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NOZZLE CONSTRUCTION FOR A VACUUM CLEANER OR THE LIKE

Filed Jan. 31, 1969

2 Sheets-Sheet 1

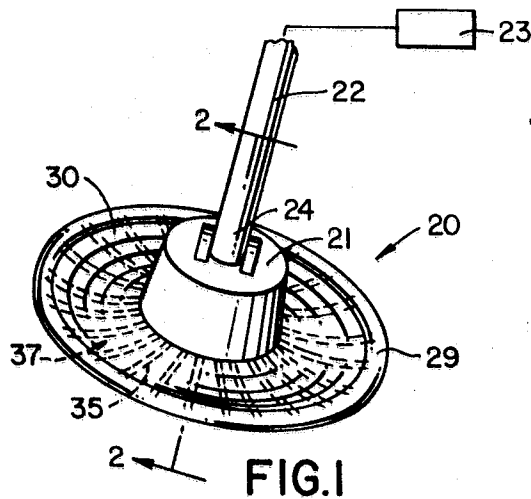


FIG. 1

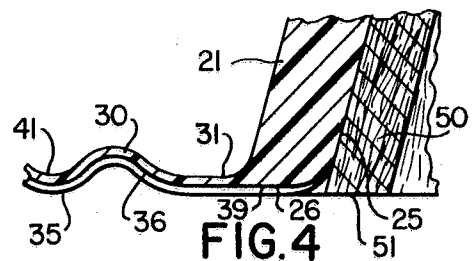


FIG. 4

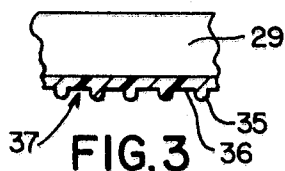


FIG. 3

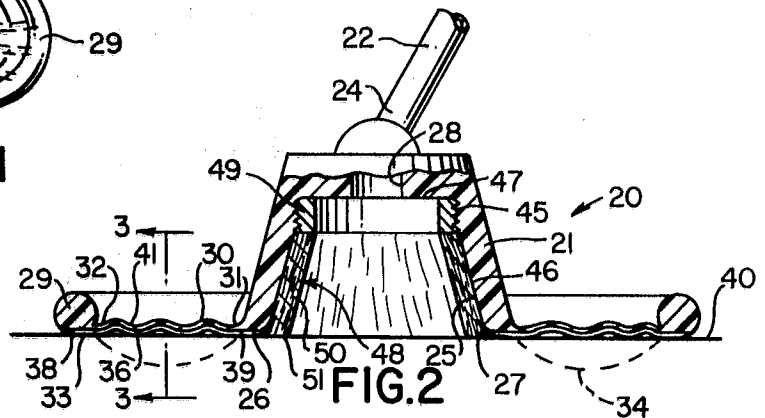


FIG. 2

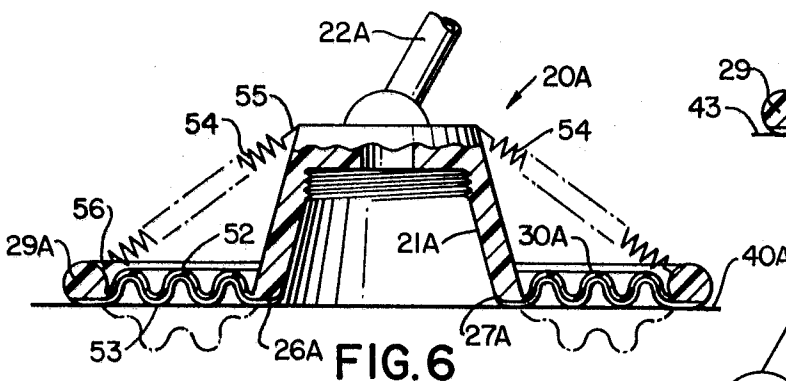


FIG. 6

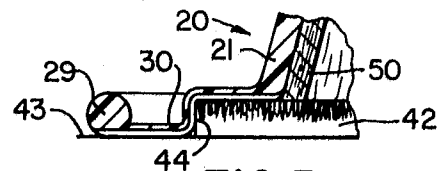


FIG. 5

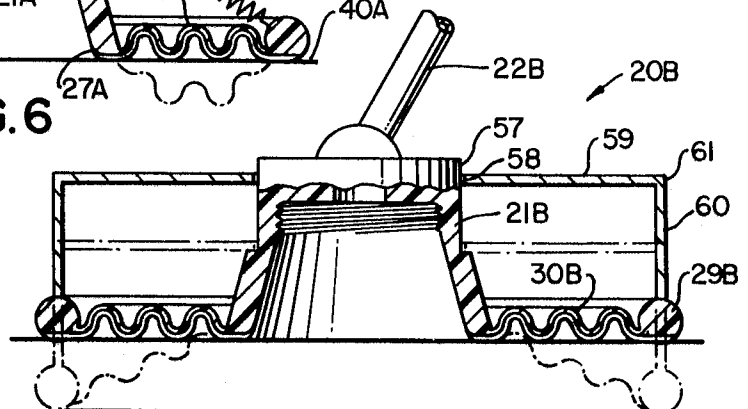


FIG. 7

