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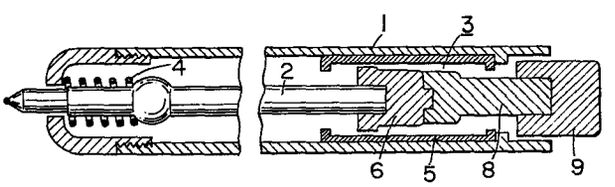
(54) Writing instrument.

(57) A writing instrument has a refill (2) which can axially slide in an outer casing or cylinder (1). A rotating cam set (3) is located at the rear of the refill (1) and a spring (4) biases the refill (1) rearwardly. An inertial weight (9) acts on the cam bar (8) of the cam set (3). When the writing instrument is shaken with force in excess of a given level, the weight of the moving parts functions to project and retract the refill from the outer cylinder (1) and to operate the cam set (3). The weight (9) may also act as a plunger for the manual operation of the cam set (3).



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WRITING INSTRUMENT

This invention relates to a writing instrument of the type having a refill which is projected from, and retracted into, an outer casing or cylinder.

A variety of knocking or plunger type writing instruments have been proposed wherein a refill is projected from its outer cylinder when the writing instrument is to be used. In this type of instrument, however, it is required for the user to depress a plunger and, to do so, the manner of holding the writing instrument must inevitably be changed as between bringing the instrument into readiness for writing and the writing itself.

It is an object of the present invention to provide a writing instrument in which its refill can be positively projected and retracted by simply shaking the writing instrument so that preparing the instrument for writing can be rapidly achieved, and the disadvantages as described above can be avoided.

More specifically, the present invention relates to a writing instrument comprising a refill axially slidable in an outer cylinder between a retracted position and a projected position; a rotating cam set which is located in the vicinity of the rear of the refill and which includes a cam bar; and a spring member for biasing the refill rearwardly towards the retracted position. The invention is

characterised in that an inertial weight is slidable within the outer cylinder in the vicinity of the cam bar so that, when the cylinder is shaken with a force in excess of a given level, the refill is depressed against the bias of the spring member and the cam set is operated to retract or project the refill.

The writing instrument may include a plunger or knocking portion for operating the cam bar of the rotating cam set, whereby the refill may also be projected and retracted by manual operation of the knocking portion.

The invention will be more readily understood by way of example from the following description of writing instruments in accordance therewith, reference being made to the accompanying drawings, in which

Figure 1 is a longitudinal sectional view of a first form of the writing instrument;

Figure 2 is a schematic plan view showing a rotating cam set utilized in the writing instruments; and

Figures 3 to 7 are longitudinal sectional views showing the writing instruments of further embodiments.

In the various figures, like reference numerals designate like or corresponding parts.

In the writing instrument of Figure 1, an outer casing or cylinder 1 contains a refill 2 which can slide in the axial direction between the projected position shown and a retracted position, a rotating cam set 3 provided in the

vicinity of the rear of the refill 2, and a spring member 4 for biasing the refill 2 rearwardly towards the retracted position.

As shown in Figures 1 and 2, the rotating cam set 3 is of known form and consists of a cam casing 5 secured to the inner wall of the outer cylinder 1, and a rotor 6 which is slidable within the cam casing 5 and the extreme end of which is engaged with the rear end of the refill 2.

Rotation generating surfaces 7 are formed on the inner circumferential surface of the cam casing 5, as shown in Figure 2. Those surfaces comprise first and second inclined surfaces 7a and 7b, a stepped portion 7c, and long grooves 7d, and are engaged with the rotor 6 to apply prescribed rotation to the latter.

Axial projections 6a are provided on the outer circumference of the rotor 6, and those projections 6a so mesh with the rotation generating surfaces 7 that axial movement of the rotor 6 is accomplished by rotation and operation of the cam set 3. The refill is thereby moved from its inoperative, retracted position to its operative projected position, or vice versa.

