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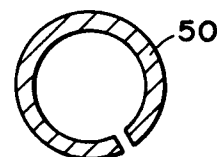
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Sevenoaks, Kent TN13 1XR (GB)(54) **Writing instrument.**

(57) A writing instrument comprising a tubular member having a spiral groove, an eraser guide member having longitudinal guide grooves, and an eraser holder having projections slidably arranged in the guide grooves of the eraser guide member, and an eraser grip portion of the eraser holder. The eraser grip portion is capable of protruding beyond the rear end of the writing instrument when the eraser holder is at the most retreated position thereof so that an eraser can be projected from a rear end of the writing instrument.

FIG. 10B**EP 0 545 917 A2**

BACKGROUND OF THE INVENTION

The present invention relates to a writing instrument which is capable of pushing out, as much as required, an elongated eraser or a stick-type solid paste through the rear end thereof, and more specifically, relates to a writing instrument of the type described above, which is convenient to use and which requires no complicated construction, a writing instrument excellent in productivity and capable of being produced at a low cost.

In order to increase a usable portion of an eraser mounted on a writing instrument, various attempts have been made on the structure of a writing instrument of the type that contains an elongate eraser which can be pushed out as much as required. For example, Japanese Utility Model Publication (Unexamined) No.57-132598(1982) discloses a structure in which a spiral groove formed on the inner surface of the rear barrel is engaged with projections of an approximately cylindrical eraser holder. The projections protrude through a slit provided in the lead container, the eraser being pushed out by rotating the rear barrel. Further, Japanese Utility Model Publication No.62-27438-(1987) discloses a writing instrument structure enabling the eraser to be pushed out in the same manner as disclosed in the above-described publication No.57-132598 except that it utilizes the spiral groove of an elastic member in the form of spiral tube and a longitudinal groove formed in the rear barrel.

However, when the eraser is to be replaced with a new one, i.e., when the eraser holder has reached the most retreated position thereof, the eraser holder is positioned inside the barrel of the writing instrument, so that it is impossible to know when to replace the eraser. As a result, the user possibly rotate the rear barrel beyond its limit, which will damage the projections of the eraser holder or the spiral groove. The former example has a relatively simple construction, but a stick of lead can be caught in the slit provided in the lead container, resulting in a malfunction. Further, it is necessary to remove the eraser each time leads are replenished. From these viewpoints, the latter example is an improvement over the former one, in that the lead container is separated from the eraser-pushibg-out mechanism (rear barrel). However, fastening of the rear barrel is effected by a projection rotatably arranged in a pivot tube, so that it is deficient in reliability and may gradually become loose. Further, this example utilizes a coil-spring-like spiral tube, so that additional elements such as a pivot tube cap for preventing the eraser holder from falling, etc. must be provided, which leads to increased cost and a time-consuming assembly operation.

SUMMARY OF THE INVENTION

A principal object of the present invention is to provide a writing instrument overcoming the problems with the prior art.

Another object of the present invention is to provide a writing instrument which is capable not only of pushing out an elongated eraser as much as required, but also allowing an easy replacement thereof.

Still another object of the present invention is to provide a writing instrument which requires no complicated structure, and which excels in productivity and can be produced at low cost.

In an embodiment of the present invention, a writing instrument comprises a spiral member having a spiral groove, an eraser guide member having longitudinal guide grooves, and an eraser holder having projections slidably arranged in the guide groove of the eraser guide member, wherein the eraser grip portion of the eraser holder is capable of protruding beyond the rear end of the writing instrument when the eraser holder is at the most retreated position thereof.