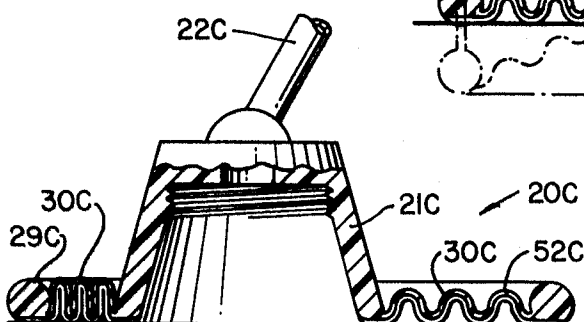


FIG. 8

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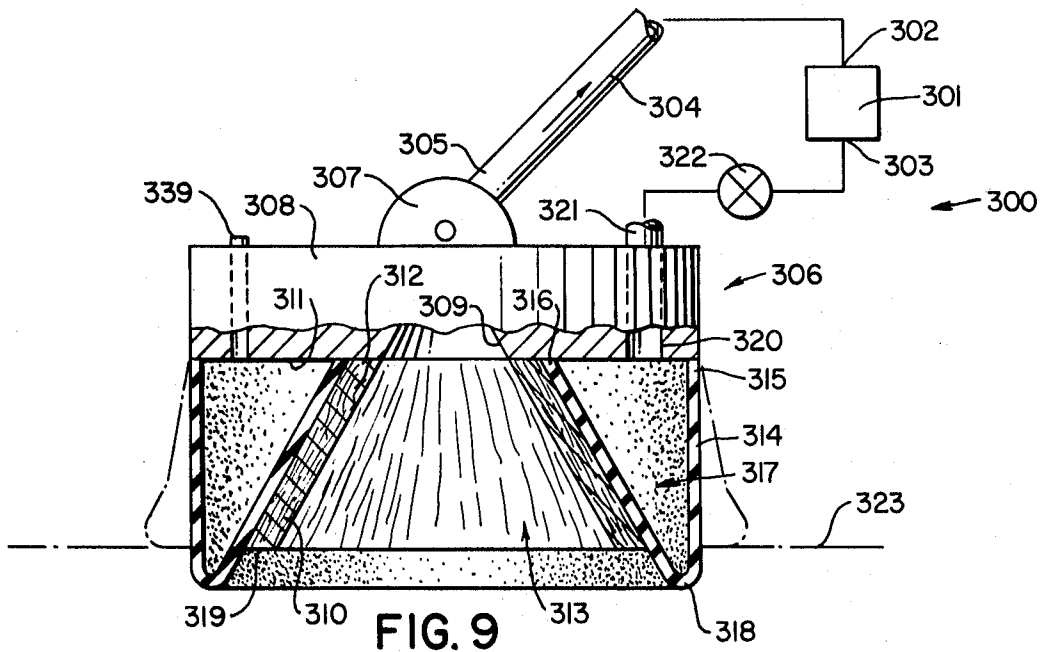


FIG. 9

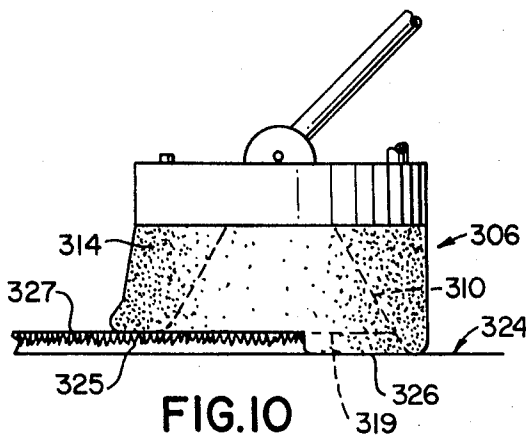


FIG. 10

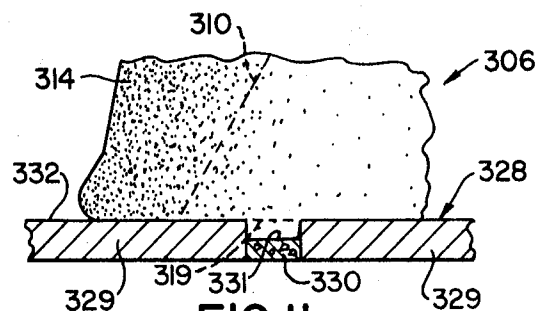


FIG. 11

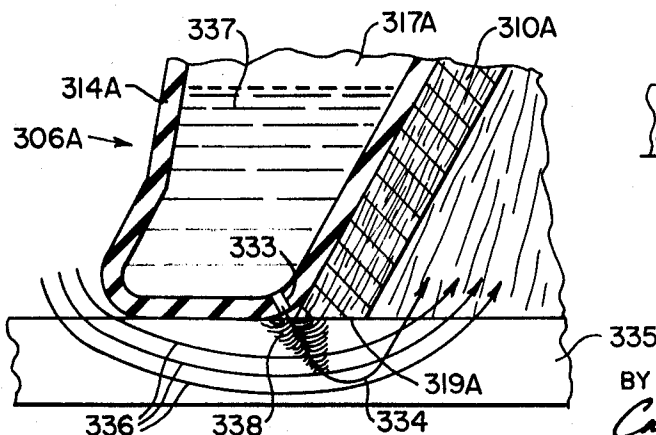


FIG. 12

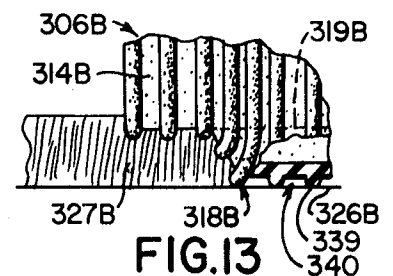


FIG. 13

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Continuation-in-part of application Ser. No. 788,278, Dec. 31, 1968. This application Jan. 31, 1969, Ser. No. 795,453

