May 1, 1962 G. H. DINGMAN 3,032,735

ELECTRICAL CONTACT BRUSH AND SPRING ASSEMBLY

Filed June 13, 1957

Fig. 1

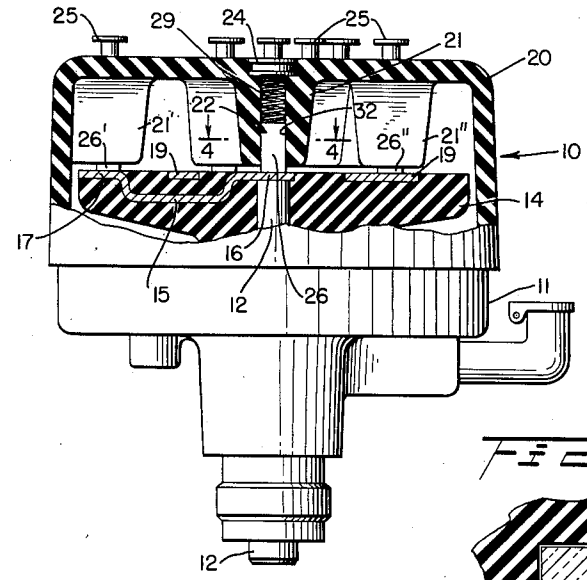


Fig. 4

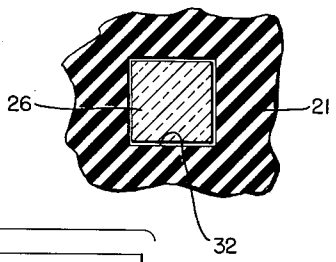
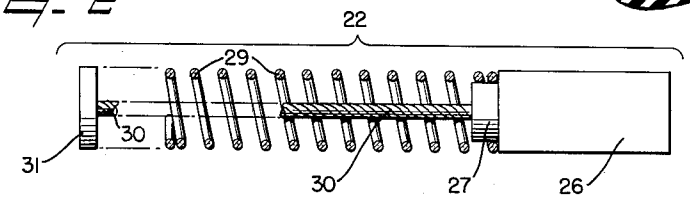


Fig. 2



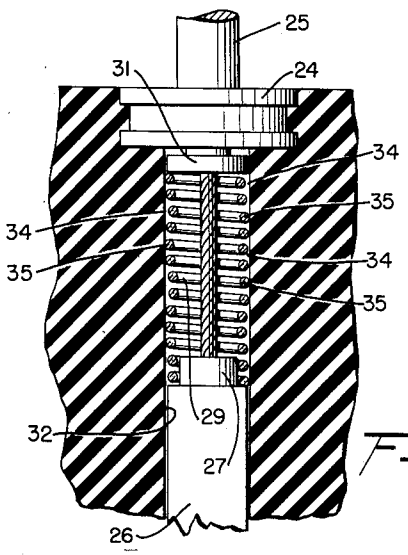


Fig. 5

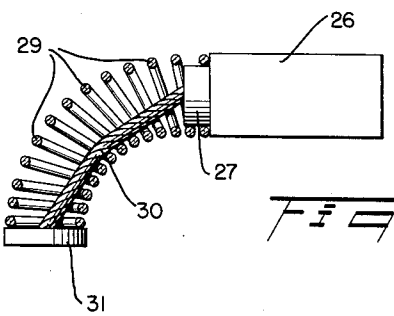


Fig. 3

INVENTOR.
GLEN H. DINGMAN

BY Bauer & Seymour

ATTORNEYS

United States Patent Office

3,032,735
Patented May 1, 1962

3,032,735
ELECTRICAL CONTACT BRUSH AND SPRING ASSEMBLY

Glen H. Dingman, Sidney, N.Y., assignor to The Bendix Corporation, a corporation of Delaware

Filed June 13, 1957, Ser. No. 665,559
4 Claims. (Cl. 339—6)

This invention relates to electrical apparatus and more particularly to an electrical contact assembly wherein a sliding contact member such as a brush fits within an open-ended passage in a supporting structure.

Among the objects of the invention is the provision of a novel improved sliding contact assembly.

A further object is to provide a novel sliding contact and lead assembly adapted to be held in an open-ended passage in a supporting structure.

Yet another object is to provide a sliding contact and lead assembly of such construction as to allow its ready installation through the open-end of a passage in a supporting structure, the contact and lead assembly being self-retaining in the passage while permitting their substantially free reciprocation in the passage to provide good electrical contact with a conductor member moving past the contact.

The above and further objects and novel features of the invention will more fully appear from the following detailed description when the same is read in connection with the accompanying drawings. It is to be expressly understood, however, that the drawings are for the purpose of illustration only and are not intended as a definition of the limits of the invention.

