

Sept. 2, 1958

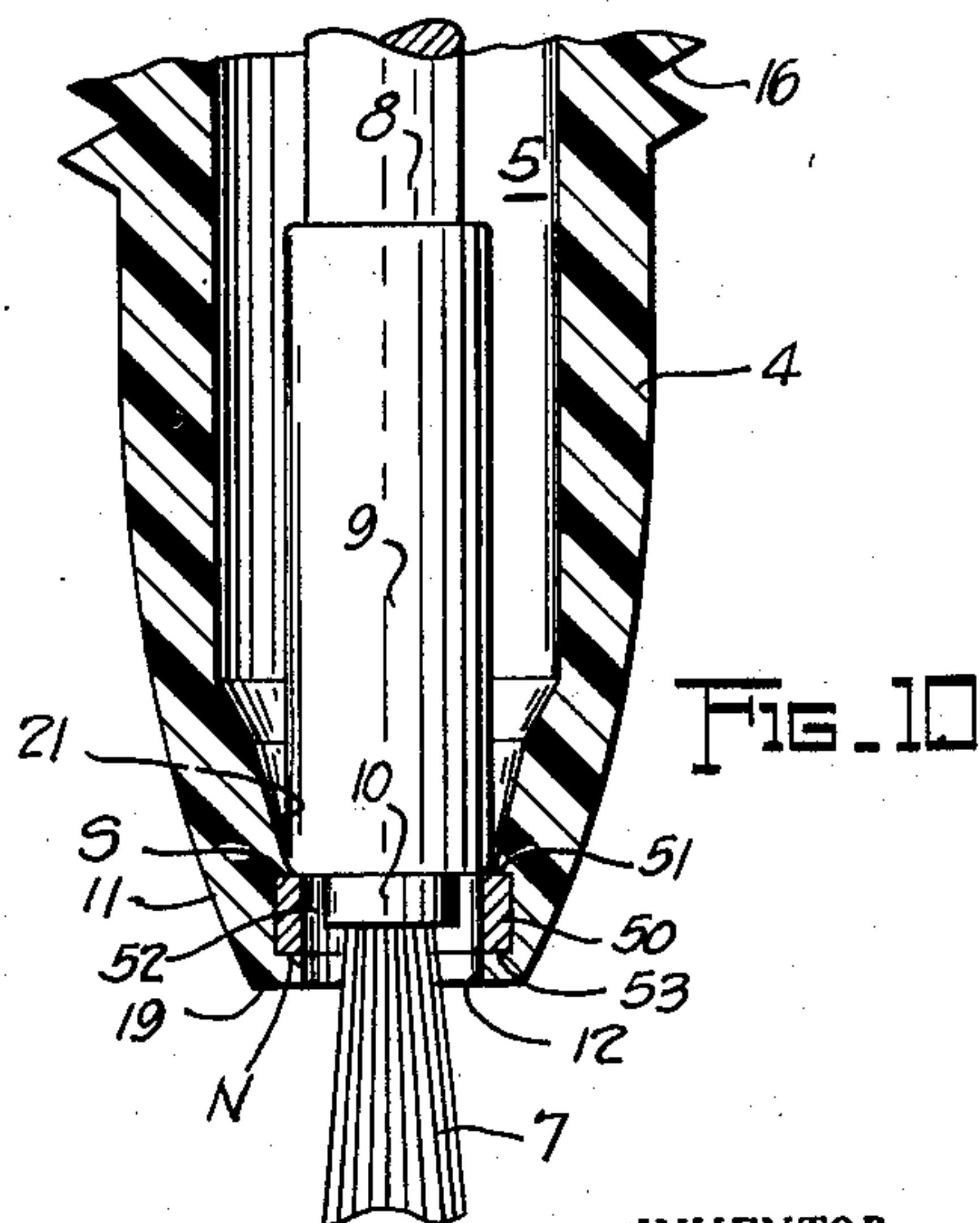
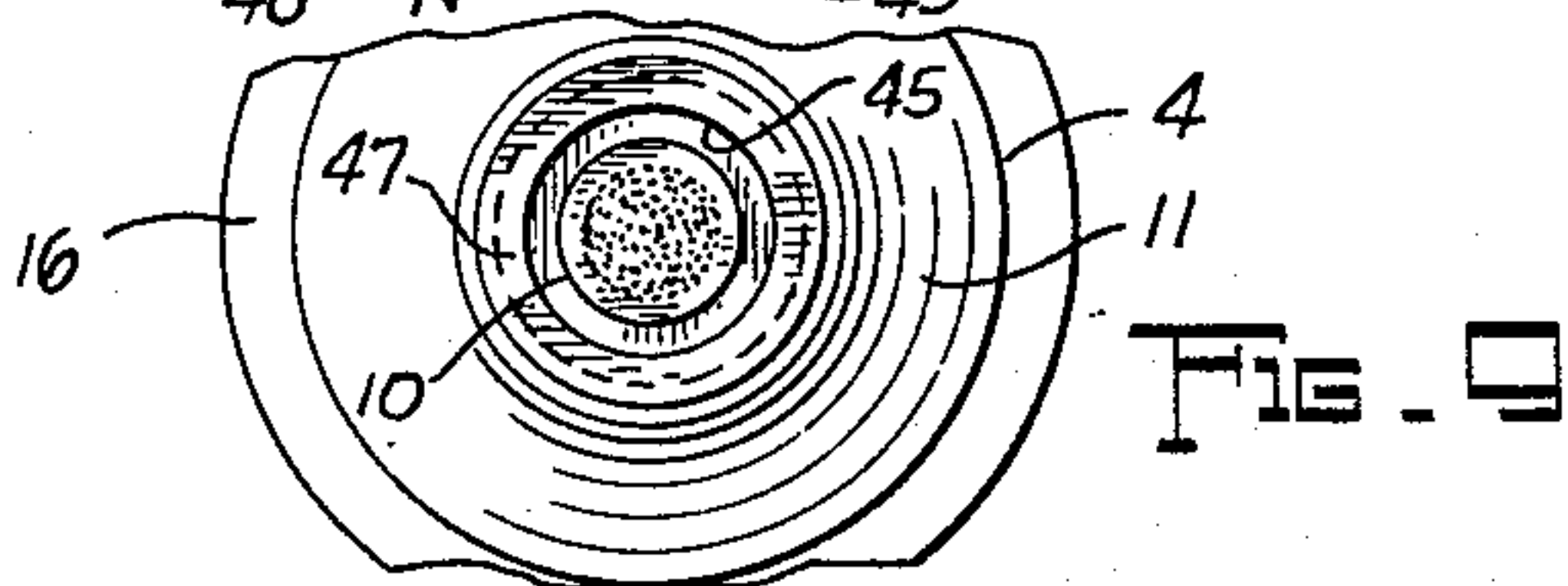
