Jan. 3, 1967 R. W. FRASER 3,296,395

ADJUSTABLE VACUUM SWITCH

Filed June 12, 1964

Fig. 1.

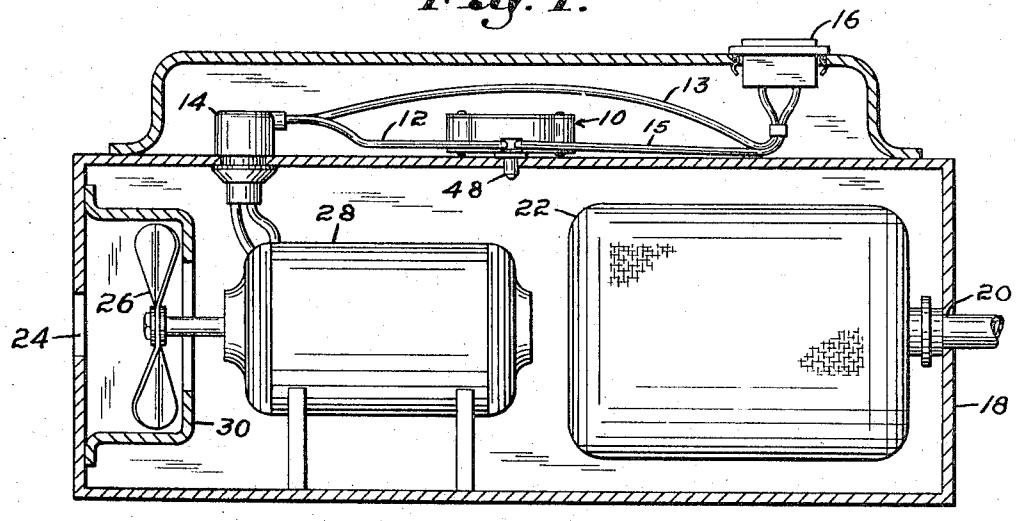


Fig. 2.

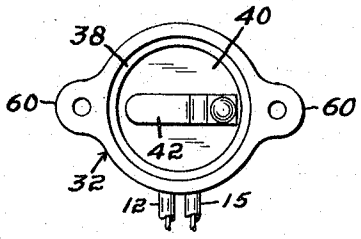


Fig. 3.

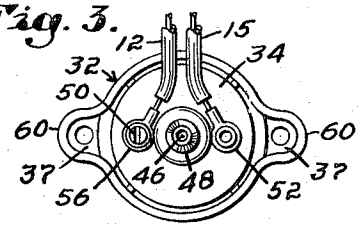


Fig. 4.

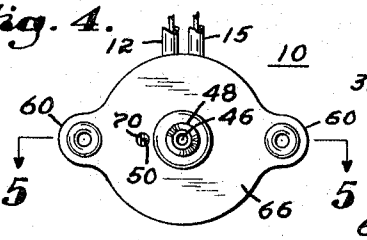


Fig. 5.

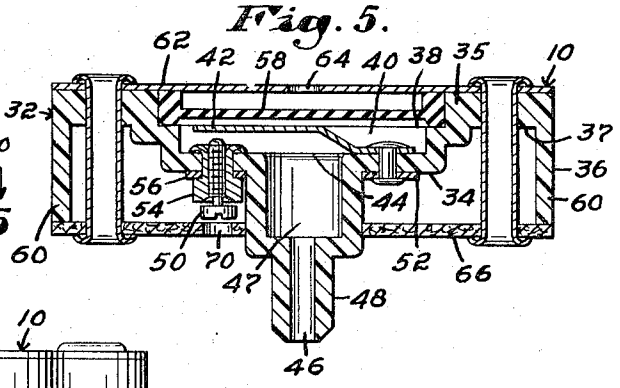
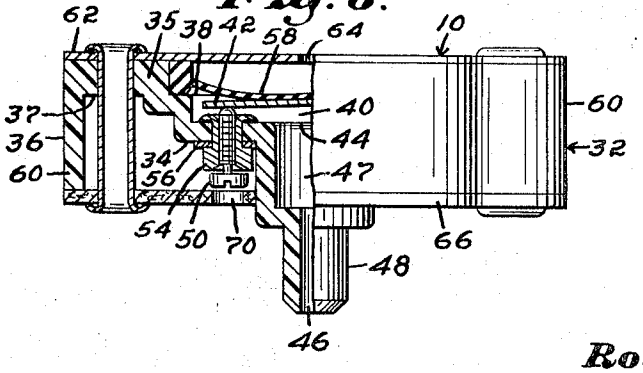


Fig. 6.