The cam casing 5 meshing with the rotor 6 may be dispensed with, the rotation generating surfaces 7 being directly formed on the inner wall of the outer cylinder 1.

A plunger or knocking portion 9 is fitted to a cam bar 8 of the rotating cam set 3, enabling the cam set to be

operated manually. In this embodiment, the plunger 9 also acts as an inertial weight, and has a relatively high density, e.g. a metal.

In the use of the writing instrument, there are two ways in which the refill 2 may be projected and retracted and the instrument is thus rendered advantageous.

Firstly, the rotating cam set 3 may be operated by manually pressing inwardly the plunger or knocking portion 9 as in known writing instruments, in order to project and retract the refill 2.

Secondly, the whole writing instrument may be shaken so that the assembly consisting of refill 2, rotor 6, cam bar 8 and plunger 9 is driven towards the extreme end of the outer cylinder 1 with a force in excess of a given level. The rotating cam set 3 is operated by the shaking motion to project and retract the refill 2, in a manner similr to its operation by the knocking movement of plunger 9.

In this case, the following relationships:

1. $(B_1+B_2+B_3+B_4) + D < A < (B_1+B_2+B_3+B_4) + C$, or
2. $(B_1+B_2+B_3+B_4) + D < A \leq (B_1+B_2+B_3) + C$, or
3. $(B_1+B_2+B_3+B_4) + D < A < (B_1+B_2) + C$, or
4. $(B_1+B_2+B_3+B_4) + D < A < B_1 + C$, or
5. $(B_1+B_2+B_3+B_4) + D < A < C$

are valid in respect of the undermentioned respective forces:

(1) Rearward bias force A which is applied to the refill 2 by spring member 4,

(2) Weight B_1 of the refill 2, weight B_2 of the rotor 6, weight B_3 of the cam bar 8, and weight B_4 of the knocking portion 9,

(3) Forward inertial force C in respect of the weight $(B_1+B_2+B_3+B_4)$ obtained by shaking with a power greater than the given level, and

(4) Forward inertial force D in respect of the weight $(B_1+B_2+B_3+B_4)$ obtained by shaking with a power less than the given level.

Accordingly, the refill 2 and the rotating cam set 3 are not operated by merely directing downwardly the writing instrument or applying a shaking motion of a power less than such given level. However, when the writing instrument is shaken with a power greater than the above given level, the retracted refill 2 is moved to the projected position against the spring bias force, in quite the same manner as the usual knocking action, so that the writing instrument is brought into a state of readiness for writing.

Similarly, when the refill 2 is to be retracted into the outer cylinder 1 when writing is completed, the writing instrument is again shaken in the same manner as described above so that the refill 2 is retracted into the outer cylinder 1 by the bias force of the spring member 4, on operation of the cam set 3 by inertial movement of the assembly.

The refill 2 can thus be projected and retracted by

either of the two operational modes. When shaking is adopted, the refill 2 can be projected and retracted by merely shaking the writing instument so that faster operation than that of knocking can very simply be attained without changing the manner of holding the writing instrument. Furthermore, since the refill 2, the rotating cam set 3 and the like may be introduced into the outer cylinder 1 from the rear end thereof, the assembly is simple and the number of parts to be used may be reduced, so that very inexpensive writing instruments can be manufactured.

In the embodiment of Figure 3, an inertial weight 10 for assisting the projection and retraction of the refill 2 is loosely disposed between the cam bar 8 and the plunger 9. In this case also, the refill 2 can be projected and retracted by either of the two operational modes. The refill 2 is more positively projected and retracted by shaking than in the previous embodiment. In this case, the same relationships with those mentioned above are valid in respect of the respective forces. The weight 10 may be integrally formed with the cam bar 8, if desired.