Int. Cl. A47I 9/06

U.S. Cl. 15—399

7 Claims

ABSTRACT OF THE DISCLOSURE

This disclosure relates to a nozzle construction for a vacuum cleaning apparatus or the like for applying a suction to a surface to be cleaned thereby, the nozzle construction comprising a support means having opening means therein provided with an outlet to be interconnected to a vacuum pump means and an inlet to be disposed adjacent to a surface means to be cleaned. A flexible wall surrounds the inlet so as to have one side thereof engaged against the surface means around said inlet to substantially seal the inlet of the support means to the surface means. The flexible wall is so constructed and arranged that a pressure differential acting across the same resulting from the vacuum pump means drawing fluid from the surface means into the inlet and out through the outlet of the opening means causes the flexible wall to be urged toward the surface means to substantially seal against the surface means around the inlet and substantially conform to the contour of the surface means outboard of the inlet.

This application is a continuation-in-part patent application of its copending patent application, Ser. No. 788,278, filed Dec. 31, 1968, and entitled, Laundry Apparatus or the Like.

This application relates to various nozzle constructions for use with a conventional vacuum cleaning apparatus or the like.

The aforementioned copending patent application discloses nozzle means for use within a laundry apparatus or the like for removing moisture from laundry or the like contained therein, such application also claiming and disclosing how such nozzle means can be utilized with a vacuum cleaning apparatus for improving the cleaning action thereof because the nozzle means will substantially conform to the contour of the surface means being cleaned thereby.

It is a feature of this invention to provide other nozzle constructions utilizing the improved features of the aforementioned copending patent application.

In particular, one embodiment of this invention provides a nozzle construction for attachment to the conventional conduit or wand means of a conventional vacuum cleaner or the like, the nozzle construction comprising a support means having an opening means therein provided with an outlet to be interconnected to the vacuum cleaner conduit means and an inlet to be disposed adjacent a surface means to be cleaned. A flexible wall surrounds the inlet so as to have one side thereof engaged against the surface means around the inlet to substantially seal the inlet of the support means to the surface means, the flexible wall being so constructed and arranged that a pressure differential acting across the same resulting from the vacuum pump means of the cleaner drawing fluid from the surface means into the inlet and out through the outlet of the opening means causes the flexible wall to be urged toward the surface means to substantially seal

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against the surface means around the inlet and substantially conform to the contour of the surface means outboard of the inlet.

Accordingly, it is an object of this invention to provide an improved nozzle construction for a cleaning apparatus or the like and having one or more of the novel features set forth above or hereinafter shown or described.

Other objects, uses and advantages of this invention are apparent from a reading of this description which proceeds with reference to the accompanying drawings forming a part thereof and wherein:

FIG. 1 is a top perspective view of one embodiment of the nozzle construction of this invention.

FIG. 2 is an enlarged, cross sectional view taken on line 2—2 of FIG. 1.

FIG. 3 is a fragmentary, cross sectional view taken on line 3—3 of FIG. 2 to illustrate the radial ribbing on the under side of the flexible wall of the nozzle construction of FIG. 2.

FIG. 4 is an enlarged, fragmentary view of the nozzle construction of FIG. 2 illustrating the juncture of the support of the nozzle construction and the flexible wall thereof.

FIG. 5 is a view similar to FIG. 2 and illustrates the flexible wall of the nozzle construction conforming to an irregular contoured surface means being cleaned thereby.

FIG. 6 is a view similar to FIG. 2 and illustrates another embodiment of this invention.

FIG. 7 is a view similar to FIG. 6 and illustrates another embodiment of this invention.

FIG. 8 is a view similar to FIG. 6 and illustrates another nozzle construction of this invention.

FIG. 9 is a view similar to FIG. 2 and illustrates another nozzle construction of this invention schematically interconnected to a vacuum cleaning apparatus.

FIG. 10 is a side view of the nozzle structure illustrated in FIG. 9 and illustrates one use thereof.

FIG. 11 is an enlarged, fragmentary, cross sectional view similar to FIG. 10 and illustrates another use of the nozzle means of this invention.

FIG. 12 is an enlarged, fragmentary, cross sectional view of the end means of the nozzle means of FIG. 9 and illustrates another use thereof.

FIG. 13 is an enlarged, fragmentary view of the nozzle of FIG. 10 in the region of the juncture of the bare floor with the carpet thereon.

While the various features of this invention are herein-after described and illustrated as being particularly adapted to provide nozzle construction means for cleaning surface means or the like with conventional vacuum cleaner apparatus or the like, it is to be understood that the various features of this invention can be utilized singly or in any combination thereof to provide nozzle constructions for other apparatus as desired.

Therefore, this invention is not to be limited to only the embodiments illustrated in the drawings, because the drawings are merely utilized to illustrate some of the wide variety of uses of this invention.

Referring now to FIGS. 1 and 2, an improved nozzle construction of this invention is generally indicated by the reference numeral 20 and comprises a support means 21 adapted to be interconnected in any suitable manner to the conventional conduit means or wand 22 of a conventional vacuum cleaner 23 in any suitable manner, the support means 21 having means for permitting the nozzle means 20 to swivel on the attached end 24 of the conduit 22 or to be secured thereto in a fixed angular relation, as is conventional in the art, as desired.