In another embodiment of the present invention, a writing instrument comprises a spiral member having a spiral groove, an eraser guide member having longitudinal guide grooves, and an eraser holder having projections slidably arranged in the guide groove of the eraser guide member, wherein either the spiral member or the eraser guide member includes a flange and an engagement step formed thereon, the spiral member is rotatably secured to the eraser guide member by means of a deformable securing member engaging with the engagement step and the flange.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1-A is a sectional view of a writing instrument embodying the present invention;

Fig. 1-B is a sectional view taken along line 1B - 1B of Fig. 1-A;

Fig. 2 is a sectional view illustrating the operation of the eraser holder;

Figs. 3 and 4 are sectional view showing other embodiments of the eraser holder;

Fig. 5 is a perspective view illustrating the operation of another embodiment of the eraser holder;

Fig. 6 is a sectional view of a writing instrument according to a second embodiment of the present invention;

Fig. 7 is a perspective view of the eraser holder of the embodiment shown in Fig. 6;

Figs. 8 and 9 are sectional views illustrating other embodiments of the eraser holder;

Fig. 10-A is a sectional view of a writing instrument according to a third embodiment of the present invention;

Fig. 10-B is a sectional view of the securing member of the embodiment shown in Fig. 10-A; Figs. 11-A and 11-B are sectional views illustrating the deforming operation of the eraser guide member;

Fig. 12 is a sectional view of an embodiment employing a securing member which has elasticity in the longitudinal direction;

Figs. 13-A and 14-A are sectional views illustrating embodiments employing the securing members shown in Figs. 13-B and 14-B, respectively; Fig. 15 is a sectional view showing a ring provided for the purpose of preventing the securing member from being detached; and

Figs. 16-A and 16-B are schematic views showing modifications of the essential parts of the securing member.

PREFERRED EMBODIMENTS OF THE INVENTION

The present invention will now be described in detail, based on the embodiments shown in the attached drawings.

Fig. 1-A shows a first embodiment of the present invention as applied to a mechanical pencil. A front metal section 3 having a well-known lead detent member or a lead retainer 2 of a desired resilient material is screwed onto the front end of a barrel 1. Inside the barrel 1 is provided a lead container 5 with an adjacent chuck 4. A spiral spring S is provided between the barrel 1 and the lead container 5, and a chuck ring 6 is slidably fitted over the front portion of the chuck 4. A tubular spiral member 7 has a spiral groove 7a and is held between a press-fitted ring 9 and a rear end flange 8b which are formed on an eraser guide member 8 and which serve to prevent an eraser holder 11, which is to be described later, from being detached and the eraser projection mechanism from being broken down. The eraser guide member 8 is irrotatably arranged between the barrel 1 and the lead container 5 (see Fig. 1-B) and has longitudinal guide grooves 8a. The spiral member 7 is rotatably arranged with respect to the eraser guide member 8. The eraser holder 11 has a grip portion 11b for securing an eraser 10 and is inserted into the eraser guide member 8, and projections 11a of the eraser holder 11 protrude beyond the guide grooves 8a of the eraser guide member 8 and are engaged with the spiral groove 7a of the spiral member 7.

The eraser pushing out operation will now be explained with respect to the above-described structure.

When the spiral member 7 is rotated with respect to the barrel 1, the projections 11a of the eraser holder 11 protruding beyond the guide grooves 8a of the eraser guide member 8, which is irrotatably arranged to the barrel 1, move along the spiral groove 7a of the spiral member 7. This movement causes the projections 11a to move backward along the guide grooves 8a. In other words, the eraser holder 11 carrying the eraser 10 moves backwards, causing the eraser 10 to protrude beyond the rear end of the mechanical pencil as illustrated in Fig. 2.

Fig. 2 shows a state in which the eraser holder 11 is placed at the most retreated position as a result of the continued pushing out operation of the eraser 10, and the grip portion 11b is shown to be protruded beyond the rear end. By providing slits 12 and a groove 13 in the grip portion 11b (see Figs. 3 and 4), it becomes possible to remove the eraser 10 from the eraser holder 11 by means of fingers or such means as a lead protector tube, which leads to easier eraser replacement. By outwardly expanding, as shown in Fig. 5, the protruding grip portion 11b, eraser replacement can be facilitated likewise.

