

June 12, 1945.

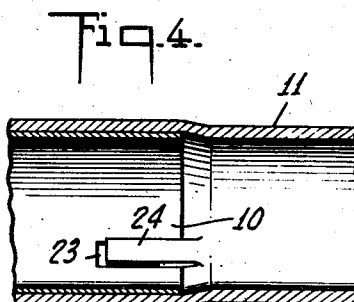
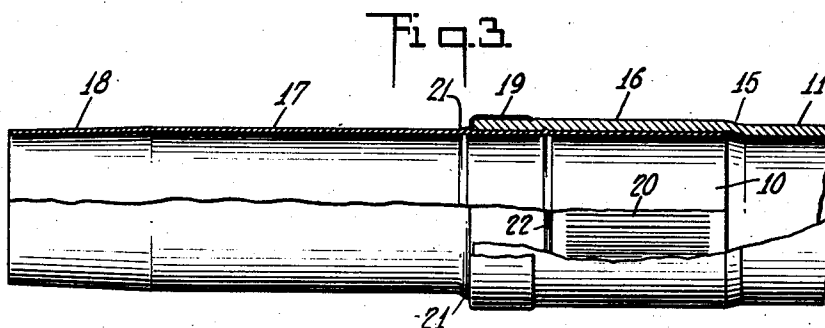
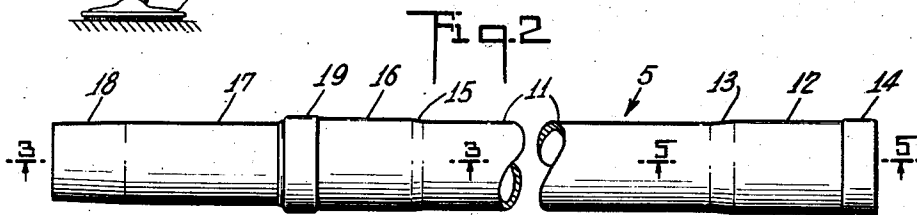
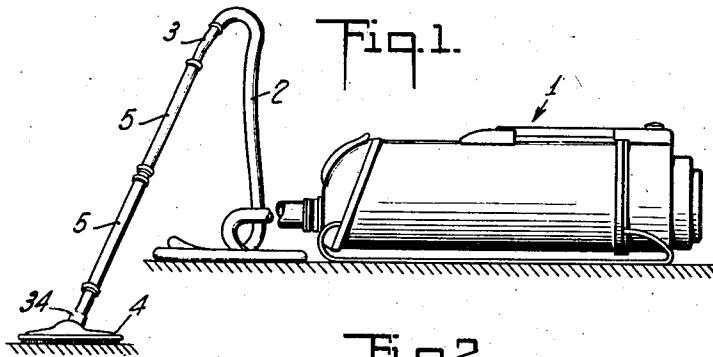
A. H. BEEDE

2,378,174

VACUUM CLEANER

Filed May 12, 1942

2 Sheets-Sheet 1



INVENTOR.
Arnold Henry Beede
BY *Murray Robinson*
ATTORNEY

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2 Sheets-Sheet 2

Fig. 5.

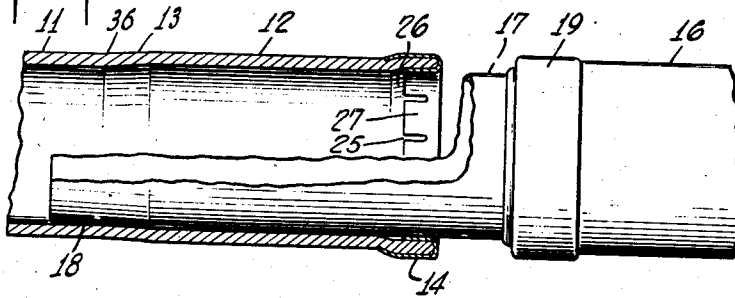


Fig. 6.