The nozzle construction 20, in a preferred embodiment thereof, is formed from a one-piece molded plastic structure wherein the support means 20 is a substantially rigid frusto-conical part and has an opening 25 interrupting the

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bottom surface 26 thereof and providing an opening means through the support means 21 whereby the lower end 27 of the opening 25 forms an inlet for the nozzle construction 20 and the upper end 28 of the opening 25 forms an outlet that is disposed in fluid communication with the conduit 22.

An annular, substantially rigid, ring-like member 29 is concentrically disposed about the support 21 and is integrally interconnected thereto by a flexible wall 30 having its inner periphery 31 integrally interconnected to the substantially rigid support means 21 and its outer periphery 32 integrally interconnected to the substantially rigid annular member 29 as illustrated in FIGS. 2 and 4. However, the length of the flexible wall 30 between the rigid member 29 and support means 21 is so constructed and arranged that when the end surface 26 of the support means 21 is disposed coplanar with the bottom surface 33 of the annular part 29 and the annular part 29 is disposed concentric about the support member 21, the flexible wall 30 will drape downwardly and extend below the same in the manner provided by the dash lines 34 in FIG. 2 so that it can be seen that there is considerable slack in the flexible wall 30 between the support member 21 and the annular part 29.

A plurality of radially disposed or outwardly spreading ribs 35 extend integrally from the lower surface 36 of the flexible wall 30 to define air flow passages 37 therebetween as will be apparent hereinafter, the air flow passages 37 between adjacent ribs 35 each being aligned respectively with a groove 38 formed in the bottom surface 33 of the annular part 29 and a groove 39 formed in the bottom surface 26 of the support 21 so that when the nozzle construction 20 is disposed on a surface means 40 in the manner illustrated in FIG. 2, a controlled amount of air can flow from adjacent the outer edge of the annular part 29 through the grooves 38 thereof and interconnecting passages 37 between adjacent ribs 35 of the flexible wall 30 and through the aligned grooves 39 in the end surface 26 of the support 21 to enter the opening means 25 at the inlet 27 so that dust particles and the like can readily be drawn from the surface means 40 at the inlet 27 of the opening means 25 through the opening means 25 and out of the outlet 28 thereof into the conduit 22 when the vacuum cleaner 23 is turned on.

However, because the flexible wall 30 is relatively flexible and the drawing of fluid into the inlet 27 of the support means 21 by the vacuum pump means of the vacuum cleaner 23 creates a pressure differential across the flexible wall 30 in much the same manner as provided by a venturi wherein a low pressure is created between the surface means 40 and the under surface 36 of the flexible wall 30, the higher pressure (atmospheric pressure) acting against the top surface 41 of the flexible wall 30 urges the flexible wall 30 downwardly toward the surface 40 so that the same wall provide effective sealing completely about the inlet 27 of the nozzle means 20 to not only improve the cleaning effect thereof, but also to permit the flexible wall 30 to conform to the contour of the surface means 40 while still providing effective sealing completely about the inlet 27 of the support means 21.

For example, reference is now made to FIG. 5 wherein it can be seen that the nozzle means 20 is bridging the juncture of a carpet or rug 42 disposed on a floor means 43 at the end edge 44 of the rug or carpet 42 whereby the flexible wall 30, due to the previously described slack thereof, permits the support means 21 to be disposed on top of the rug 42 while the annular portion 29 thereof can have a part thereof bearing against the bare floor 43 with the flexible wall 30 conforming to the change in contour between the rug 42 and bare floor 43 so as to provide effective sealing completely about the opening means 27 of the support means 21 whereby a more effective cleaning action is provided by the nozzle means 21 of this invention than would be provided if the same were not provided with the flexible wall 30.

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Since the radially disposed ribs 35 on the under surface 36 of the flexible wall 30 are urged downwardly against the surface means 40 or 42, 43 in the manner previously described by the resulting pressure differential acting across the flexible wall 30 and the grooves 37, 38 and 39 around the end surface 26 of the support means 21 are radially disposed, such radially disposed ribs 35, and the grooves 37, 38 and 39 are believed sufficient to provide effective brushing up of the dirt and dust particles on any surface means so that a conventional brush need not be utilized with the nozzle construction 20 of this invention.

However, a brush structure can be provided for the nozzle construction 20 of this invention, if desired.

For example, when the nozzle construction 20 is being molded as a one-piece structure from plastic material or the like, such molding operation could provide internal threads 45 intermediate the frusto-conical portion 46 of the opening means 25 and a shoulder means 47 adjacent the outlet 28 of the opening means 25 so that a brush structure 48 can be provided with an externally threaded part or ring 49 attached to a frusto-conical brush means 50 at the top thereof and be threaded into the internal threaded portion 45 of the opening 25 so that the lower end 51 of the brush 50 will be coplanar with or extend slightly beyond the end surface 26 of the support means 21 as desired whereby the end 51 of the brush 50 will brush against the surface means 40 when the nozzle construction 20 is disposed thereon in the manner illustrated in FIG. 2.

In this manner, the brush structure 48 is readily removable from the nozzle construction 20 of this invention, if desired, so that another brush structure 48 can be inserted therein for replacement purposes or for the insertion of other types of brush structures as desired.