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3,296,395

ADJUSTABLE VACUUM SWITCH

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1 Claim. (Cl. 200—83)

This invention relates generally to switches and more specifically to a switch actuated by a vacuum.

An object of the present invention is to provide a switch which will close a circuit when a vacuum has reached a predetermined level of vacuum condition.

Another object of the present invention is to provide a switch which may be adjusted for a predetermined vacuum condition without dismantling the switch.

A further object of the present invention is to provide a vacuum switch wherein a flexible diaphragm reacts to the changes of pressure in a vacuum and forces a movable contact into engagement with an adjustable second contact.

In the drawings:

FIG. 1 is a schematic representation partly in section showing a vacuum cleaner chamber utilizing the switch of the invention;

FIG. 2 is a top plan view of the switch with the diaphragm and cover plate removed;

FIG. 3 is a bottom plan view of the switch shown in FIG. 2 with the insulating cover removed;

FIG. 4 is a bottom plan view of the switch;

FIG. 5 is a section taken on lines 5—5 of FIG. 4 with the diaphragm and movable contact in neutral position; and

FIG. 6 is a section similar to FIG. 5 partially in elevation showing the diaphragm and movable contact actuated.

In the drawings, there is shown a switch **10** which is connected by a lead **12** to a socket **14** and a lead **15** which is connected to the indicator light **16**. The socket **14** in turn is connected by a second lead **13** to the indicator light **16** and it is also connected to a plug (no number) having leads which ultimately go to a source of electrical power. The socket **14** is formed of insulating material, and, in this particular case, utilizes a snap in groove type engagement with the vacuum chamber housing **18**. The vacuum chamber housing **18** has an intake opening **20**, which is attached by means well known in the art to a porous bag **22**. There is also formed through the housing **18** directly across from and in line with the intake opening **20** an exhaust opening **24**. Directly in front of and in close proximity to the exhaust opening **24**, a fan **26** is mounted on a motor **28**. The fan **26** is preferably mounted within an inner housing **30**, which has an opening in it on the same line as the intake and exhaust openings. In other words, the inner housing **30** places the fan **26** within a separate compartment from the remaining portion of the area defined by the vacuum chamber housing **18**.

The switch **10** comprises a housing **32** formed of an insulating material including a base portion **34**, an inner upstanding circumferential wall **35**, an outer circumferential wall **36** connected to the upper surface of said inner wall **35** by a connector portion **37**. The connector portion **37** is on a plane in substantially spaced parallel relationship to the plane of the base portion **34**. The outer wall **36** is in spaced circumscribing relationship with the base portion **34** and the inner wall **35** as shown in FIG. 5. It also has a free edge extending beyond the plane of the base portion **34**. An internal circumferential shoulder **38** is formed in the inner wall **35** spaced from the base portion **34**.

The base portion **34** and the inner wall **35** define a well **40**. A leaf spring contact **42** formed of an electrically conductive material is riveted to the base portion **34** and has bends formed in it whereby the major portion of the spring contact **42** is spaced from the base portion **34** in substantial parallel relationship therewith. The base portion **34** has an aperture **44** formed therethrough which is continued as a chamber **47** and then a channel or bore **46** of a nozzle **48**. The nozzle **48** extends from and is integral with the opposite side of the base portion **34** from the attachment of the leaf spring contact **42**. An internally threaded bushing **54** is attached through a hole in the base portion **34** and an external screw like contact **50** is threaded into the internally threaded bushing **54** to lie in spaced relation and directly below the spring contact **42** as indicated in FIG. 5.