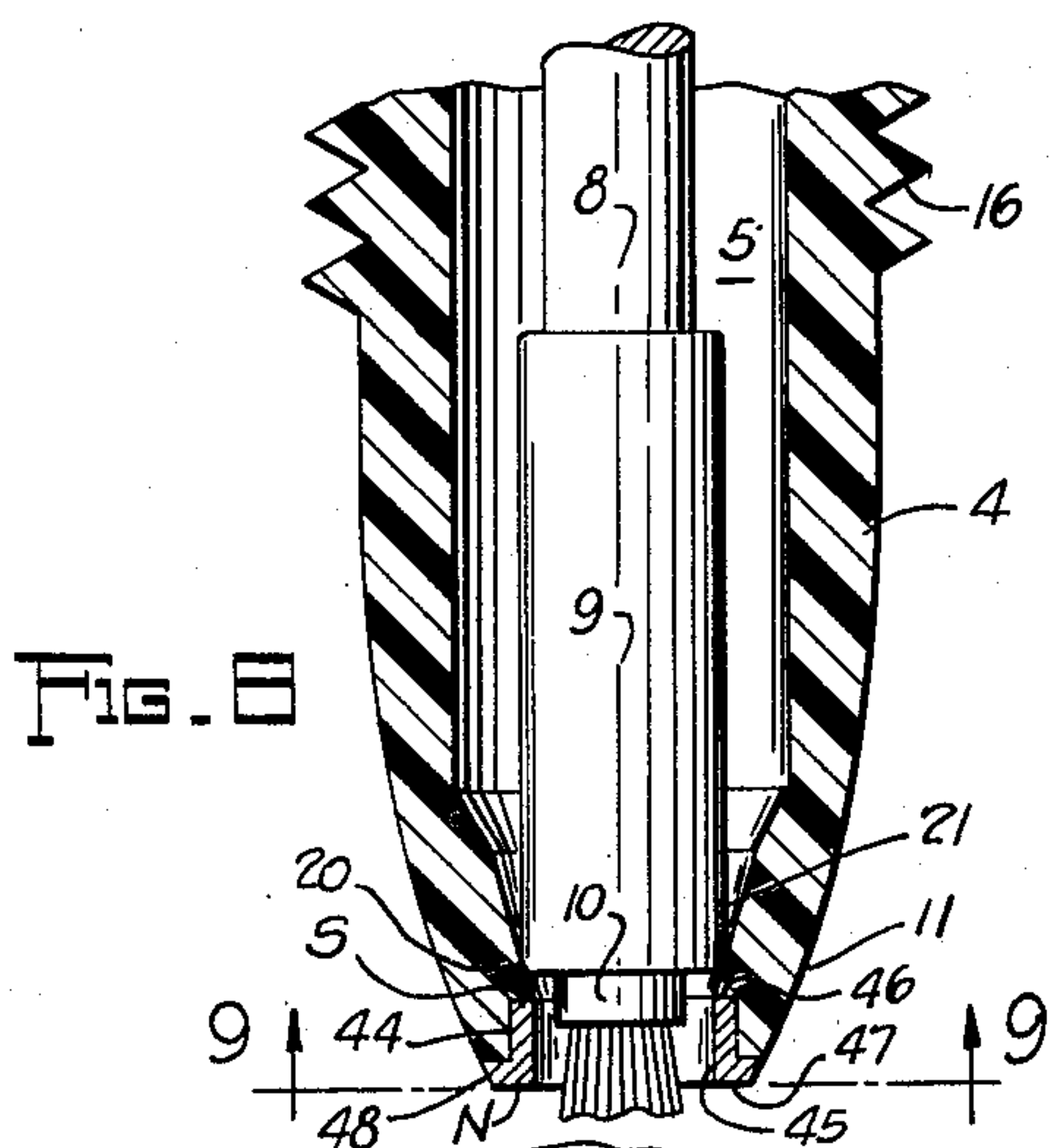
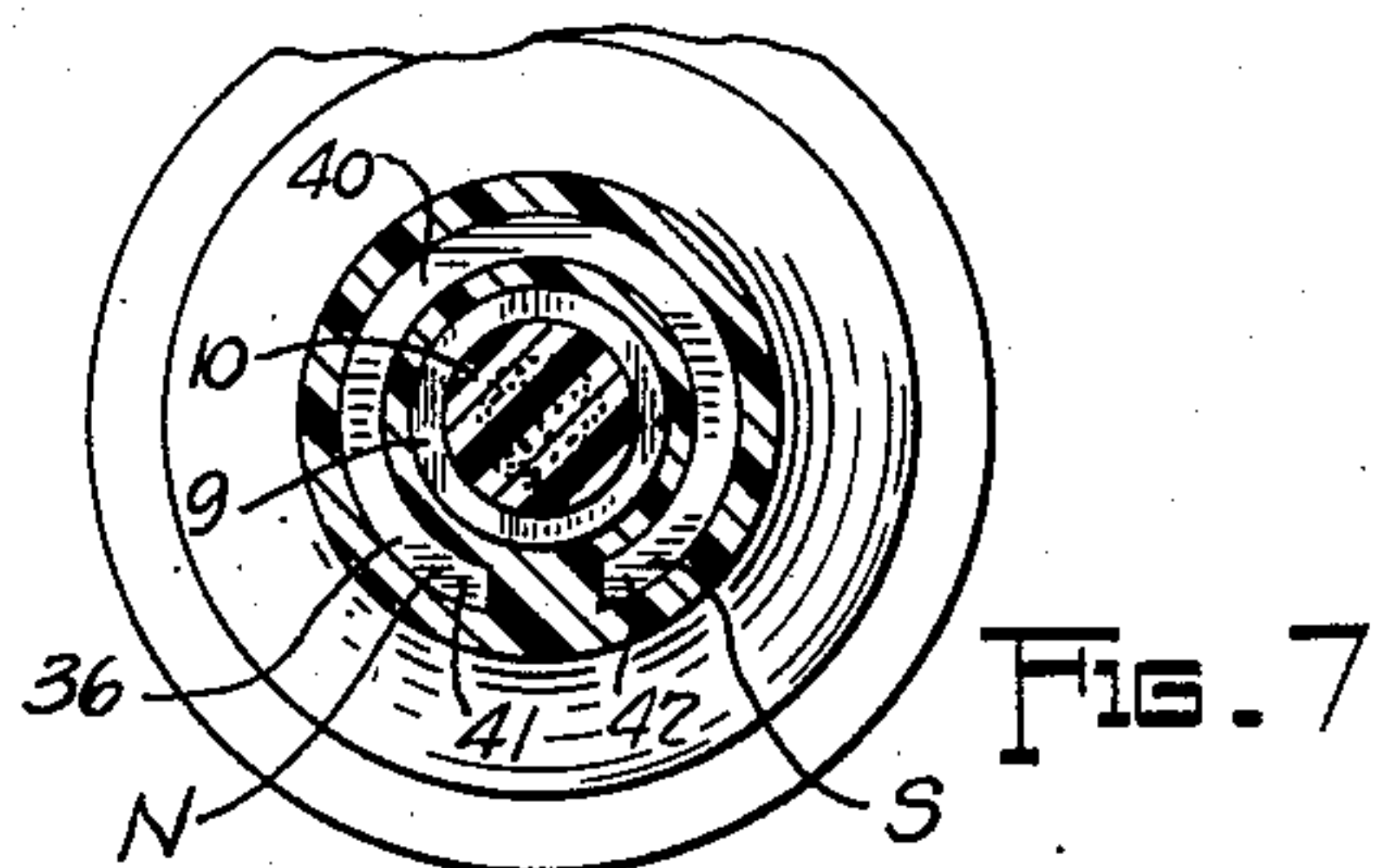