Therefore, it can be seen that the nozzle construction 20 of this invention can be made in a relatively simple and inexpensive manner by molding the same as a one-piece structure from plastic material wherein the thickness of the plastic material in forming the support means 21 is such that the support means 21 is relatively rigid while the thin wall 30 surrounding the support means 21 is relatively flexible so as to permit the resulting pressure differential acting across the flexible wall 30 to conform the flexible wall 30 to the contour of the surface means being engaged thereby, the annular rigid means 29 also being thicker and, therefore, being substantially rigid to assure that the flexible wall 30 will not tend to gather underneath the end surface 26 of the support means 21 when the vacuum cleaner means 23 is turned on to draw air into the opening means 25 thereof.

During the movement of the nozzle construction 20 across the surface means 40 in the normal vacuum cleaning motion by the operator or the like, the support means 21 will tend to move relative to the annular outer rigid part 29 within the limits of the slack in the flexible wall 30. For example, as the support means 21 is moved to the left in FIG. 2 across the surface means 40, the support means 21 will move toward the left hand part of the annular member 29 until the right hand part of the wall 30 is substantially stretched between the support 21 and the right hand part of the annular member 29 so as to pull the annular part 29 therewith during further movement of the support means 21 to the left on the surface means 40. Conversely, movement of the support means 21 to the right will cause the right part of the flexible wall 30 to bunch up between the support 21 and the right part of the annular member 29 while the slack will be taken up in the flexible wall 30 to the left of the support means 21.

While it is believed that such repeated flexing and stretching of the flexible wall 30 will have no adverse effects thereon, it may be desired to control the contour of the flexible wall 30 between the support means 21 and the outer annular part 29 and also to substantially minimize movement between the support means 21 and the outer annular part 29.

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Therefore, reference is now made to FIG. 6 wherein another nozzle construction of this invention is generally indicated by the reference numeral 20A and parts thereof similar to the nozzle construction 20 previously described are indicated by like reference numerals followed by the reference letter A.

As illustrated in FIG. 6, the flexible wall 30A has been molded or otherwise formed with concentric annular flutes 52 between the support means 21A and the outer annular ring 29A so as to provide annular and concentric sealing parts 53 of the flexible wall 30A which will touch the surface means 40A when the nozzle construction 20A is disposed thereon whereby the slack between the support means 21A and the outer ring 29A and the flexible wall 30A is performed therein in a fluted shape. However, such flutes are not sufficiently rigid as to prevent the wall 30A from sagging downwardly when the annular ring 29A and the support means 21A are held in a coplanar relation as illustrated in FIG. 6 and the flexible wall 30A is free to bend downwardly therebetween so that the same would be positioned as illustrated in dotted lines in FIG. 6. In order to prevent the relative movement between the support means 21A and the outer ring 29A as well as to tend to hold the annular ring 29A in coplanar relation with the bottom surface 26A of the support means 21A, a plurality of springs 54 can have one end 55 thereof attached to the support means 21A and the other end 55A attached to the annular ring 29A as illustrated in FIG. 6 to provide a lifting and centralizing action on the ring 29A.

In this manner, the springs 54 tend to maintain the annular ring 29A fully concentric with the support means 21A during normal movement of the nozzle construction 20A across the surface means 40A while the flexible wall 30A performs the sealing function previously described for the nozzle construction 20. However, if the operator should move the nozzle construction 20A against a wall or the like, where the rigid ring 29A will be held from further movement in that direction, the support means 21A can be moved further toward the wall so as to bunch up the flutes 52 of the flexible wall 30A between the held ring 29A and the moving support means 21A much in the manner illustrated in FIG. 8 so as to place the inlet 27 closely adjacent the wall joint to clean the same.

However, when the nozzle construction 20A is moved away from such restraining position of the annular ring 29A thereof, the spring means 54 will again place the annular ring 29A concentric about the support means 29A.

Another means for holding the annular ring 29 of the nozzle construction 20 fully concentric with the support means 21 while still permitting the annular ring 29 to move vertically relative thereto is provided in FIG. 7 wherein the nozzle construction is generally indicated by the reference numeral 20B and parts thereof similar to the nozzle construction 20 previously described are indicated by like reference numerals followed by the reference letter B.

As illustrated in FIG. 7, the support means 21B of the nozzle construction 20B has an outer cylindrical portion 57 which is telescopically disposed in an opening 58 of a flat plate 59 that has an annular flange 60 extending downwardly from the outer peripheral edge 61 thereof and is attached to the annular ring 29B as illustrated. If desired, the plate 59 and the flange 60 could be integrally interconnected and also be integral with the annular ring 29B by being formed during the molding of the nozzle construction 20B, as desired.

In this manner, it can be seen that the plate 59 is adapted to move axially relative to the support means 21B while the annular ring 29B will also move axially relative to the support means 21B and the slack in the flexible wall 30B permits such movement. However, the annular ring 29B is positively held in a concentric relation to the support means 21B through the telescoping relation of the plate 59 with the cylindrical part 57 of

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the support means 21B. However, the flexible wall 30B performs the sealing function in substantially the same manner as the flexible wall 30 of the nozzle construction 20 previously described.

As previously stated, the nozzle construction 20 permits relative movement between the support means 21 thereof and the annular ring 29 thereof depending upon the length of the flexible wall 30 therebetween. Accordingly, it can be seen in FIG. 8 that another nozzle construction of this invention is generally indicated by the reference numeral 20C and parts thereof similar to the nozzle construction 20 previously described are indicated by like reference numerals followed by the reference letter C.