The number of the slits and the width thereof can be determined as necessary. As for the groove, an appropriate number of them can extend over an entire circumference or only an appropriate portion thereof.

While in the illustrated embodiment of the invention the number of guide grooves 8a of the eraser guide member 8 and that of projections 11a of the eraser holder 11 are both two, one could be sufficient for either of them.

Thus, in accordance with the writing instrument described above, the grip portion 11b of the eraser holder for securing the eraser can protrude beyond the rear end of the pencil at the most retreated position thereof, which makes it possible to remind a user when to replace the eraser, facilitating at the same time the replacement operation.

Now an embodiment suited to avoiding any damage to the writing instrument due to improper handling thereof will be explained. A detailed explanation of the eraser pushing out operation will be omitted here.

Figs. 6 and 7 show a second embodiment of the present invention. In this embodiment, inwardly deformable arm portions 34 extend from a grip portion 31b of an eraser holder 31. The arm portions 34 has projections 31a which engage with a spiral groove 27a of a spiral member 27 through guide grooves 28a of an eraser guide member 28. In the examples shown in Figs. 8 and 9, slits 35 are provided in an approximately cylindrical eraser holder 31, thereby enabling it to be inwardly deformed. The number and shape of slits 35 can be

arbitrarily determined, and they may not be necessary if the eraser holder itself is made of an elastic material and is capable of inward deformation.

The operation of the above-described structure will now be explained.

As in the first embodiment, the spiral member 27 is rotated, and when the eraser holder 11 has reached the most retreated position thereof, any further rotation of the spiral member 27 causes the arm portions 34 in the vicinity of the projections 31a of the eraser holder 31 to undergo inward deformation and release the engagement of the projections 31a with the spiral groove 27a of the spiral member 27 and the guide grooves 28a of the eraser guide member 28, with the result that the spiral member 27 fails to engage and is free to rotate. Next, the spiral member 27 is rotated in the opposite direction in order to receive the eraser holder 31 has reached the most advanced position thereof as a result of this operation, any further rotation thereof results in its failing to engage in the same manner as described above.

Thus, in the writing instrument described above, the portion in the vicinity of the projections 11a of the eraser holder 11 can be inwardly deformed, so that any damage to the eraser holder 31 or the spiral member 27 due to unnecessary rotation beyond the limitation where the eraser holder is at the most retreated or advanced end of the eraser holder 31 can be avoided.

Now a desirable assembly example of the above writing instrument will be described based on an embodiment.

Fig. 10-A shows a third embodiment of the present invention as applied to a known mechanical pencil. A front metal section 43 having a well-known lead detent member 42 is screwed on the front portion of the barrel 41. Inside the barrel 41 is provided a lead container 45 including an adjacent chuck 44 at the front end portion thereof. A spiral spring S is provided between the lead container 45 and the barrel 41, and a chuck ring 46 is slidably fitted over the front portion of the chuck 44. A spiral member 47 having a spiral groove 47a is held between a rear end flange 48b of an eraser guide member 48 and a securing member 50. The eraser guide member 48 is irrotatably arranged between the barrel 41 and the lead container 45. The rear end flange 48b serves to prevent an eraser holder 51, which is to be described later, from being broken. The securing member 50 is composed of a deformable C-ring (see Fig. 10-B) engaged with an engagement shoulder 49 of an eraser guide member 48 and having a cutout. The section of the ring may be circular or polygonal, and the cutout may not be provided if the securing member itself has elasticity in the radial direction. The spiral member 47 is rotatably arranged with

respect to the eraser guide member 48. The flange 48b may be formed as a member independent of the eraser guide member 48. The flange and the engagement step may be provided in the spiral member (see Fig. 14-A). An eraser holder 51 adapted to secure the eraser guide member 48, and projections 51a of the eraser holder 51 protrudes through the guide grooves 48a of the eraser holder 48 and engages with the spiral groove 47a of the spiral member 47.