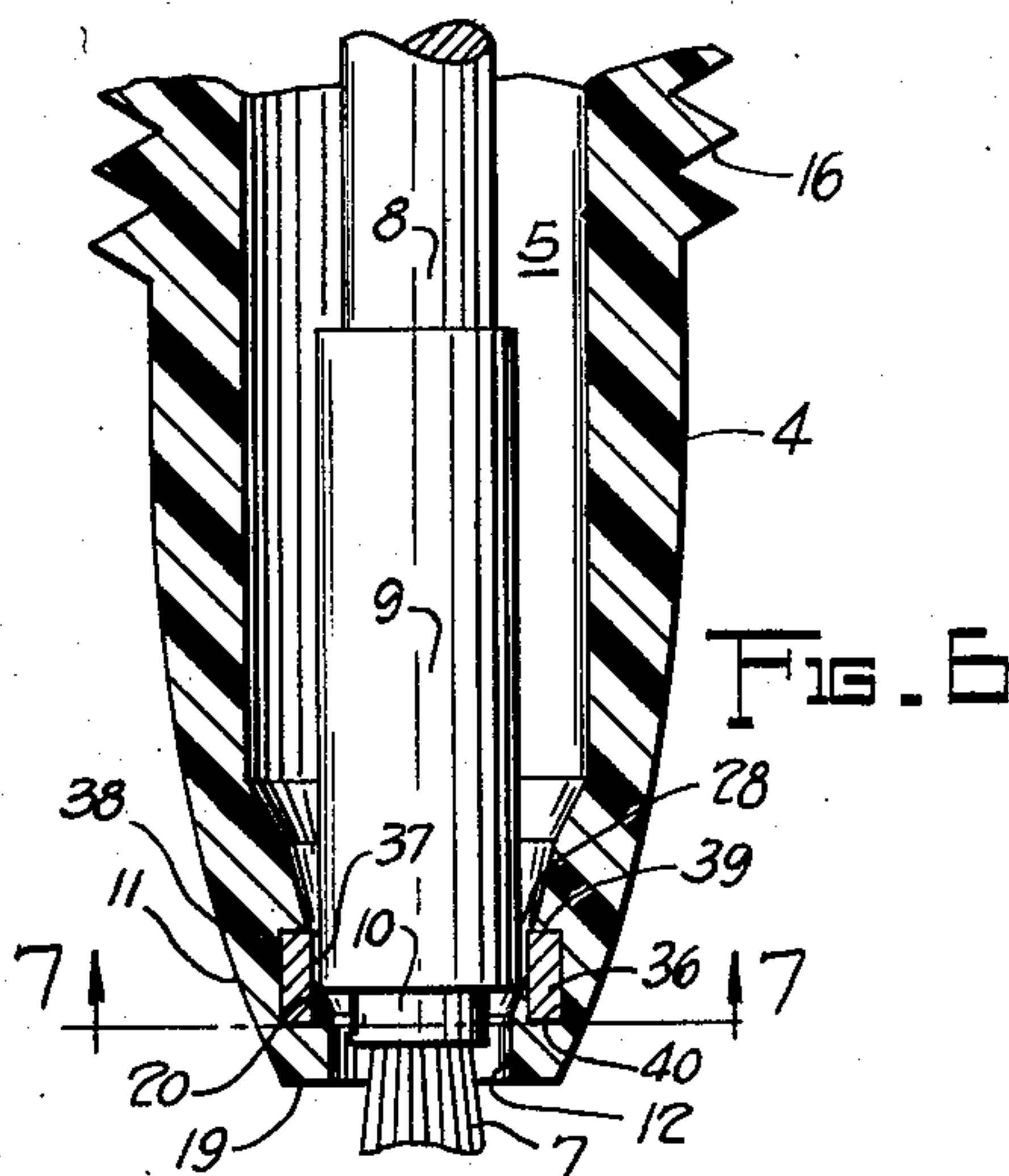
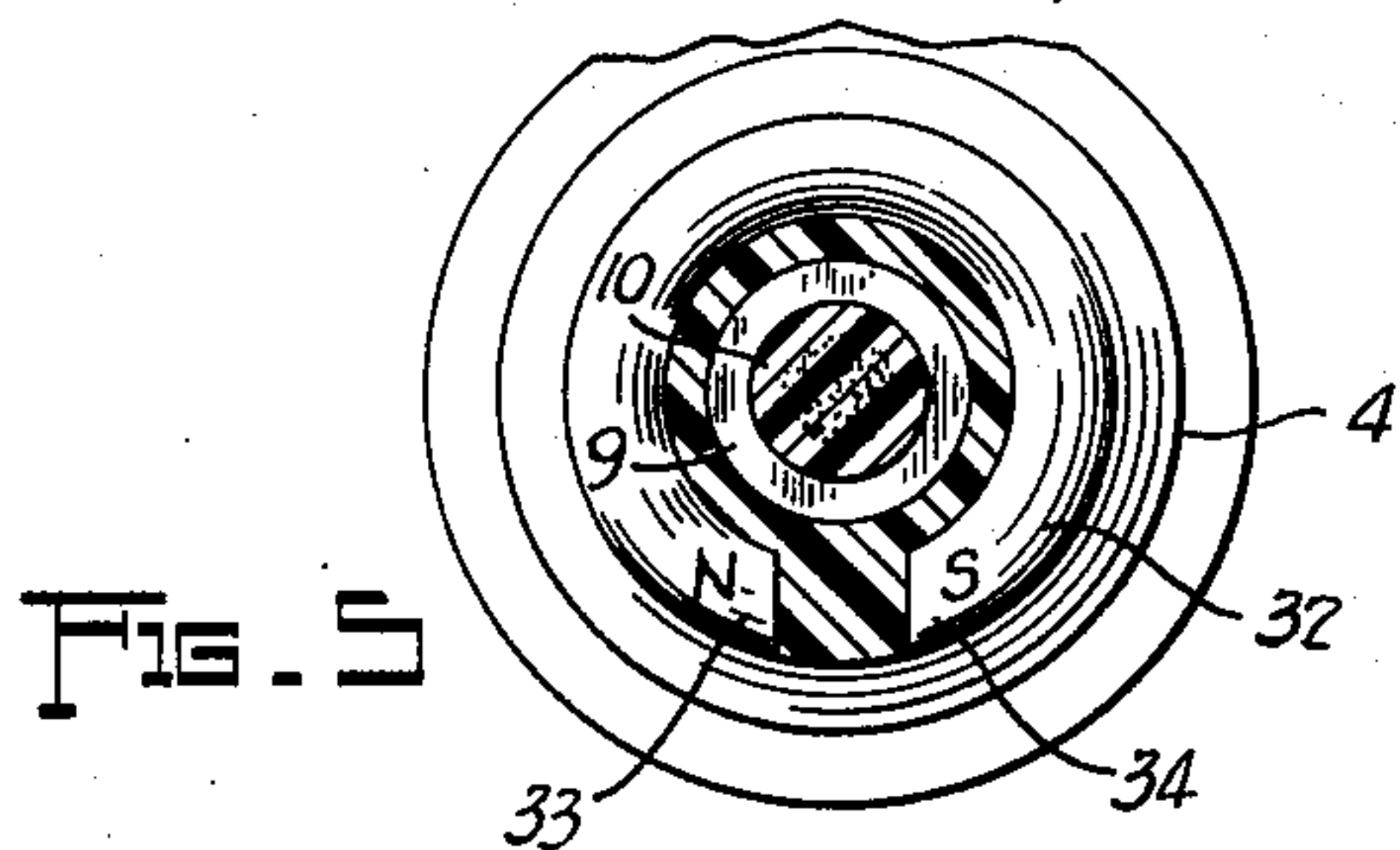