As illustrated in FIG. 8, the flexible wall 30C is provided with a plurality of concentrically disposed flutes 52C in the same manner as the nozzle construction 20A with such flutes 52C providing sufficient slack in the flexible wall 30C to completely permit the support means 21C to compact the flexible wall 30C between the support means 21C and the outer annular ring 29C in the manner illustrated in FIG. 8 when the support means 21C is moved relative to the ring 29C in a particular direction, the fluting 52C minimizing the wear on the flexible wall 30C during such movement of the support means 21C relative to the ring 29C.

Therefore, it can be seen that in all of the nozzle constructions 20, 20A, 20B and 20C previously described, such nozzle constructions can be formed in a relatively simple and economical manner as one-piece structures with the improved result of the flexible surrounding wall thereof permitting a sealing relationship with an irregularly contoured surface means being cleaned by such nozzle construction.

While the nozzle construction as previously described has each been illustrated as providing a circular support means 21 and annular ring 29, it is to be understood that such support structure could be rectangular, triangular or of any desired shape with the flexible wall therebetween conforming to the desired configuration and still performing the improved sealing function of this invention.

Also, while the nozzle constructions previously described have all been illustrated and described as relying on the pressure differential existing across the flexible wall by the venturi effect previously described, it is to be understood that such flexible wall could be urged into sealing relationship with an auxiliary fluid pressure being imposed on the sides thereof opposite to the sides that engage the surface means.

For example, an improved vacuum cleaning system of this invention is generally indicated by the reference numeral 300 in FIG. 9 and comprises a conventional household or commercial vacuum cleaner 301 having an inlet 302 and an outlet 303 whereby the unit 301 is adapted to draw air into the inlet 302 and exhaust the same out of the outlet 303. A conventional conduit or hose arrangement 304 is adapted to be interconnected to the inlet 302 of the vacuum unit 301, the conduit means 304, in turn, being adapted to have its free end 305 connectable to and disconnectable from an improved nozzle means 306 of this invention in a conventional manner by being coupled to a swivel joint means 307 carried upon a support member 308 of the nozzle means 306 and fluidly interconnecting the conduit 304 to an opening means 309 in the support 308.

The support member 308 of the nozzle means 306 has a frusto-conically shaped flexible brush 310 secured to the underside 311 thereof in any suitable manner at the smaller end 312 of the brush 310 so that the interior 313 of the brush 310 is disposed in fluid communication with the opening 309 in the support member 308 and surrounds the same. The support member 308 also carries a flexible, plastic sheet means 314 arranged to have one annular end 315 thereof secured to the lower surface 311 of the support member 308 about the outer periphery thereof

and an inner annular end 316 secured to the lower surface 311 of the support member 308 closely adjacent the outer edge of the upper end 312 of the brush 310 as illustrated in FIG. 9 whereby the flexible sheet 314 defines an annular chamber 317 with the support member 308. The flexible sheet 314, as illustrated in FIG. 9, has a natural configuration as illustrated in full lines wherein an annular end means 318 of the sheet 314 completely surrounds the opening means 309 and projects beyond the lower end 319 of the brush 310 as illustrated. The chamber 317 defined by the flexible sheet 314 is disposed in fluid communication with another opening 320 in the support member 308 which is adapted to be coupled to the outlet 303 of the vacuum cleaner unit 301 by a conduit means 321, the conduit means 321 or opening means 320 having a suitable pressure relief valve or pressure regulator valve 322 therein so as to tend to maintain a predetermined pressure fluid in the chamber 317 when the unit 301 is turned on as will be apparent hereinafter.

The weight of the nozzle means 306 of this invention together with the weight of the conduit means 304, etc., is sufficient to force the end 319 of the brush 310 into engagement with any surface means 323 on top of which the nozzle means 306 is disposed even though the unit 301 is applying fluid under pressure into the chamber 317 of the nozzle means 306 whereby the flexible wall 314 is forced outwardly at the end 318 thereof to generally assume the configuration illustrated by dashed dotted lines in FIG. 9. In this manner, the distorted flexible sheet means 314 when disposed against the surface means 323 effectively provides an annular seal about the opening means 309 of the nozzle means 306 to provide for excellent dirt and dust removal from the surface means 323 when the unit 301 is turned on to tend to draw air through the opening 309 of the nozzle means 306 and expel the same out of the conventional outlet means 303 thereof, a certain amount of the air pressure being delivered out of the outlet means 303 being directed by the conduit means 321 into the chamber 317 of the nozzle means 306 to exert the downward force on the distorted end 318 thereof to cause the end 318 to maintain sealing contact with the surface means 323 even though the surface means 323 may be irregular in a transverse cross section thereof.

For example, reference is now made to FIG. 10 wherein it can be seen that the nozzle means 306 is disposed on a surface means 324 which comprises a carpet 325 disposed above a wooden floor 326 or the like whereby the flexible sheet means 314 of the nozzle means 306 through the fluid pressure in the chamber 317 thereof can cause part of the end means 318 of the flexible sheet means 314 to engage against the bare floor 326 at the juncture thereof with the carpet 325 while the remainder of the end means 318 of the flexible sheet means 314 conforms to the upper surface 327 of the carpet 325 so that complete sealing is effected completely around the opening 309 of the nozzle means 306 for the improved dust and dirt removal operation thereof, such fluid sealing also taking effect even if the lower end 319 of the brush 310 is canted across the juncture of the carpet 325 and the bare floor 326.