When the leaf spring contact **42** is riveted to the base portion **34**, the same rivet is utilized to hold a ring terminal **52** on the opposite side of the base portion **34**. The internally threaded bushing **54** includes a head portion and a tubular shank. A second ring terminal **56** is placed around the shank of the bushing **54** adjacent its head portion and then the bushing **54** is passed through a hole in the base portion **34** and curled over to complete the engagement therewith. Thus, in the disclosed construction there is a ring terminal on each side of the nozzle **48** as shown in FIG. 3 and FIG. 5. The slotted head of the screw like contact **50** is faced toward the same plane as that toward which the nozzle **48** is directed. A rubber diaphragm **58**, formed of a highly flexible material, in this case rubber, and having a circular configuration is placed to cover the well **40** with the peripheral ridge of the diaphragm **58**, which is formed of a thicker material than its center portion, resting on the internal circumferential shoulder **38**. The diaphragm **58** seals the well **40** from direct contact with its environment for a purpose to be set forth hereinafter. The top plane of the peripheral ridge of the diaphragm **58** lies on the same plane as the top surface of the housing **32** of the switch **10**. The more flexible center portion of the diaphragm **58** is spaced below the upper surface of the ridge and the upper surface of the housing **32** as shown in FIG. 5. A pair of wing like extensions **60** are formed by the outer wall **36** and the connector portion **37** on each side of the housing **32**. Each of the wings **60** has an aperture formed through its portion of the connector portion **37**. A cover plate **62** formed of cold rolled steel is placed over the housing **32** in superposed abutting relation to the ridge of the diaphragm **58** and the extensions **60**. An aperture is formed through each of the wings, which extends from the cover plate **62** and the configuration of the cover plate **62** is the same as the external configuration of the top surface of the housing **32**. An air vent **64** is formed centrally in the cover plate **62** as indicated in FIG. 5. On the opposite side of the base portion **34** from the leaf spring contact **42** an insulating cover **66** is provided having a configuration which is the same as the bottom surface of the housing **32**. The nozzle **48** has two portions, the first which is adjacent to the base portion **34**, referred to hereinbefore as the chamber **47**, has greater internal and external diameters than the remaining portion of the nozzle **48**. An aperature is provided in each of the wings of the insulating cover **66** and a large aperture is formed axially in the insulating cover **66** so that the outer surface of the wall of the chamber **47** of the nozzle **48** can be passed therethrough. A small adjustment aperture **70** is formed in close proximity to the centrally located hole of the insulating cover **66** and is placed so as to be directly over the head of the screw like contact **50**.

When the insulating cover **66** and the cover plate **62** are both in place on the housing **32**, a through hole is

provided in each wing of the assembly. An eyelet can now be passed through the apertures and the terminal ends of the eyelet curled over to hold the switch **10** in assembly.

The exemplification in FIG. 1 will be utilized to illustrate one way in which the switch **10** may be utilized. When a clean porous bag **22** has been placed over the intake opening **20** of the vacuum chamber housing **18** and the fan **26** is caused to rotate, air will be drawn both from the vacuum chamber and through the porous bag **22**, which tends to create a vacuum in the vacuum chamber housing and within the bag **22**. As the bag **22** fills with debris, less air will be drawn from the outside through the bag **22** and more air will be drawn from within the vacuum chamber housing **18** thus increasing the vacuum. This increase in the vacuum will also increase the vacuum in the larger chamber **47**, the well **40** and the channel of the nozzle **48**, which protrudes into the vacuum chamber as shown in FIG. 1. Since the air pressure above the diaphragm **58** is maintained at the same level as that of the outside air through the utilization of the air vent **64**, and that area is isolated from the vacuum itself, this pressure will force the diaphragm **58** down against the spring contact **42** causing it to flex toward the screw like contact **50**. The contact **50** may be adjusted through the adjustment aperture **70** with a screwdriver to a predetermined vacuum condition within the vacuum chamber housing **18**. When the required vacuum condition is reached, the spring contact **42** will engage against the screw like contact **50** causing the circuit to be completed and the indicator light **16** to glow informing the housewife that the bag **22** has been filled.

While there has been illustrated and described a preferred embodiment of the invention, it should be understood that the invention is best defined by the following claim.

What is claimed:

A vacuum switch comprising a housing formed of insulating material, said housing including a circumferential wall defining a tubular well, having a circumferential shoulder portion formed therein and having a base portion and an opening, an aperture formed through said base portion, a tubular nozzle extending from said base portion, having a channel extending therethrough, said channel forming a continuation of said aperture, a movable leaf spring contact and an adjustable second contact each extending into said well, said movable contact and said second contact spaced from each other and a flexible diaphragm lying completely within said well and having portions in abutting relationship with said circumferential shoulder, and a vented cover plate mounted on said housing above and abutted to said diaphragm to hold said diaphragm in position, said diaphragm having a planar, uninterrupted center portion including an under surface and being in spaced relation to said base portion and to said movable contact, and covering the major portion of the opening of said well whereby an increase in a vacuum connected to said nozzle will cause said under surface of said diaphragm to deflect said movable contact toward said second contact.

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