surface **42** is integrally formed in the adapter **32** and extends from the inner surface of wall **33** inwardly and preferably away from the container to which the adapter is mounted. Thus, the sealing surface **42** is beveled in a manner to receive the connector **30** in a continuous, peripheral sealing engagement as will be made clear presently.

Turning now to the connector **30**, it includes an insert generally designated **44** and a seat for the hose **24**, the seat being generally designated by reference numeral **45**. The insert **44** defines at the innermost portion of the connector **30**, a cylindrical wall **46** which is dimensioned to be telescopically received in the receptacle **32**. The proximal edge of the insert wall **46** is formed into a beveled surface **47** which is constructed and arranged to engage and form a seal with the correspondingly beveled sealing surface **42** of the adapter **28**. The insert **44** also includes a peripheral recess or groove **48** into which the latch **40** of the toggle member **35** is received when the insert is assembled to the adapter **28**, as best seen in FIG. **3**. This prevents accidental withdrawal of the connector from the adapter.

The hose seat **45** of connector **30** includes a cylindrical wall **50**, the outer surface of which is slightly tapered to a progressively reduced diameter to the distal end **51** for receiving the proximal end of the hose **24**. The hose seat **45** also includes an circumferential wall or skirt **52** which is conventionally spaced outwardly of the wall **50** to provide an annular space **53** for receiving the proximal end of the hose **24** and for protecting it against accidental dislodgment.

When the hose **24** is to be assembled to the connector **30**, the connector and adapter are axially aligned as seen in FIG. **2**, and the connector **30** is assembled to the adapter **28** by placing the insert **44** of the connector **30** telescopically into the receptacle **32** of the adapter **28** until the sealing surface **47** of the connector **30** engages the correspondingly beveled sealing surface **42** of the adapter. The two sealing surfaces thus form a continuous peripheral seal at a location on the adapter which is immediately adjacent the wall of the tank and downstream (in the direction of air flow into the tank **15**) of the aperture **39** for the toggle member **35**. The beveled surfaces are frusto-conical in shape with the apex of the cone located on the axis of the cylindrical walls **33**, **46** outside the tank. Although this is preferred, the bevel could be facing the other way (i.e., with the apex inside the tank), but the illustrated embodiment insures proper location of the hose connector and applies an outward tension to the leading edge of the insert **44** during use.

It will be observed that the latch **40** need not cam the connector **30** into sealing engagement, nor is there any need for a mechanical sealing force (such as a screw force) on the connector other than that which is created by atmospheric pressure on the hose **24** and connector **30** which normally exists when the motor **18** is turned on to create a partial vacuum in the tank **15**. In other words, the force on the connector **30** resulting from the pressure differential between atmospheric pressure and the partial vacuum created within the hose **24** and connector **30** provides a positive sealing force causing the correspondingly shaped sealing surfaces **42**, **47** to form an even tighter seal, the greater the vacuum.

A wide range of materials may be used for the adapter **28** and connectors **30**, but preferably they are formed of a molded plastic which is rigid after molding, such as polyethylene or ABS plastic.

Having thus disclosed in detail a preferred embodiment of the invention, persons skilled in the art will be able to modify certain of the structure which has been illustrated and to substitute equivalent elements for those disclosed while continuing to practice the principle of the invention; and it is, therefore, intended that all such modifications and substitutions be covered as they are embraced within the spirit and scope of the appended claims.

We claim:

1. In a vacuum cleaner having a tank providing a reservoir for collecting refuse, a motor coupled to said tank for generating a vacuum therein and a hose having a proximal end coupled to said tank and communicating the vacuum in said tank to a distal end for picking up debris and refuse and for routing said debris and refuse to said tank, an improved intake assembly comprising: an adapter mounted on a wall of said tank and including a generally cylindrical wall defining a receptacle having an inlet end and an outlet end, a beveled sealing surface on the interior of said receptacle immediately adjacent the outlet end thereof and extending continuously about said inner wall of said receptacle and spaced inwardly thereof said adapter further including an opening in said wall intermediate said inlet end and said outlet end for receiving a [toggle] latch mounted to said adapter and received in said opening; and a hose connector having a first end providing a cylindrical seat portion received in said proximal end of said hose for sealing therewith and a second end providing a cylindrical insert adapted for telescopic insertion into said inlet end of said receptacle and defining a leading beveled surface corresponding to and continuously sealingly engaging said sealing surface of said receptacle when said hose connector is assembled to said adapter, whereby a continuous circumferential seal is formed downstream of said opening in said adapter and adjacent the wall of said tank.

2. The apparatus of claim **1** wherein each of said beveled seating surfaces comprises a portion of a frusto-conical surface.

3. The apparatus of claim 2 wherein the apex of said seating surfaces lies on the axis of said receptacle outboard of said tank.

4. The apparatus of claim 1 further characterized in that said beveled seating surface of said adapter faces outwardly of said tank and that a force is generated on said hose and said hose connector when said vacuum motor is turned on to generate a vacuum within said tank and said hose, said force applying a positive seating force for sealing said beveled surfaces.

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