The assembly method will now be explained with respect to the above-described construction.

Fig. 10-A shows known push-type mechanical pencil, in which mechanism of the mechanical pencil in the front section is separated from the eraser pushing-out mechanism in the rear section. The front section has an ordinary mechanical pencil mechanism, so that only the rear section, i.e. the eraser pushing-out mechanism, will be described.

First, the eraser holder 51 is inserted through the guide groove 48a of the eraser guide member 48 and slidably arranged with respect to the eraser guide member 48. If the guide groove 48a extends to the rear end of the eraser guide member 48, it can be inserted at this end. If, as shown in Fig. 11-A, the guide groove in the rear end portion is a narrow one, or if the guide groove 48a does not extend to the end of the eraser guide member and is formed integrally with the flange 48b, a desirable effect may be obtained in that the eraser holder is kept from being detached and the number of parts and elements can be reduced. If the portion in the vicinity of the guide groove 48a is deformable, insertion of the eraser holder 51 is facilitated. A further desirable effect may be obtained by effecting chamfering or the like at the portion near where the guide groove 48a is in contact with the eraser holder 51. Subsequently, the spiral member 47 is inserted into the eraser guide member 48 at the front end thereof until it abuts the flange 48b. After that, the securing member 50 is engaged from the front end of the eraser guide member 48. It is secured when returning to its normal state. Finally, the eraser 10 is press-fitted into the eraser holder 51.

It is desirable, that, as shown in Fig. 12, a member which has elasticity in the longitudinal direction, for example, a coil spring, a one-turn spring (Fig. 12), or a ring having a plurality of flanges 50a (Fig. 13-B) or claws (Fig. 14-B) be adopted as the securing member 50. By using the securing member 50 as described, any clearance generated between the flange 48b and the spiral member 47 held between the flange 48b and the securing member 50 by errors during production can then be prevented from causing looseness as much as possible since the elasticity of the securing member 50 will allow the spiral member 47 to

always abut against the flange. Further, the setting of the rotational loads, which has been conventionally effected by friction, can then be conducted by adjusting the elasticity of the securing member, so that stable rotational loads can be obtained. Further, it is desirable to fix a ring 55 restraining the radial movement of the fixed securing member 50, as shown in Fig. 15, because this prevents the securing member from being detached.

Further, if, as shown in Fig. 16-A, continuous recesses 53a and projections 53b are provided in the spiral member 47 engaged with the securing member 50 and the engagement shoulder 49 or the opposing shoulder of the eraser guide member 48, respectively, it becomes possible to effect an appropriate resistance when rotating the spiral member 47, so that any unnecessary rotation during the eraser projection operation can be prevented as possible. The number of the recesses 53a and the projections 53b may be one or more for each. Furthermore, by adjusting the configuration and the number of the recesses 53a and projections 53b and the configuration of the securing member (for example, projections 54 may be provided in a ring 50, as shown in Fig. 16-B), a click-clack sound will be given during the rotation, thus providing an excellent feel in using. Further, a similar effect can also be obtained when the recesses and the projections are formed by the combination of flange 48b of the eraser guide member 48 and a part of the spiral member 47 abutting the flange 48b.

Thus, the above-described writing instrument has a simple construction in which a flange and an engagement step are formed in either the spiral member or the eraser guide member, and the spiral member is rotatably secured to the eraser guide member by merely engaging a deformable securing member with the engagement shoulder. Thus, the spiral member is then held between the flange and the securing member. Accordingly, the writing instrument of the present invention is easily assembled. Moreover, since the securing member is positively engaged with the engagement shoulder, securing reliability can be maintained for a long period of time.