In the drawings, wherein like reference characters refer to like parts throughout the several views,

FIG. 1 is a view partially in vertical axial section and partially in side elevation of an illustrative device in which the electrical contact assembly may be used;

FIG. 2 is a view in side elevation of the electrical contact assembly of the invention, the central lead wire of the assembly being shown broken through and the spring being shown in its free or relaxed state;

FIG. 3 is a view in side elevation of the electrical contact assembly, the assembly being shown in a typical position which it assumes when unsupported in a confining passage in a supporting structure;

FIG. 4 is a fragmentary view in section through a supporting structure and a brush or contact supported therein, the section being taken along the line 4—4 of FIG. 1; and

FIG. 5 is a fragmentary view in vertical section through the supporting structure and the brush assembly mounted therein, certain parts being shown in side elevation, the undulations in the spring of the assembly being shown somewhat exaggerated for clarity of illustration.

The electrical contact and its lead assembly is illustrated in its use as a brush in a distributor generally designated **10** in FIG. 1. It will be understood, however, that the contact assembly of the invention may be employed to advantage in a number of other applications wherein a contact member is supported in an open-ended passage in a supporting structure and is resiliently urged into contact with an electrically conducting member confronting the passage.

Distributor **10** has a body **11** in which there is journaled a vertical central shaft **12** having a rotor **14** keyed thereto. It will be understood that, when the distributor is employed as an element of the internal combustion engine, shaft **12** will be connected to be driven in timed relationship with the crankshaft of the engine so as to produce properly timed fuel igniting sparks at the spark plugs of the various cylinders of the engine. In the illustrative embodiment of the distributor shown, rotor **14** has a first contact member **15** embedded in the electrically insulating body thereon. Member **15** has an inner central portion **16**, disposed to make electrical contact with central brush **26**, and a radially outer portion **17** lying flush with the upper surface of the rotor and adapted successively to make electrical contact with a series of brushes **26'** circularly disposed about central brush **26**. In the illustrative embodiment rotor **14** includes a second contact member **19** embedded in rotor **14**, the exposed upper surfaces of member **17** successively making contact with a second series of brushes **26''** circularly arranged around the central brush **26**, the second contact member and the brushes associated therewith constituting a timing circuit for auxiliary apparatus. It will be understood that the particular distributor shown forms no part of the present invention.

The above described brushes **26**, **26'**, and **26''** are supported in suitably located vertically extending bosses **21**, **21'**, and **21''**, respectively, which are an integral part of the molded cap **20** of the distributor. The boss **21**, shown in section in FIGS. 1, 4, and 5, and the brush and brush assembly in the passage in such boss, are typical of the construction of the other brushes or contact members and their supporting structures. Boss **21** has a central vertical passage **32** therein which is open at its lower end. The passage is preferably rectangular or square in section. Passage **32** illustrated herein is square in section. The upper end of such passage is closed by a metallic electrically conducting member **24** which may be formed as an insert molded into cap **20**. The outer end of insert **24** is provided with a projecting terminal member **25** to which a wire (not shown) leading to a spark plug or a similar device timed by distributor **10** may be connected.

The contact or brush member **26**, which may be made of carbon or the like is of square cross section. The rear or upper end of brush **26** has a centrally disposed cylindrical boss **27** thereon, such boss snugly receiving the lower (FIGS. 1 and 5) end of a metal coil compression spring **29**. Brush **26** accurately but slidingly fits within bore **32** in boss **21**. The diameter of boss **27** and the diameter of the wire from which spring **29** is made are such that the outer diameter of coil spring **29** which surrounds boss **27** does not lie beyond the flat sides of brush **26**. The effective diameter of coil spring **29** is somewhat less than the distance between the opposing flat faces of bore **32**.

The lead assembly to brush **26** includes a central flexible lead wire **30** having its lower end connected to brush **26** internally of the latter. The upper end of wire **30** is connected as by being soldered to the lower face of a metal disk **31** which overlies the upper end of spring **29**. Disk **31** has a diameter at least slightly less than the distance between opposite side surfaces of bore **32**. It will be apparent that most of the current to brush **26** flows through member **31** and wire **30**, although a relatively small portion thereof will be carried by spring **29**. The total length of the brush and lead assembly is somewhat greater than the distance from the closed end of passage **32** and the confronting member such as **15** cooperating with the brush, so that the brush engages member **15** with sufficient force to provide a sure, non-arcing contact therebetween.

The free or relaxed length of spring **29** is such that it is somewhat greater than the length of wire **30** between the lower end of boss **29** and the lower surface of member **31**. The spring **29** has a relatively small compressive force and is fairly easily bent out of the substantially straight line which it assumes when it is relaxed. Consequently, with the brush, spring, lead wire, and disk **31** assembled as described, when such assembly is unsupported in a passage in a support spring **29** is markedly deflected away from the longitudinal axis of brush **26**. The attitude which a typical brush and lead assembly in accordance with the invention assumes under such con-

dition is shown in FIG. 3, wherein the relaxed length of spring 29 and the effective length of lead wire 30 have such relationship that the spring is bent throughout substantially 90°.