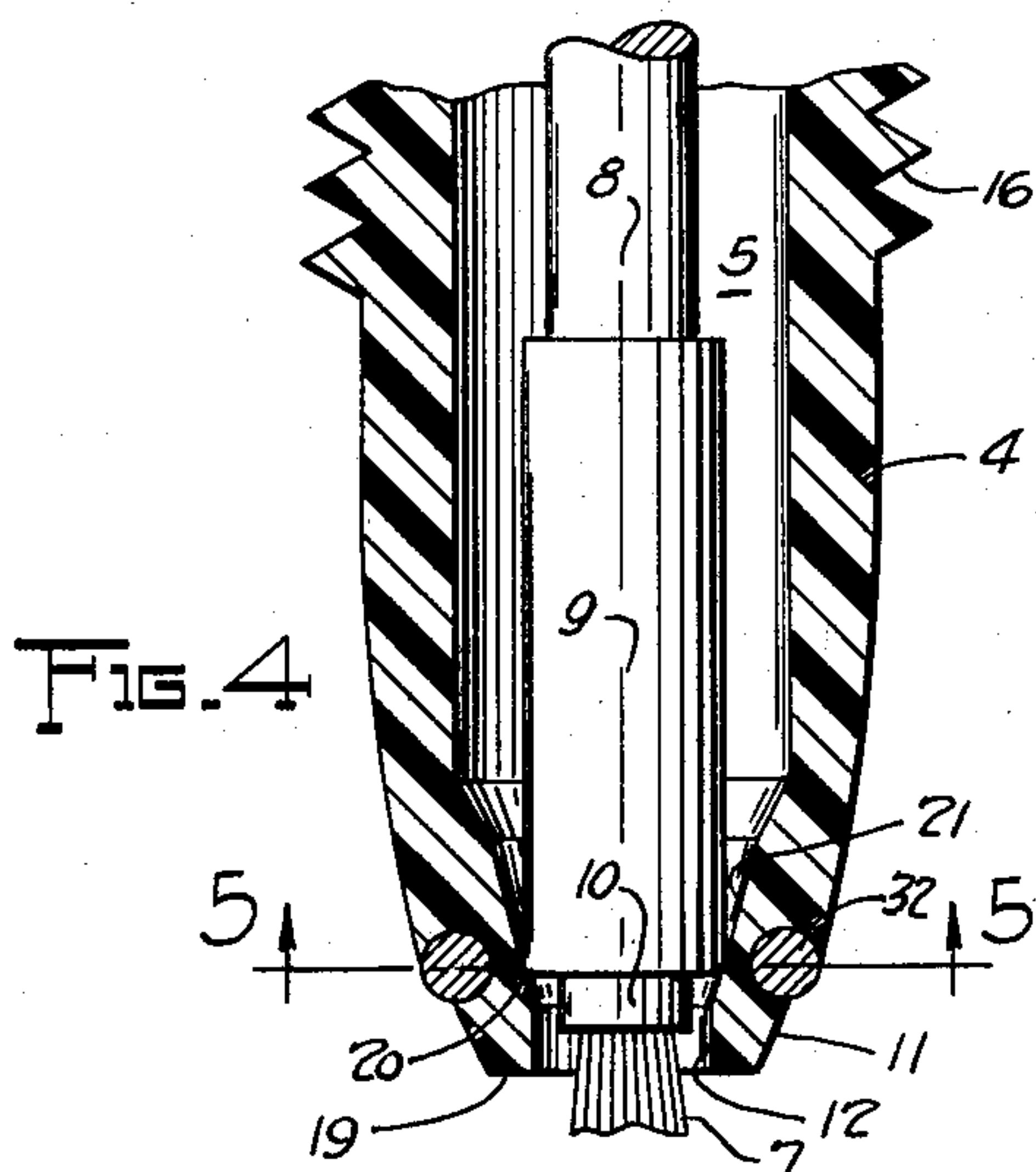
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2,849,738