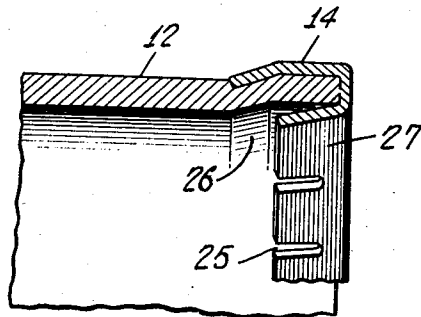
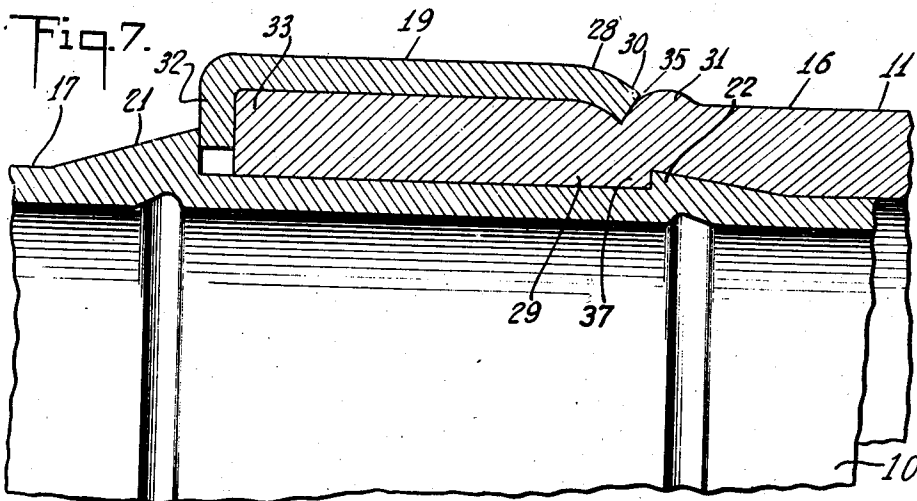


Fig. 7.



INVENTOR
Arnold Henry Beede
BY *Murray Robinson*
ATTORNEY

UNITED STATES PATENT OFFICE

2,378,174

VACUUM CLEANER

Arnold Henry Beede, Fairfield, Conn., assignor to
Electrolux Corporation, New York, N. Y., a cor-
poration of Delaware

Application May 12, 1942, Serial No. 442,579

2 Claims. (Cl. 285—84)

This invention relates to a wand or extension tube for a vacuum cleaner, especially those of the pull-tank type in which an enclosed dust bag and suction unit is connected to a cleaning tool by means of a tube or hose and is pulled around from place to place when it is desired to clean in different areas. The principal object of the invention is to provide a wand that will be durable and at the same time very light in weight, thereby reducing the effort expended in moving the cleaning tool over a floor or rug that is being cleaned. A light weight wand, though desirable in all cases, is particularly advantageous when the vacuum cleaner is used for cleaning walls, curtains, and other objects at a relatively high level compared to the operator.

More specifically, it is an object of this invention to provide a tube composed in large part of fibre, paper, plastic, or other light weight material.

It is a further object of the invention to provide such a tube which may be used to connect the air conduit of a vacuum cleaner to the air-flow connection of a pneumatic cleaning tool.

It is another object of the invention to provide such a tube which may be connected between the air conduit of a vacuum cleaner and a similar tube already connected to a pneumatic cleaning tool.

It is a further object of the invention to provide such a tube which will wear well so that it will make a tight, rigid joint with the apparatus to which it is connected, even after it has been in use for a long time.

A further object of the invention is to provide a composite wand formed in part of a material that will wear well such as metal, and in large part of a less durable but light material.

One specific object of the invention is to provide a joint between the two parts of such a composite tube that will not pull apart nor work loose when in use.

A further object of the invention is to provide an extension tube which, when used either alone or as one of a set of extension tubes, may be telescoped into engagement with the other parts of the apparatus or other extension tubes, and which shall have accurate dimensions at its ends where it telescopes into engagement.

A further object of the invention is to provide a composite extension tube for a vacuum cleaner that has a substantially uniform cross-section throughout its length so that there will be a minimum disturbance of and resistance to air flow therethrough, and that will have a minimum of

recesses and pockets on the interior thereof, so that little opportunity will be afforded for the collecting of dust and dirt on the interior surface of the tube.

5 A still further object of the invention is to provide a wand that is made of a light weight material which shall not be subject to deterioration through the absorption of water from air flowing therethrough.

10 Another object of the invention is to provide a wand having a large end and a small end adapted to telescopically engage with the correlative ends of a like wand or with the air conduit and cleaning tool of a pneumatic cleaning device in which the large end is so shaped as to make line contact with a tube inserted therein.