The advantages flowing from the described conductor and lead assembly will be more readily apparent upon consideration of FIG. 5. Upon the insertion of the brush assembly 22 into bore 32 in the manner shown in FIGS. 1 and 5, spring 29 is brought into a substantially straight configuration by the fairly closely confining opposing side walls of bore 32. Since the effective diameter of spring 29, however, is somewhat less than the distance between opposing side walls of bore, spring 29 does not lie along an absolutely straight line but instead undulates in a manner such as illustrated in FIG. 5 wherein the spring 29 is shown spaced from the side walls of the bore at zones 34 and touching such side walls at zones 35. The spring lightly engages the side walls with small forces which are sufficient to hold the brush assembly from falling out of passage 32 when cap 20 has been removed from the distributor and is held vertical with the open ends of the brush-receiving passages downward. Consequently, the present invention provides for the ready assembly and disassembly of the brush members from their supporting structures, the brushes being stably held in the distributor cap until it is desired to remove them. The frictional engagement between the spring 29 and bore 32, however, is not sufficient to prevent brush 26 from being pressed outwardly toward the open end of the passage to make good electrical contact with the confronting members such as member 15.

Simply by way of example the following dimensions are given of the parts of a typical brush and lead assembly made in accordance with the invention. Spring 29 has an outer diameter of .180 inches and a free or relaxed length of .875 inch. When assembled with its lead wire 30, the spring has a compressed length of .562 inch, and when thus compressed exerts from 6 to 8 ounces of forward thrust upon brush 26. As noted, passages 32 are square. A typical passage employed with a brush and lead assembly as set out above at its opposite side spaced a distance of .189 inch.

The present invention provides a sliding electrical contact which is simple in construction and which is self-retaining when inserted in an open-ended supporting passage. The assembly has the advantage that it is rendered self-retaining without the addition of any parts thereto, and also that it does not interfere with the action of the spring impressing the brush forwardly into contact with its confronting electrically contacting element.

Although only a single embodiment of the invention has been illustrated in the drawings by way of example, it is to be expressly understood that various changes, such as in the relative dimensions of the parts, the materials used and the like, may be made therein without departing from the spirit and scope of the invention as will now be apparent to those skilled in the art.

What is claimed is:

1. An electrical brush assembly adapted for insertion as a whole into a straight brush-holding passage in a supporting structure, said assembly comprising a brush member, a coil compression spring having one end abutting and held in alignment with the brush member, a flexible wire connected to the brush member and extending generally axially within the spring, and an electrically conductive washer-like member beyond the other end of the spring and centrally connected to the wire, the washer-like member having an effective diameter which is no greater than that of the spring, the parts being so constructed and arranged that when the spring lies generally straight and in alignment with the brush member the wire holds the spring in compression, the spring having generally the same effective width of section as the brush member, the uncompressed length of the spring exceeding the length of said flexible wire to such an extent that when the assembly is unconfined the spring is bent through an angle on the order of at least a substantial fraction of 90° throughout its length.

2. An electrical brush assembly as defined by claim 1, wherein the brush member is polygonal in cross-section, the coil spring is circular in cross-section, and the outer diameter of the spring is no greater than the diameter of the imaginary axial cylinder which is tangent to the midpoints of the sides of the brush member.

3. In electrical apparatus wherein there are a movable contact member, a supporting structure fixedly mounted with respect thereto, and a brush member held in a polygonal passage in the supporting structure generally directed toward the movable contact member for cooperation therewith, the improvement which comprises a brush assembly slidable as a whole within the passage, the brush assembly comprising a brush member accurately fitting and slidably mounted in the passage, a circular coil compression spring wholly within the passage and having one end abutting and held in alignment with the brush member, the spring having an effective outer diameter somewhat less than that of the passage, a flexible wire connected to the brush member and extending generally axially within the spring, and an electrically conductive washer-like member within the passage, beyond the other end of the spring, and centrally connected to the wire, the washer-like member having an effective diameter which is no greater than that of the spring, the parts being so constructed and arranged that when the spring lies generally straight and in alignment with the brush member the wire holds the spring under an initial compression, that the uncompressed length of the spring exceeds the length of said flexible wire to such an extent that when the assembly is unconfined the spring is bent through an angle on the order of at least a substantial fraction of 90° throughout its length, and that when the brush assembly is operatively mounted in the apparatus the spring is under an additional compression whereby it frictionally engages the wall of the passage at randomly-spaced zones.

4. Electrical apparatus as claimed in claim 3, wherein the supporting structure overlies the movable contact member, the passage in the supporting structure is directed generally vertically, the upper end of the passage is closed, the lower end of the passage is open, and the lower end of the brush member protrudes downwardly beyond the lower end of the passage.

References Cited in the file of this patent

UNITED STATES PATENTS

985,518	Elers	Feb. 11, 1918
1,318,713	Aalborg	Oct. 14, 1919
1,746,650	Harrington	Feb. 11, 1930
2,194,620	Sekyra	Mar. 26, 1940
2,274,154	Morgan et al.	Feb. 24, 1942
2,284,384	Evans	May 26, 1942
2,372,490	Hartzell	Mar. 27, 1945
2,516,608	Wightman	July 25, 1950
2,548,631	Stapleton	Apr. 10, 1951

FOREIGN PATENTS

456,774	Great Britain	Nov. 16, 1936