RETRACTABLE BRUSH APPLICATOR WITH MAGNETIC BRUSH RETAINER

Filed Dec. 30, 1955

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

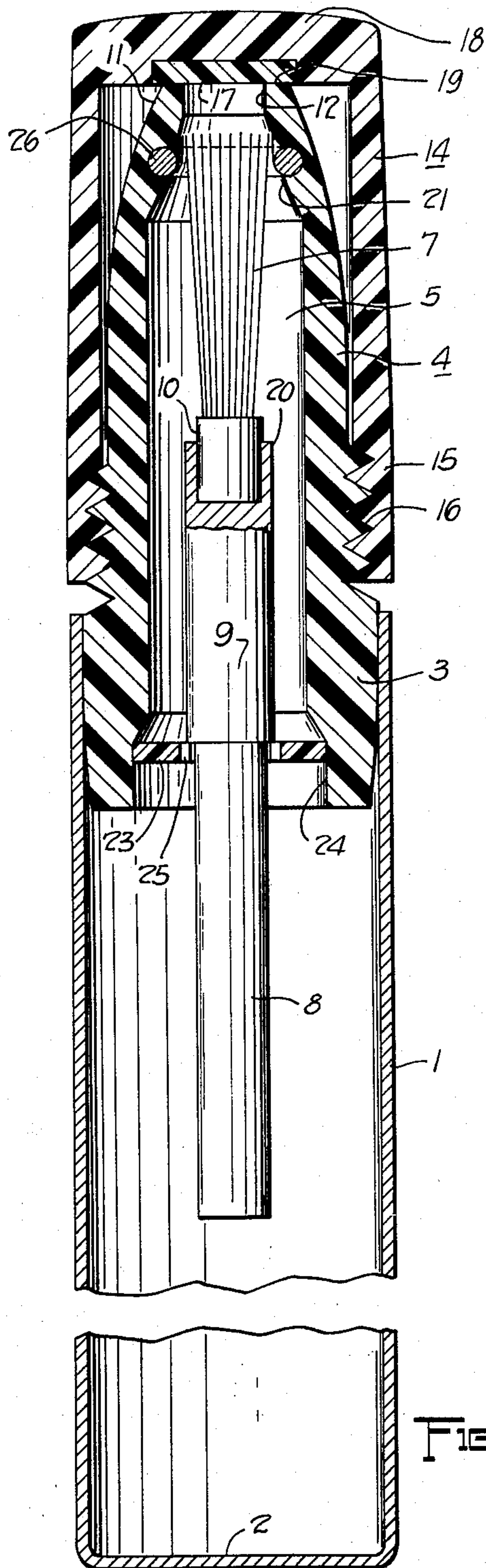


FIG. 2

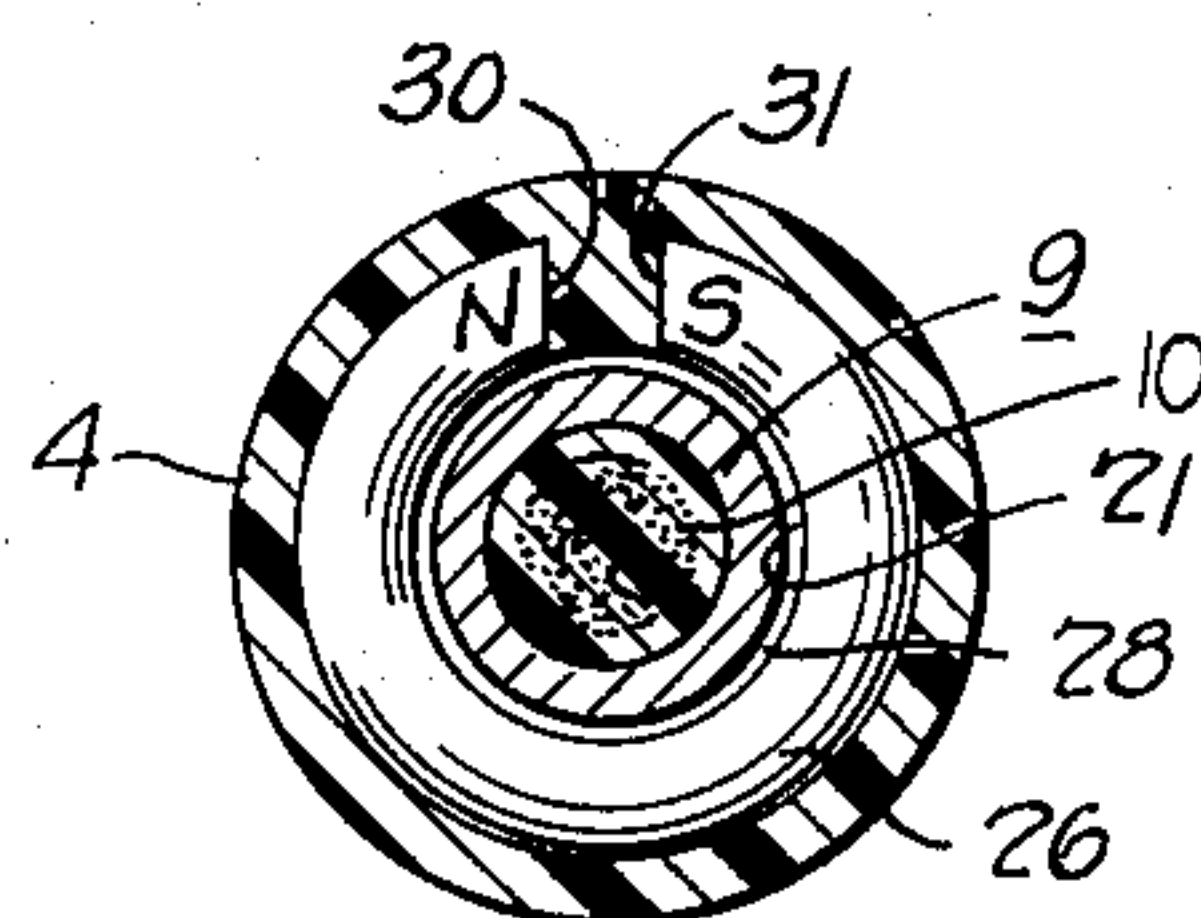
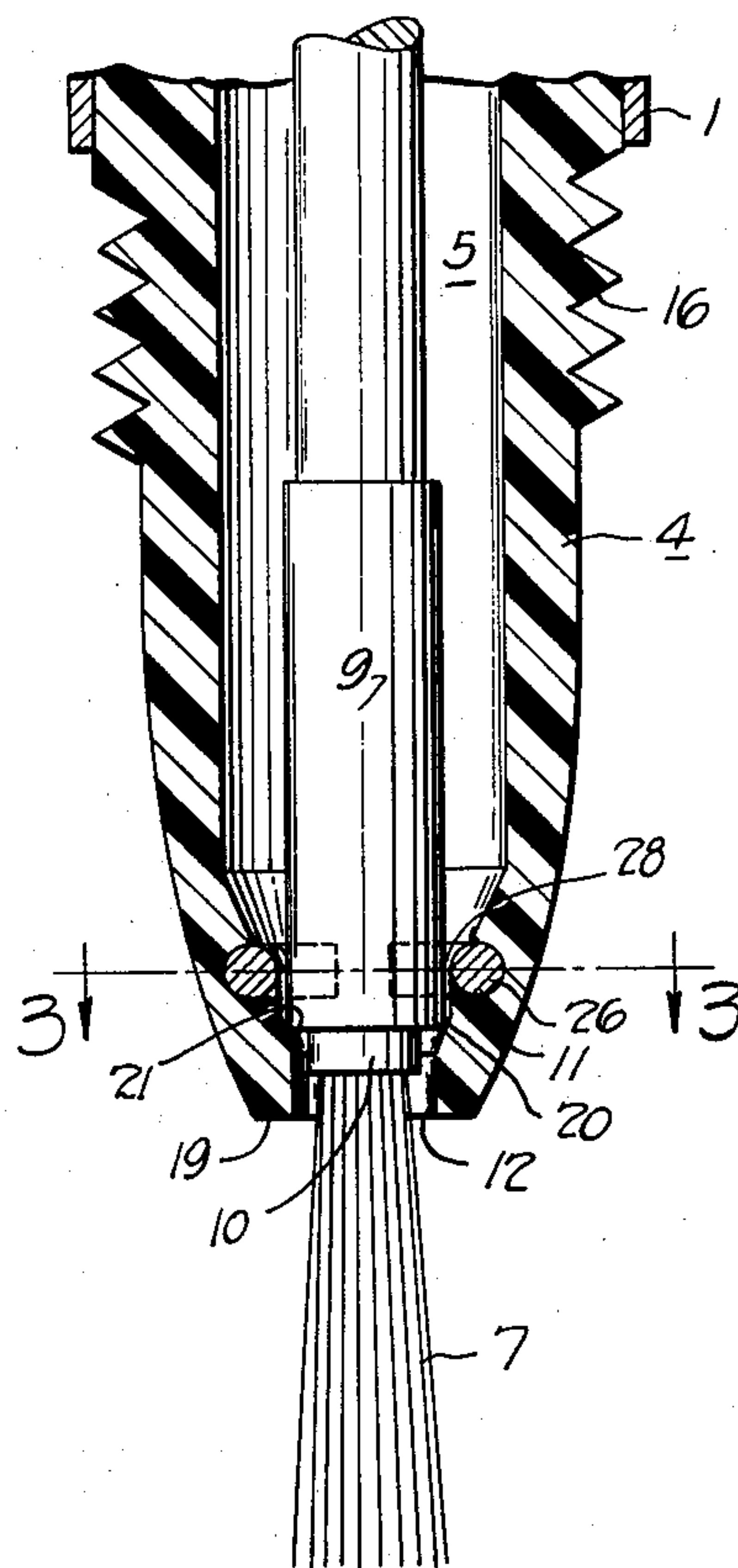