While the above-described writing instruments are of the type in which the tube-like spiral member having a spiral groove is provided exteriorly and the eraser guide member having guide grooves is provided interiorly, the eraser guide member may, as to the case with the prior art shown, be provided exteriorly (the guide grooves are then formed into longitudinal grooves, instead of slit-like ones) and the spiral member having a spiral groove may be provided interiorly. The spiral groove can then be a spiral tube. However, it is

more desirable to form the longitudinal guide grooves of the eraser guide member shown in Fig. 11-A and Fig. 11-B into spiral grooves so that any looseness in using the eraser may be avoided.

Claims

1. A writing instrument comprising a tubular member having a spiral groove, an eraser guide member having longitudinal guide grooves, and an eraser holder having projections slidably arranged in the guide grooves of said eraser guide member comprising a flange and an engagement shoulder formed thereon, said spiral member being rotatably secured with respect to said eraser guide member by means of a deformable securing member engaging with said engagement shoulder and said flange.
2. A writing instrument according to claim 1, wherein the securing member has elasticity in the longitudinal direction.
3. A writing instrument as claimed in claim 1, wherein the portion in the vicinity of the guide grooves of said eraser guide member of an eraser holder insertion portion or that in the vicinity of the spiral groove of the spiral member is deformable.

FIG. 1A

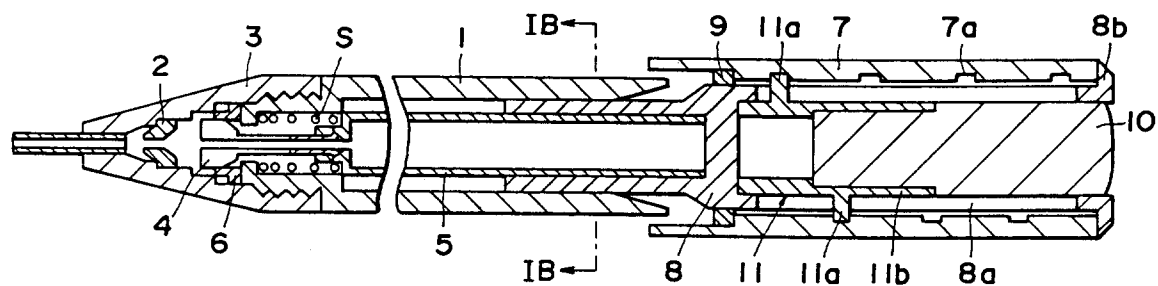


FIG. 1B

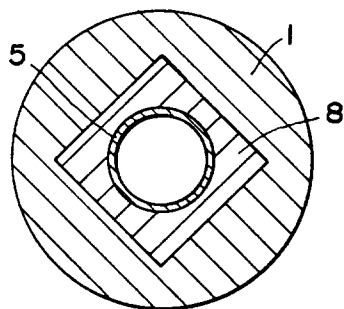


FIG. 2