As illustrated in FIG. 11, the surface means 328 illustrated therein comprises tile pieces 329 separated from each other by a mortar joint 330 which through wear or by design has an upper surface 331 disposed lower than the upper surfaces 332 of the tiles 329. However, when the nozzle means 306 of this invention is disposed on the surface means 328 so that the end 319 of the brush 310 is disposed on the upper surfaces 332 of the tiles 329, the pressure differential across the end means 318 of the flexible sheet 314 is such that the same can force the flexible sheet 314 to distort into the mortar groove and engage against the upper surface 331 thereof as illustrated so as to effect good sealing around the entire circumference of the opening 309 for the improved dust and dirt removal operation thereof.

Therefore, it can be seen that the entire annular end 318 of the flexible sheet 314 of the nozzle means 306 of this invention readily conforms to irregularities in various surface means to be cleaned thereby so as to effect good sealing completely about the opening means 309 of the nozzle means 306 so that good dirt and dust removal can be effected thereby, the flexible sheet 314 being formed of a suitable flexible plastic material which permits the same to readily glide over the surface means while providing the sealing effect previously described. For example, the flexible sheet means 314 can be formed of Teflon, polyethylene, and the like, and can be formed of non-stretchable material so that the same will assume the shape illustrated in FIG. 9 when the fluid pressure is directed into the chamber 317 thereof. However, it is to be understood that the flexible sheet means 314 could also be formed of a stretchable material, such as rubber compositions and the like, so that when the same is inflated by the proper fluid pressure in the chamber 317 thereof, the same will stretch into the configuration illustrated in full lines in FIG. 16 so that the end means 318 thereof will normally be disposed beyond the end 319 of the brush 310 for the purpose previously described.

It should be understood that while the nozzle means 306 has been previously described as removing dirt and dust from the desired surface means, it can be seen that such nozzle means 306 will be particularly effective in removing moisture from a desired surface means because of the good sealing effect provided by the end means 318 of the flexible sheet means 314 thereof. For example, such nozzle means could be utilized to dry a scrubbed kitchen floor or the like or to remove liquid spillage or the like.

In order to improve the cleaning function of the nozzle means 306 of this invention, suitable opening means can be provided in the sheet means 314 which would direct jets of fluid in a proper direction into the surface means being cleaned thereby to facilitate the scrubbing action of the end 319 of the brush 310 in beating dirt and dust from the surface means to be removed by the suction effected by the unit 301 in the manner previously described.

For example, reference is now made to FIG. 12 wherein like parts of the nozzle means of this invention are generally indicated by the same reference numeral followed by the reference letter A.

As illustrated in FIG. 12, the nozzle means 306A has minute openings 333 formed in the flexible sheet means 314A adjacent the end 319A of the brush 310A so that fluid from the chamber 317A of the nozzle means 306A will be directed in an angularly disposed path, such as is represented by the arrow 334 in FIG. 12 into the surface means 335, which can comprise a carpet or the like, to be entrained in the normal air paths, indicated by the arrows 336 passing through the surface means 335 because of the suction being created inside the brush means 310A by the unit 301 or the like.

Such openings 333 in the flexible sheet means 314 can be disposed completely about the outer periphery of the end 319A of the nozzle of the brush 310A or to be located in just the portion thereof which would normally form the front of the nozzle means 306A as desired. Further, such openings 333 could be so minute that the same would not permit the passage of fluid therethrough unless the chamber 317A is pressurized such as by the outlet pressure from the unit 303 through the conduit means 321 of FIG. 9.

With the opening means 333 of the nozzle means 306A normally being sealed closed by the natural resiliency of the sheet means 314 until a fluid pressure is created in the chamber means 317A thereof, such chamber means 317A can be utilized to contain a carpet or other surface cleaning liquid 337 as illustrated in FIG. 12 so that the operator or the like after placing the nozzle means 306A on the surface means 335 can turn on the unit 301 and continuously pressurize the chamber 317A so that jets of

the fluid 337 in the proper amounts would be dispensed out of the openings 333 into the surface means 335 as indicated by the feathering lines 338 in FIG. 12 to clean the carpet 335 with such residue of the fluid 337 that is jetted into the carpet 335 being subsequently drawn into the inside of the brush 310A by the suction created at the inlet 302 of the unit 301 whereby such jetting of the fluid 337 is controlled by the angular relation of the openings 333 and the fluid 337 is thereafter immediately drawn into the nozzle means 306A after the fluid 337 has accomplished its cleaning function in the surface means 335.

Thus, it can be seen that the nozzle means 306A of this invention can be utilized as a merchandising container for cleaner fluid 337 so that the customer or the like could buy part of the nozzle means 306A which could snap onto the support means 308 in any suitable manner for subsequent cleaning of the surface means in the manner previously described.

While the nozzle means 306 of this invention illustrated in FIG. 9 has the conduit means 321 and 304 separately disposed as illustrated, it is to be understood that such conduit means 304 and 321 could be disposed in a common conduit means to be attached to the pivot joint 307 as a tandem unit.

Also, if it is desired not to have the unit 301 pressurize the chamber 317 of the nozzle means 306, the chamber means 317 could be separately pressurized through a tire valve means 339 or the like in periodic manner as the chamber 317 is completely sealed from the atmosphere so that leakage will not occur therebetween, the tire valve 339 merely being provided so as to recharge the chamber 317 with fluid under pressure as the need arises.

In addition, the valve means 339 could be utilized for disposing cleaning liquid within the chamber 317 when it is desired to dispense such liquid through the opening means 333 in the manner previously described.