Fig. 3

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RETRACTABLE BRUSH APPLICATOR WITH MAGNETIC BRUSH RETAINER

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7 Claims. (Cl. 15—139)

This invention relates to liquid applicator devices of the type in which a brush or other yieldable liquid applying element is stored interiorly of an hermetically sealed container for the liquid, and the container has a discharge opening which is unsealed and through which the brush or applying element is projected for use.

In applicators of the character referred to it is desirable to provide means for holding the brush in projected use position so that the brush is not forced back into the container by the slight endwise pressure which is incidental to using the brush in applying the liquid. In one type of well-known applicator, shown and described in United States Patent 2,485,494, issued 18 October 1949 to Harry W. Jockers on Gravity Controlled Liquid Applying Device, the brush is carried by a weighted stem so that by removing the sealing cap and then pointing the nozzle downwardly the weighted stem drops by gravity and projects the brush through the discharge opening for use. When such an applicator is turned to a position in which the discharge opening is pointed upwardly the brush is drawn into the container by the dropping of the weighted stem. The gravity controlled applicator as previously known is thus unsuited to uses such as painting or touching up an undersurface on an appliance, automobile or article of furniture.

In the case of an applicator having a spring or other resilient means biasing the brush and stem to the projected use, such as described and claimed in copending application for patent Serial Number 379,581, filed 14 September 1953, for Fountainbrushes for Mobile Material, it is desirable, particularly with a stiff brush, to provide means other than the spring for retaining the brush in the projected position.

It is, therefore, the aim and objective of the present invention to provide improved means for holding the liquid applying brush or element in projected use position in applicator devices of the type referred to. This objective is achieved by incorporating magnetic elements in the device, one carried by the container and the other carried by the stem or movable liquid applying component. These magnetic elements are so arranged that when the liquid applying brush is in projected use position the lines of force between the magnetic elements resist return movement of the brush to the retracted or nonuse position within the container. As another aspect of the invention the magnetic elements are so arranged that the magnetic lines of force bias the brush to projected use position and thus augment the force of gravity in the case of a gravity actuated device or the force of the projection spring in the case of a spring actuated device in moving the brush to projected use position. The best known mode of practising the principles of the invention is illustrated in connection with certain preferred embodiments illustrated in the accompanying drawings, which form part of the specification.

In the drawings:

Figure 1 is a foreshortened longitudinal sectional view of a gravity controlled applicator having a ring magnet

embedded in the plastic nozzle of the container adjacent the discharge opening so as to influence the steel brush-carrying stem toward projected use position and to hold the stem and brush so projected;

Fig. 2 is a fragmentary longitudinal sectional detail showing the applicator of Fig. 1 in inverted use position with the brush projected through the discharge outlet;

Fig. 3 is a sectional detail taken transversely through the nozzle in the plane of the magnet represented by line 3—3 of Fig. 2;

Fig. 4 is a fragmentary longitudinal sectional detail, similar to Fig. 2, showing a modification in which the split ring magnet is embedded in the nozzle body adjacent the outer surface;

Fig. 5 is a sectional detail with parts broken away and removed, taken substantially in the plane of the magnet of the embodiment of Fig. 4 represented by the line 5—5 of that figure;

Fig. 6 is a fragmentary longitudinal sectional detail, similar to Figures 2 and 4, illustrating another modification, in which a split ring magnet having a rectangular radial section is embedded in the nozzle body close to the internal walls which define the liquid passage and adjacent the discharge outlet;

Fig. 7 is a transverse sectional detail through the end of the nozzle body of Fig. 6, taken substantially in the plane of the split ring magnet represented by the line 7—7 of that figure;

Fig. 8 is a fragmentary longitudinal sectional detail, similar to Fig. 2, through the nozzle body of an applicator, showing another modification, in which a sleeve-like magnet, completely annular in extent, is carried by the tip end of the nozzle body and defines the discharge opening;

Fig. 9 is an end view of the applicator of Fig. 8 with parts broken away and removed, this view being taken substantially on the transverse plane represented by line 9—9 of Fig. 8; and

Fig. 10 is a fragmentary longitudinal sectional detail, similar to Fig. 2, through the nozzle body of a gravity controlled applicator showing a modification in which annular ring magnet is disposed in the nozzle body just inside the discharge opening so as to define the discharge passage and a circular valve seat which is engaged by the brush-carrying stem to seal the liquid passage when the brush is in projected position.

The present invention is of utility in applicators having containers of various shapes and constructions but, for simplicity, is illustrated in connection with applicators having containers comprising a receptacle 1 conveniently formed of aluminum as by drawing into substantially cylindrical tube shape having a closed end 2 which constitutes a bottom for the applicator device 1 in upright or storage position. The other end of the tubular receptacle receives as by a sealing press fit the generally cylindrical end 3 of a tubular nozzle member 4 molded of a suitable nonmagnetic material such as phenolformaldehyde, a urea resin or a hard plastic composition. Extending axially through the circular sectioned nozzle body is a passage 5 for the liquid which accommodates an axially movable brush assembly comprising a stem and a brush 7. The stem is formed of soft iron or steel having good magnetic properties and may include a relatively long rod portion 8 and a relatively short brush holding portion 9. The end of the brush holding portion is bored to receive as by a press fit a plastic element 10 in which the brush bristles 7 are embedded. Outer end portion 11 of the nozzle body member 4 is tapered and terminates in a discharge opening 12 through which the brush is projected for use and through which liquid flows onto the brush when the device is being used to apply the liquid to the surface to be covered.

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When the device is not in use the discharge opening 12 is sealed by a thimblelike cap 14 which is received over the nozzle member 4 and held in place as by a threaded joint comprising internal threads in skirt portion 15 of the cap and external threads 16 on the nozzle body adjacent the base of the latter. Circular disc 17 of deformable plastic material such as polyethylene is retained in a recess in bottom 18 of the closure cap 14 and is engaged by tip end 19 of the nozzle body to seal the discharge opening when the closure is tightened in place.