15 Another object of the invention is to provide an extension tube or wand that presents a pleasing appearance and is economical to manufacture.

20 Other objects and advantages of the invention will appear as the description thereof proceeds.

Referring to the drawings forming a part of this specification, Fig. 1 is a view showing the wand forming the subject of this invention assembled with other parts of a vacuum cleaner in the manner in which it is customarily used. Fig. 2 is a view of the wand when disassembled from the remaining apparatus. Fig. 3 is a view of the small end of the wand and has been partly broken away so as to show the interior of the tube and a section through the joint between the metal insert and fibre body of the tube. Fig. 4 is a view similar to Fig. 3, showing a modification of the means for keeping the metal insert from rotating with respect to the body of the tube. Fig. 5 is a sectional view of the large end of the tube and of the small end of a similar tube inserted therein. Fig. 6 is an enlarged view of a detail of the large end of the tube showing the manner in which a ferrule is locked thereon. Fig. 7 is a view to a greatly enlarged scale, showing the structure of the joint between the metal insert and body of the tube.

Referring to Fig. 1 of the drawings, there is shown a vacuum cleaner 1 to which is connected a flexible hose 2 on the end of which is a metal terminal 3. A cleaning tool 4 is connected to the terminal 3 by means of one or more wands or extension tubes 5.

Referring to Fig. 2, there is shown a wand generally indicated at 5 which comprises a body member 11 made of some light material which is expanded at one end 12. There is a tapered

portion 13 extending between the body 11 of the tube and the enlarged end 12. A ferrule 14 made of some durable material such as metal, covers the end of the enlarged portion 12. The body of the tube 11 also has an enlarged portion 16 at its other end where it is connected to a metal insert 17. A tapered section 15 of the tube 11 provides for the expansion between the enlarged section 16 and the body 11. The end of the metal insert 17 is tapered as shown at 18. The taper 18 is of a more gradual slope than the taper 13 so that when one tube is inserted into the end of another, the joint between the corresponding parts 13 and 18 will approximate a line contact. At 19 is indicated a ferrule or band for strengthening the joint between the members 11 and 17 and also for improving the appearance thereof. The member 19 also serves to protect the end of the member 11 against abrasion.

Referring to Fig. 3, there is shown the manner of joining the member 11 to the insert 17. It is essential that this joint be capable of resisting the pushing, pulling and twisting strains imposed upon a wand when it is being connected and disconnected with the associated cleaner parts. The portion 10 of the tube 17 extends within the enlarged section 16 of the tube 11. The internal diameter of the tube 17 is substantially the same as that of the tube 11 so that the portion 10 thereof when seated against the tapered portion 15 makes a fairly smooth joint at the interior surface of the wand. When end 16 of tube 11 is assembled to tube 17, beads 21 and 22, which may be rolled onto the surface of the tube 17, engage the enlarged end 16 of tube 11 to prevent it from sliding with respect to tube 17. A knurled portion 20 on the outer surface of the portion 10 of tube 17 prevents the tube 17 from rotating with respect to tube 11. An alternative scheme for preventing relative rotation of the tubes is shown in Fig. 4, in which a slot 23 cut into the end 10 of the tube 17 engages a boss 24 formed on the interior surface of tube 11. The boss 24 may be formed merely by not expanding that portion of tube 11 when the rest of the end of the tube is expanded to form enlarged end 16.

Figures 5 and 6 show the construction of the large end of the wand and the manner in which it receives the small end of a similar tube or wand. In particular, there is shown the construction of the ferrule 14 fitted over the end 12 of the tube 11. The enlarged end 12 of tube 11 is further expanded at 25 so that when the ferrule 14 is placed over the end thereof, the internal diameter of the ferrule will be approximately the same as the internal diameter of the portion 12 of the tube 11. The taper 26 also serves to lock the ferrule in place when the ferrule is crimped to the tube. Slots 25 are cut through the inner portion of the ferrule and the remaining tongue portions 27 between the slots are normally slightly out of contact with the inner surface of the tube. With this construction, when the end 17 of a like tube or the terminal 3 of the air conduit is inserted, it will have to force outwardly the spring-like tongues 27, thereby forming a firm support at this point. Since the tapered portion 18 of the tube 17 will engage the junction 36 of tube 11 and the taper 13, forming a second point of support, the two tubes thus joined will be so supported that one cannot readily be moved with respect to the other, in other words, there will be no wobbling or looseness at the joint.