It may be found that it is desirable to provide at least a predetermined restricted air flow between the end 318 of the flexible wall 314 of the nozzle means 306 of this invention when the same is disposed on a bare floor, such as on a linoleum or an asphalt tile covered surface, in order to prevent a complete suction cup effect if the material that forms the wall 314 is not substantially frictionless to cause an ease of sliding the nozzle means 306 over such surface means with full suction being imposed thereon.

For example, the flexible wall 314 of this invention could be provided with closely spaced external ribs that are disposed around the end 318 thereof on the outside surface thereof to provide such restricted flow path. With such ribbing on the end 318 of the nozzle means 306, such ribbing would still permit a substantially full seal against rugs and carpeting so that substantially all of the air flow must be through such rugs or carpeting for the improved cleaning effect of this invention.

For example, reference is now made to FIG. 13 wherein the nozzle means of this invention is generally indicated by the reference numeral 306B and parts thereof similar to the nozzle means 306 of FIG. 10 are indicated by like reference numerals followed by the reference letter B.

As illustrated in FIG. 13, the flexible sheet 314B has integral ribs 339 formed in spaced apart arrangement so as to extend down from the outer periphery of the wall 314B across the end 318B of the nozzle means 306B and upwardly into the inner periphery thereof so as to provide minute or controlled spacing 340 therebetween so that when the end 318B is disposed against the bare floor surface 326B, the minute spaces 340 between adjacent ribs 339 provide for a certain restricted air flow into the nozzle means 306B so that a complete full suction cup effect will not be created between the nozzle 306B and the surface 326B as the part of the wall 314B between the adjacent ribs 339 is not sufficiently flexible to collapse

downwardly to fill the spaces 340. However, such minute spacing 340 between adjacent ribs 339 substantially completely disappear when the end 318B of the nozzle means 306B is disposed against a carpet-like surface 327B as illustrated in FIG. 13 as the ribs 340 dig therein so that substantially all the air flow will take place through the carpet 327B in the manner as illustrated in FIG. 19 and previously described.

While the various nozzle means of this invention have been previously described as being provided with a super-atmospheric pressure in the chamber 317 thereof in order to insure that the end 318 of the flexible wall 314 will be disposed in sealing relation against the surface to be cleaned thereby, it is to be understood that such chamber means 317 could be directly interconnected to the atmosphere at all times so that only atmospheric pressure is in the chamber 317. However, the end 318 of such nozzle means 306 will still be drawn into tight sealing relation with the surface against which such nozzle means 306 is disposed because the flow of air into the opening means 309 of such nozzle means will create a pressure differential across the end 318 of the nozzle means in much the same manner as a "venturi effect" so that a low pressure area is created below the end 318 of the wall 314 and the high pressure area, in this instance, atmospheric pressure, is above the end 318 so as to cause the end 318 to move downwardly into substantially sealed relation with the engaged surface.

Therefore, it can be seen that this invention provides improved nozzle means for surface treating operations and the like.

What is claimed is:

1. A nozzle construction for a vacuum cleaning operation or the like comprising a support means having opening means therein provided with an outlet to be interconnected to a vacuum pump means and an inlet to be disposed adjacent a surface means to be cleaned, and a flexible wall surrounding said inlet to have one side thereof engage against said surface means around said inlet to substantially seal said inlet of said support means to said surface means, said flexible wall being so constructed and arranged that a pressure differential acting across the same resulting from said vacuum pump means drawing fluid from said surface means into said inlet and out through said outlet of said opening means is adapted to cause said flexible wall to be urged toward said surface means to substantially seal against the same around said inlet and substantially conform to the contour of said surface means outboard of said inlet, said flexible wall having an inner peripheral means secured to said support means adjacent said inlet thereof and an outer peripheral means disposed remote from said inlet of said support means, annular rigidifying means secured to said outer peripheral means of said flexible wall and surrounding said inlet of said support means outboard of said inlet, said flexible wall having a length between said rigidifying means and said support means greater than the distance between said support means at said inlet thereof and said rigidifying means in any transverse cross section thereof when said rigidifying means is in at least one position relative to said support means, and stabilizing means interconnected to said rigidifying means and said support means to tend to maintain said rigidifying means in a certain spaced relation about said support means when said support means and said rigidifying means are disposed against said surface means.

2. A nozzle construction as set forth in claim 1 wherein a brush means is carried by said support means at said inlet thereof for engaging against said surface means, said brush means being disposed inboard of said flexible wall.

3. A nozzle construction as set forth in claim 1 wherein said support means and said flexible wall comprise a one-piece integral structure.

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4. A nozzle construction as set forth in claim 1 wherein said flexible wall has at least one annular flute between its inner and outer peripheral means and surrounding said inlet of said support means to at least partially take up some of the slack thereof between said rigidifying means and said support means when said rigidifying means is in said one position thereof.

5. A nozzle construction as set forth in claim 1 wherein said stabilizing means is so constructed and arranged that said rigidifying means can move axially relative to said inlet of said support means.

6. A nozzle construction as set forth in claim 1 wherein the slack in said flexible wall between said support means and said rigidifying means when said rigidifying means is in said one position thereof is such that when said support means and said rigidifying means are disposed against said surface means the support means can be moved against the inside of said rigidifying means at one point thereof and said flexible wall will still have slack between said support means and said rigidifying means in any transverse cross section thereof.

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7. A nozzle construction as set forth in claim 1 wherein said one side of said flexible wall has spacing means thereon to provide a controlled fluid flow between said one side of said flexible wall and said surface means.

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