When the cap is removed and the applicator device inverted, the weight of the brush assembly causes such assembly to move downwardly by gravity to the use position shown in Fig. 2, projecting the brush 7 through the discharge opening 12 and bringing circular edge corner 20 on the end of the stem portion 9 into circular line contact sealing engagement with a tapered frustoconical wall portion 21 of the nozzle body passage adjacent the discharge opening. In this endwise travel of the brush assembly projecting the brush, and likewise in reverse travel retracting the brush, the rod portion 8 of the stem is guided by a flat circular washer 23 of fiber or plastic press fitted into an enlarged circular sectioned or counterbored portion 24 of the nozzle passage 5 located in the cylindrical base end 3 of the nozzle, this enlarged passage portion 24 opening through the base end of the nozzle body and constituting the fluid receiving opening of the nozzle. The washer 23 has a loose fit about the stem of the brush assembly, providing an annular clearance through which the liquid flows from the receptacle tube 1 into the interior of the nozzle when the applicator is held in the inverted position of Fig. 2. In addition to this annular clearance between the centering washer 23 and the stem of the brush assembly which constitutes a metering orifice for regulating the rate to flow of liquid to the nozzle chamber 5, the inner margin of the washer may be formed with radial notches 25 that are continuous with such annular clearance to augment the flow of the liquid as in the case of a relatively viscous material like lacquer.

Adjacent the circular line of contact between the brush stem and the tapered seat 21 in the nozzle passage a magnetic element is secured inside the nozzle body as by being embedded in the walls which define the nozzle passage. This magnetic element here takes the form of a circular split ring magnet 26 of high coercive force. This magnet may comprise any of the high efficiency ferrous alloy metals, such as the aluminum-nickel-iron alloys or a powdered metal magnet having the desired high coercive force. Because of the relatively small size of the applicator, the circular sectioned nozzle having an external diameter of the order of about $\frac{7}{16}$ inch, the magnet element 26 is necessarily very small, thus requiring a magnet of high coercive force to hold the brush assembly in projected position during normal use. The inside diameter of the magnet 26 is larger than the external diameter of the stem portion 9, providing a clearance space 28 for free movement of the brush assembly and through which liquid held in the device flows to the annular orifice provided between the nozzle valve seat 21 and the circular edge corner 20 of the brush stem when the latter is shifted away from such valve seat. As shown in Fig. 3, the distance between ends 30 and 31 of the magnet is greater than twice the radial dimension of the clearance 28 between the magnet and the brush stem so that the stem provides a low reluctance path for the magnetic lines of force extending between the opposite poles 30, 31 of the magnet. The magnetic attraction which thus exists between the poles of the magnet 26 and the soft iron or steel portion 9 of the brush assembly strongly resists endwise movement of the brush assembly away from the projected use position of Fig. 2. The magnetic force lines may draw the brush stem laterally away from the concentric position illustrated in Fig. 3 to a laterally displaced position in which the stem contacts the side wall of the nozzle passage 5 ad-

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jacent the magnet ends 30, 31. This lateral displacement is corrected, however, by firmly seating the edge corner 20 of the brush stem against the frustoconical valve seat 21. Such firm seating normally occurs by reason of the weight of the magnetic metal parts 8, 9 of the brush assembly, which tend to seat the circular edge corner 20 snugly, especially when the container is filled with a liquid of relatively low viscosity. To embed the magnet 26 in the desired predetermined location during the molding of the plastic tubular nozzle body 4, the split ring magnet is mounted on the core of the mold, the latter being formed with a circumferentially extending groove that matches the shape of the magnet ring 26 so that the magnet ring can be snapped into predetermined position on the core before the latter is inserted into the mold. The circumferential groove in the molding core is of the same circumferential extent as the magnet ring 26, the core pin having a land bridging the gap between the magnet ends 30, 31.

With the brush assembly shifted by gravity to the use position of Fig. 2, the magnetic lines of force acting between the magnetic iron of the brush stem and the embedded magnet fast in the nozzle body resist endwise shifting of the brush assembly away from such projected position. In the case of a brush assembly having the rod and brush holding portions 8, 9, formed of cold rolled steel, weighing from about .15 ounce to about .25 ounce, a circular split ring magnetized element 26 formed of high coercive strength magnet wire of the order of about $\frac{1}{16}$ inch diameter, such as sold commercially under the trade name "Alnico," obtains sufficient biasing force, resisting displacement of the brush assembly from projected use position to permit upending of the applicator in painting the undersurface of an appliance, article of furniture or vehicle. In such case the gap between the ends or poles 30, 31 of the magnet is of the order of about $\frac{1}{16}$ inch, although, of course, wider gaps may be employed. Although the biasing force of the magnetic attraction between the elements is sufficient to permit use of the applicator with the brush directed upwardly and also to prevent unseating of the circular valve corner 20 in normal painting use on a flat surface, it is feasible by manipulating the device so as to exert direct endwise pressure on the bristles of the brush 7 to shift the brush assembly axially sufficient to unseat the valve edge corner 20 and permit a quantity of liquid to flow out the discharge opening 12 of the nozzle onto the still projected brush 7.

After a period of use or when otherwise it is desired to retract the brush into the nozzle, the device is upended and the brush stem element 9 is removed from the effective retaining force of the magnetic element 26 by tapping the closed end 2 of the receptacle. As soon as the brush stem is thus released from the retaining influence of the magnet 26 the brush assembly drops by gravity to the retracted position of Fig. 1, permitting the cap 14 to be replaced over the nozzle, and the discharge opening 12 to be sealed by the deformable disc 17 in the end of the cap.

Figures 4 and 5 illustrate a modification of the invention in which a magnetic element in the form of an Alnico or powdered metal magnet 32 of high coercive strength is embedded in the tapered outer end portion 11 of a nozzle body adjacent the outer surface thereof. An advantage of locating the magnet 32 on the outside of the nozzle body as distinguished from the inside location used in the embodiment of Figures 1-3 is the possibility of using a relatively larger magnet, since the radial thickness of the magnet is not limited by the wall thickness of the nozzle. The magnetic lines of force linking the brush holding steel portion 9 of the stem assembly with the poles 33, 34 of the magnet 32 act through the nonmagnetic plastic material of which the nozzle body 4 is constructed. The gap between the poles 33, 34 of the magnet is greater or has greater magnetic reluctance than the path of the force lines through the walls of the nozzle

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body which define the tapered valve seat portion 21 and through the end of the portion 9 of the brush stem.

In making the device of Figures 4, 5 the split ring circular sectioned magnet 32 is positioned in the mold cavity and held as by a friction fit in a circumferential groove provided to receive the magnetic ring. Upon completion of the molding portion the nozzle body 4 is withdrawn from the mold, carrying with it the embedded magnet 32.

Figures 6 and 7 illustrate an applicator in which the brush is held in projected use position by a split ring magnet 36 which is rectangular in radial cross section, being otherwise like the device shown in Figures 1-3. The rectangular sectioned ring magnet 36 is formed so that the greater dimension of its rectangular section represented by its cylindrically curved inner and outer surfaces 37 and 38, respectively, parallels the axis of the nozzle, the narrow dimension of the rectangular section represented by flat end faces 39 and 40 being radial or in a direction normal to the nozzle axis. The inside diameter of the magnet 36 is greater than the cylindrical brush holding portion 9 of the brush assembly, providing the desired annular clearance between the parts for the flow of liquid past the sealing edge corner 20 of the brush stem when the latter is unseated.