Since there is substantially but a line contact between portion 18 and juncture 36, any dirt collected on either part will in large part be forced away from the contact and thus will not prevent a tight seal. In the illustrated embodiment, one or both of the members is made of a soft material and any dirt not forced away from the contact will be forced into the material without the application of great force thereby assuring a tight seal.

If the tapered portions 13 and 18 were of equal slope so as to engage one another over an area, any dirt between them would not be forced aside as the parts are pushed together and hence a tight seal would be prevented. Even if soft materials were used, the dirt over the entire area of contact could not be forced all the way into the material without the use of excessive force and such dirt would merely become partially embedded in the surface and continue to prevent a tight seal.

The tube 11 may be formed in any suitable way. However, as illustrative of one method of forming the tube 11, it may be made up of a sheet of paper rolled into the form of a tube of uniform circular cross-section. A glue of suitable characteristics is spread on one surface of the paper before the tube is rolled so that the final result, when the glue hardens, is a single solid tube. The glue and paper are chosen so that the resulting tube will have desirable characteristics such as ability to be worked, strength, and resistance to moisture and wear. The tube thus formed is cut to size and is then humidified and heated to a suitable extent preliminary to expanding its ends. The ends of the tubes may be expanded by forcing them upon a mandrel having a proper shape.

Fig. 7 is a detailed view on a large scale of the joint between the tube 17 and the tube 11 and illustrates the manner of juncture. One method of assembling the parts comprises first slipping ferrule 19 over the end of the portion 16 of tube 11. Thereafter, the metal tube 17 is driven into engagement with the end portion 16 of tube 11. The barb-like bead 22 passes through the ferrule 19. With this method of assembly, bead 22 must be of less height than bead 21. However, with other methods of assembly the beads may be of the same height, or bead 22 may even be higher than bead 21. In such case one of the beads is formed after the ferrule is slipped onto tube 17. Just as the portion 10 of tube 17 engages the bottom of the enlarged portion 16 of tube 11, the bead 21 comes into engagement with the in-turned portion 32 of ferrule 19, thereby preventing further inward motion of tube 17. Since bead 22 has a tapered sidewall on the side which is driven into engagement with portion 16 of tube 11 and an abrupt sidewall on the other side thereof, it can be readily inserted within but cannot readily be withdrawn from the tube portion 16.

In order to increase the resistance to outward motion of tube 17 relative to tube portion 16, the rim 28 of ferrule 19 may be crimped inwardly so as to insure that the portion 29 of tube portion 16 seats tightly against the vertical side of bead 22. In the usual manner of crimping, the corner 30 of the ferrule rim 28 will be closely adjacent the surface of the portion 16 of tube 11. Due to the resilience of tube 11, the corner 30 may not be exactly flush with the surface of the tube 11. However, in the usual case, the bead 22 of tube 17 will cause a slight annular protu-

berance 31 on the surface of the tube 11 which will still further reduce the angle 35 between rim 28 and tube portion 16. Thus, the crimped rim 28 of ferrule 19 and the enlarged portion 16 of tube 11 will form a nearly smooth surface and thereby give a neat appearance.

The turned-in portion 32 of ferrule 19 together with bead 21, covers the end 33 of tube 16 and protects it against abrasion. If the tube 11 is made of rolled paper as outlined above, it will have a laminated structure, and the end 33 thereof will be the point of least resistance to the penetration of moisture; in such case it is particularly desirable that the portion 33 be covered. In addition to the functions of the ferrule 19 mentioned before, it also serves to prevent bead 21 from cutting into the end 33 of tube 11 as it would do, were not the ferrule used. Although it is possible to eliminate the ferrule 19 and permit the end 33 of tube 11 to abut directly against bead 21, such an arrangement would not be as desirable as that described.

The characteristics of the materials from which the tubes 11 and 17 are composed are preferably such that the bead 22 will not be appreciably worn down or dulled when it is driven into the tube 11 and also that the tube 11 will have a less resistance to deformation than tube 17 so that the bead 22 will be forced into the surface of tube 11. Tube 11 should be sufficiently resilient so that it will fall in behind the steep side of bead 22 as at 29, thereby locking the tubes in engagement with one another. Tube 17 should be made of a durable wear resistant material so that its outside dimensions will not change appreciably when the tube is used.