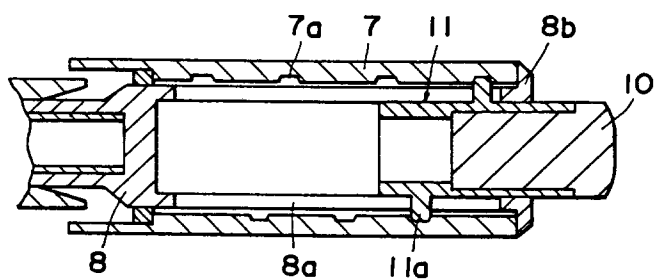


FIG. 3

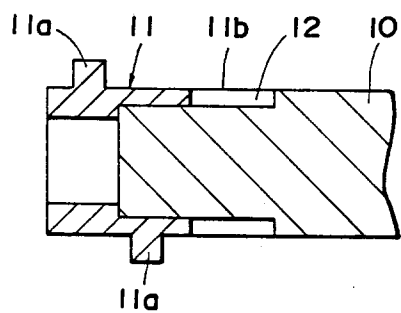


FIG. 4

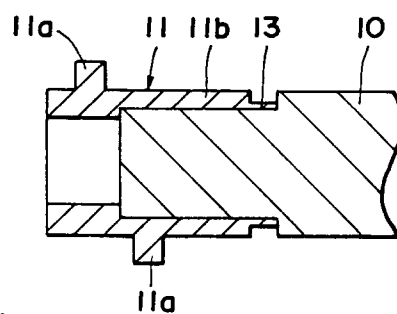


FIG. 5

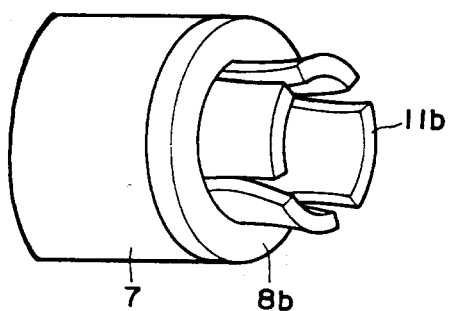


FIG. 6

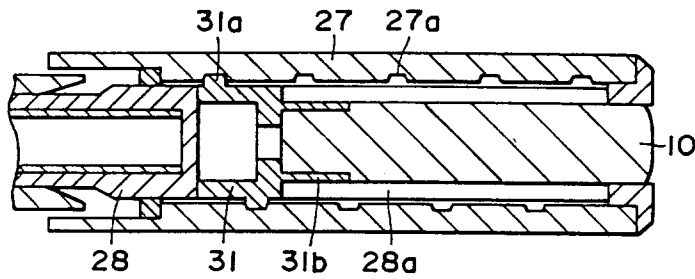


FIG. 7

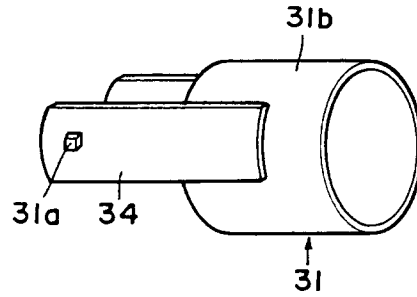


FIG. 8

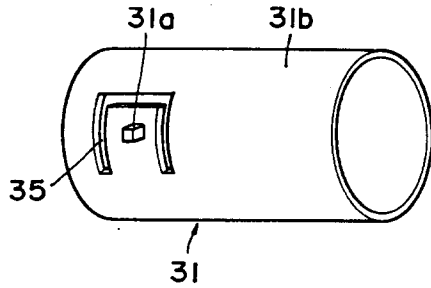


FIG. 9

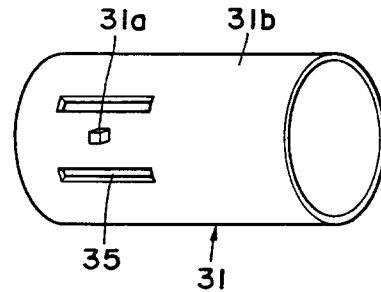


FIG. 10A

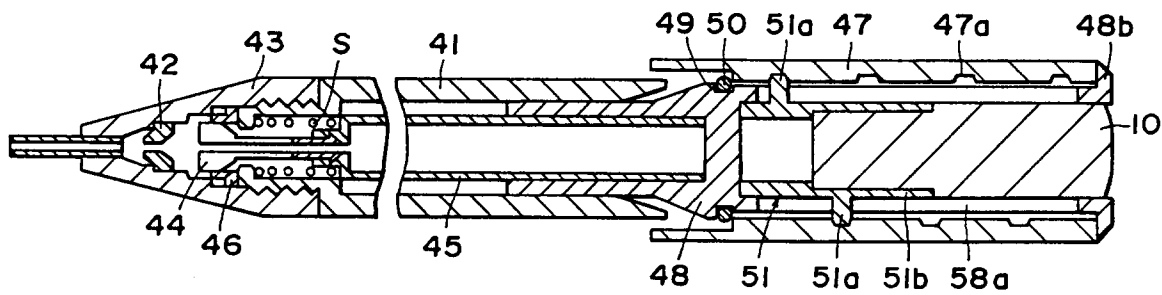


FIG. 10B

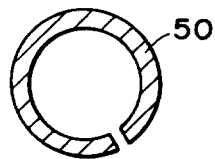


FIG. 11A

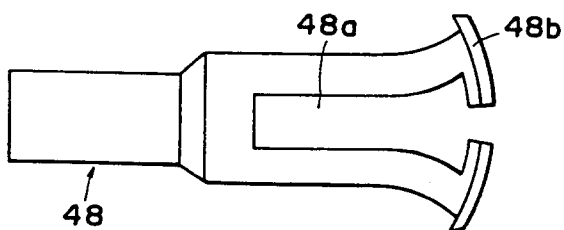


FIG. 11B

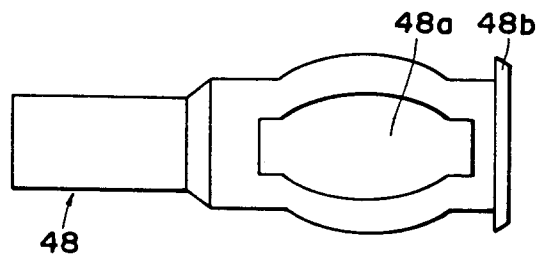


FIG. 12

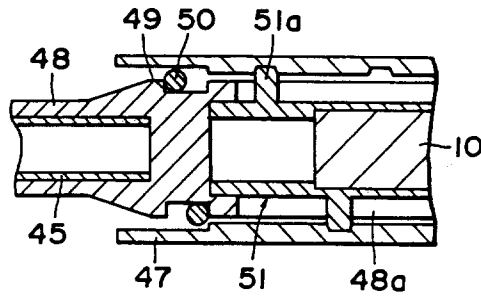


FIG. 13A FIG. 13B FIG. 14A FIG. 14B

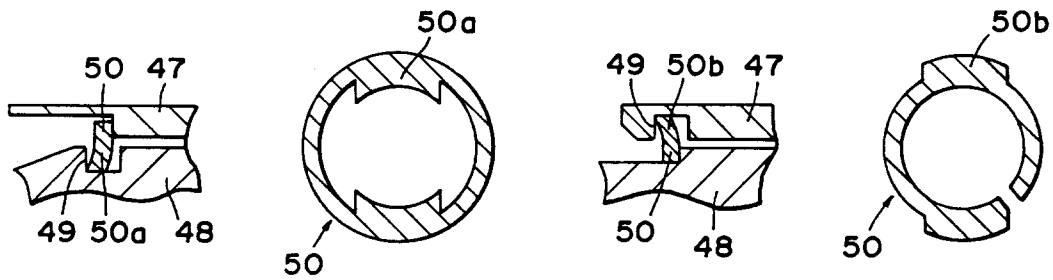


FIG. 15

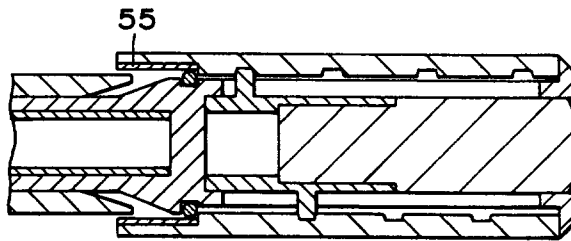


FIG. 16A

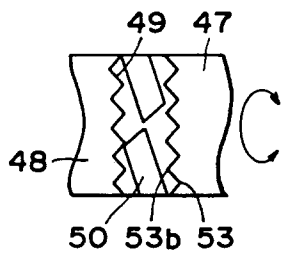


FIG. 16B