In molding the nozzle body of the device of Figures 6, 7 the magnet 36 is mounted on the mold core, which is formed with a matching circumferential groove to locate the magnet. A land on the mold core between the ends of the circumferential groove is disposed between magnet poles 41, 42 so as to define that portion of the wall of the liquid passage through the nozzle that extends between the spaced poles of the magnet.

Figures 8 and 9 illustrate a modified applicator nozzle in which, in lieu of a split ring magnet, as described in connection with the preceding figures, there is employed a magnet 44 which is completely annular in extent and is in the form of a cylindrical sleeve recessed in the end of the nozzle body so as to define a discharge opening 45 corresponding to the circular discharge opening 12 of the preceding figures. The magnet 44 is formed of magnetic material having high coercive force and is polarized axially. That is to say, one pole is at inner end 46 and the other pole is at outer end 47. The sealing edge corner 20 of the cylindrical portion 9 of the steel stem engages the frustoconical valve seat 21 at a circular contact line spaced axially from the inner pole or end face 46 of the magnet so that actual contact between the magnetic element of the stem and the magnetic element of the nozzle body is prevented. As a refinement of the design, this sleeve-like magnet is formed at its outer end with a radially projecting circular flange 48 which overlies the tip end of the nozzle body and is sealingly engaged by the deformable sealing disc 17 when the closure cap 14 is applied over the nozzle end after the brush has been retracted.

Fig. 10 illustrates a modification similar to Figures 8 and 9, in that a completely annular sleeve-like magnet is employed in lieu of the split ring type first described. In the arrangement of Fig. 10, however, inner end face 51 of magnet 50 is partially exposed within the nozzle passage and forms a shallow radial shoulder in such passage which constitutes a circular valve seat engaged by flat end face 52 of the brush holding portion 9 of the steel stem. Thus direct metal to metal contact is obtained in the device of Fig. 10 providing strong magnetic attraction holding the brush 7 in the projected use position. Outer pole or end face 53 of the magnet 50 may extend to the tip end 19 of the nozzle or, as shown, may terminate short of the nozzle tip so as to be hidden from view by the material of the nozzle body. In some applications it may be desirable to employ a sleeve magnet of greater axial length than shown in Fig. 10, it being feasible for such purpose to extend the length of the nozzle body, using longer bristles in the brush 7, if desired. Because

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of the strength of the magnetic forces holding the steel stem portion 9 against the inner end pole 51 of the sleeve magnet it may be desirable to provide a positive means for retracting the brush to storage position instead of tapping the end of the applicator. A suitable arrangement for effecting positive retraction of the brush is shown in my copending application Serial Number 379,851 referred to above and comprises a central pin carried by the sealing washer 17 and extending longitudinally through the closure cap 14 on the axis of the latter. When the closure cap is applied over the end of the nozzle the pin is received in the brush 7 and engages the base of the brush or the plastic holding element 10 to exert positive endwise pressure on the brush assembly and thereby force the brush to retracted position as the cap is screwed into place.

The present invention thus provides magnetic elements in combination in a liquid applicator of the type in which a brush assembly comprising an elongated stem and a tuft of bristles on one end of the stem is movable axially through the bore of a tubular nozzle. Movement in one, or the forward, direction projects the brush bristles or tuft through the axial discharge opening in the tip end of the nozzle body to a position of use, and movement in the other, or reverse, direction withdraws the brush tuft into the interior of the nozzle so that a sealing cap can be applied against the discharge opening. Magnetic elements, one on the brush assembly and one on the nozzle body, are so arranged that the magnetic lines of force between them tend to hold the brush assembly with the tuft of bristles in projected use position. Although in each of the several embodiments described the magnetized element is carried by the nozzle body and the soft iron or armature element of the magnetic combination is carried by the stem, it is contemplated that the parts may be reversed so that the magnet is carried by the stem and the soft iron armature is carried by the nozzle body.

In accordance with the patent statutes the principles of the present invention may be utilized in various ways, numerous modifications and alterations being contemplated, substitution of parts and changes in construction being resorted to as desired, it being understood that the embodiments shown in the drawings and described above are given merely for purposes of explanation and illustration without intending to limit the scope of the claims to the specific details disclosed.

What I claim and desire to secure by Letters Patent of the United States is:

1. A liquid applicator of the retractable brush type comprising a hollow container having a neck formed with an outlet through which liquid is dispensed from the interior of the container, a non-magnetic tubular nozzle body fast to the container and having an axial through passage, the passage having an inner end opening continuous with the neck outlet and an outer end discharge opening, a brush assembly disposed in the nozzle passage, said assembly comprising a stem having a brush mounted on one end and including a magnetic metal element, the brush assembly being axially shiftable in the nozzle passage between a use position in which the brush projects from the discharge opening and a normal storage position in which the brush is retracted wholly within the nozzle passage, the brush assembly being shiftable from said storage position by gravitational action on said assembly when said container is disposed with the discharge opening facing downwardly, there being a magnetic metal element carried by said nozzle body, one of said metal elements being magnetized to influence the other, said magnetic metal element of the stem being juxtaposed to the magnetic metal element of the nozzle body when the brush assembly is in use position so that the magnetic forces tend to hold the brush in said use position against the application to said brush assembly of external forces of predetermined magnitude tending to move said brush assembly into said storage position when the container is disposed with

said discharge opening facing either upwardly or downwardly, and the weight of the brush assembly, when the container is disposed with said discharge opening facing upwardly and the brush is in use position, being such that when the magnetic element of the brush assembly is moved a predetermined distance from the magnetic element of the nozzle, the brush assembly is shiftable by gravitational action from said use position into said storage position.

2. An applicator as defined in claim 1 in which the magnetic element carried by the nozzle body is substantially circular.

3. An applicator as defined in claim 1 in which the magnetic element of the stem is located in the nozzle body passage and the magnetic element carried by the nozzle body is embedded therein and has a surface exposed to the passage.

4. An applicator as defined in claim 1 in which the nozzle body magnetic element comprises a tubular ferrule in the discharge opening.

5. An applicator as defined in claim 1 in which the nozzle body is formed with a valve seat in the through passage adjacent the discharge opening, the stem element engages the valve seat in the use position of the stem assembly, and the nozzle body magnetic element surrounds the stem magnetic element when the latter is so engaged.

6. An applicator as defined in claim 1 in which the nozzle body is formed with a valve seat in the through passage adjacent the discharge opening and with an annular groove inwardly of the valve seat, the stem element engages the valve seat in the use position of the stem assembly, the nozzle body magnetic element surrounds the stem magnetic element when the latter is so engaged, and the nozzle body magnetic element comprises a ring seated in the annular groove.

7. An applicator as defined in claim 1 in which the nozzle body magnetic element comprises a tubular metal ferrule secured in the passage and formed with an annular valve seat, and in which the stem of the brush assembly seats against the valve seat to seal the passage in the use position of the assembly.

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