The air connection pipe of a cleaning tool is usually of a rather short length such as the portion 34 of tool 4 shown in Fig. 1. If such a tool were connected to a wand which was not formed of wear resisting material, the end of the wand would soon wear down to such a point that it would seat against the bottom of the air connection of the cleaning tool. Such bottoming of the wand would prevent it from being forced into tight engagement with the tool, with the result that either a loose joint would be formed or the tool would fall off the wand when it was lifted away from the tool. This is one of the reasons that the wand is not made wholly of a light material such as paper, fibre, or a plastic but must instead be formed as a composite part having a metal end for engagement with the cleaning tool.

Another factor requiring the use of a metal end for the wand is that the size thereof must be accurate within close tolerances, otherwise, the wand might bottom within the cleaning tool, even when it was first connected, or perhaps might be too large to be inserted into the cleaning tool at all.

A third factor requiring a metal end for the wand is that most surfaces, other than one having a metal finish, will become worn and scratched and of poor appearance after they have been in use for any length of time.

The large end of the wand need not be made of metal because it is not subject to all of the requirements outlined above for the small end. There is plenty of room for another tube to be inserted as far as possible into the large end of the tube and hence there is no danger that it will bottom. The size of the large end of the tube may be accurately controlled by means of a

metal ferrule placed over the end thereof. Such a ferrule is sufficient to prevent the diameter of the tube from changing appreciably with changes in ambient temperature and humidity. Since it is only the inner surface of the large end of the tube which is subject to wear, a scratch-proof finish is unnecessary for the interior appearance of the tube is relatively unimportant.

While only one embodiment of the invention has been described, it is obvious that many modifications therein may be made without departing from the spirit of the invention.

For example, instead of knurling the surface of portion 10 of metal tube 17, slots may be cut therein and tongues forced outwardly therefrom, forming projections to engage the inner surface of tube 11. Any other means may be used to increase the frictional resistance to rotation of tube 11 with respect to tube 17 or to positively lock them against relative rotation. The ferrule 14 at the large end of the wand has been shown as having spring tongues formed on the inside thereof but it is obvious that other resilient engaging means such as a spring clip or spring pressed buttons could be used satisfactorily at this point. It is merely desirable to form a second point of support so that when two tubes are connected together they will not wobble. While certain materials have been suggested for the tubes 11 and 17, any other materials having the desirable characteristics of lightness, strength, resistance to wear, etc. may be used. It is intended to secure by Letters Patent all features of the invention falling within the scope of the appended claims.

I claim:

1. An extension tube comprising a rigid tubular member of a light non-metallic resilient material, a metallic tube section of a material less readily deformed fitted into one end of said member, said tube section having a raised annulus adapted to prevent the tube section from being forced further into said member and another annulus of barb-like cross section on the part of the tube section within said member and in locking engagement with said member adapted to prevent the tube section from being withdrawn from said member while presenting a minimum of resistance to insertion therein and longitudinal means on the part of the tube section within said member and in locking engagement with said member adapted to prevent the tube section from being rotated in either direction with respect to said member while presenting but little resistance to relative axial movement of said section and said member, and a collar around said end of said member, the inside diameter of one end of the collar being of less diameter than the diameter prior to assembly of the outside of said member so as to force said member into tighter locking engagement with the barb-like annulus, the other end of said collar having a flange extending between said raised annulus and the extreme terminus of said end of said member, said collar, flange, raised annulus, and tube section cooperating to cover completely and seal the end of said tubular member.

2. An extension tube comprising a rigid tubular member having a bore the intermediate portion of which is of uniform cross-section and one end portion is of larger cross-section with a tapered portion connecting the two portions, said end portion having a uniform inside diameter except at its terminus which has a zone of substantially larger uniform diameter, a tube section adapted

to fit into said tubular member and having a constant outside diameter except at its terminus which is tapered to be received and engaged by the tapered portion of the tubular member thereby preventing further entrance of the tube section into the tubular member, the taper of the terminus of the tube section being less than that

of the tapered portion of the tubular member, and spring means attached to the terminus of the tubular member and extending longitudinally inwardly thereof and adapted to clampingly engage the outer surface of the inserted tube section.

ARNOLD HENRY BEEDE.