In the writing instrument of Figure 4, the weight 10 is located to the rear of the cam bar 8 and separate from the plunger 9. Shock absorbing rings 11 are carried by cylinder 1 to limit the movement of the weight 10. A refill holder 12 is interposed between cam bar 8 and the refill 2. The same relationships as those mentioned above are also valid

in respect of the respective forces and again the refill 2 can be projected and retracted by either of the two modes.

Figures 5, 6 and 7 are longitudinal sectional views each showing the writing instrument of yet another embodiment, wherein a weight 10 is slidably contained in the outer cylinder 1 at the rear end of the cam bar 8, and the refill 2 is projected and retracted only by shaking the writing instrument. In those embodiments, each weight 10 may be formed integrally with or separately from the cam bar 8 or the like. The same relationships with those mentioned above are also valid in respect of the respective forces.

In each of the embodiments described, the weight 10 has a relatively high density, e.g. a metal.

In accordance with the present invention, as described above, various advantages are obtained, e.g. the refill can be projected and retracted by merely shaking the writing instrument so that easy and rapid writing becomes possible, the assembly operation is simple, and the number of parts to be used may be reduced, whereby inexpensive writing instruments can be provided.

While the present invention has been described with reference to the preferred embodiments thereof, many modifications and alterations may be made within the spirit and scope of the invention.

CLAIMS

1. A writing instrument comprising a refill (2) axially slidable in an outer cylinder (1) between a retracted position and a projected position; a rotating cam set (3) which is located in the vicinity of the rear of the refill (2) and which includes a cam bar (8) for operating the cam set to move the refill (2) between its retracted and projected positions; and a spring member (4) for biasing the refill (2) rearwardly towards the retracted position; characterised in that an inertial weight (9 or 10) is slidable within the outer cylinder (1) in the vicinity of the cam bar (8) so that, when the cylinder (1) is shaken with a force in excess of a given level, the refill (2) is depressed against the bias of the spring member (4) and the cam set (3) is operated to retract or project the refill (2).

2. A writing instrument according to claim 1, wherein an operating plunger (9) projects from the rear of the outer cylinder (1) for the manual operation of the cam bar (8), whereby the refill may be projected and retracted either by a shaking motion or by manual operation of the plunger (9).

3. A writing instrument according to claim 2, wherein the plunger (9) forms at least a part of the inertial weight.

4. A writing instrument according to claim 2, wherein the inertial weight (10) is loosely disposed between the cam bar (8) and the plunger (9).

5. A writing instrument according to claim 1 or 2, wherein the inertial weight (10) is formed integrally with the cam bar (8).

6. A writing instrument according to claim 1 or 2, wherein a refill holder (12) is interposed between the cam bar (8) and the refill (2).

7. A writing instrument according to claim 1 or claim 2, wherein the inertial weight is separate from the cam bar (8).

8. A writing instrument according to any one of the preceding claims, wherein, when the rotating cam set (3) is operated by shaking motion in order to project and retract the refill (2), the following relationships:

1. $(B_1+B_2+B_3+B_4) + D < A < (B_1+B_2+B_3+B_4) + C$, or
2. $(B_1+B_2+B_3+B_4) + D < A < (B_1+B_2+B_3) + C$, or
3. $(B_1+B_2+B_3+B_4) + D < A < (B_1+B_2) + C$, or
4. $(B_1+B_2+B_3+B_4) + D < A < B_1 + C$, or
5. $(B_1+B_2+B_3+B_4) + D < A < C$

are valid in respect of the undermentioned respective forces:

(1) Rearward bias force A which is applied to the refill (2) by the spring member (4),

(2) Weight B_1 of the refill (2), weight B_2 of the rotor (6) of the cam set (3), weight B_3 of the cam bar (8), and weight B_4 of the plunger (9),

(3) Forward inertial force C in respect of the weight $(B_1+B_2+B_3+B_4)$ obtained by shaking with a power greater than the given level, and

(4) Forward inertial force D in respect of the weight $(B_1+B_2+B_3+B_4)$ obtained by shaking with a power less than the given level.

FIG.1

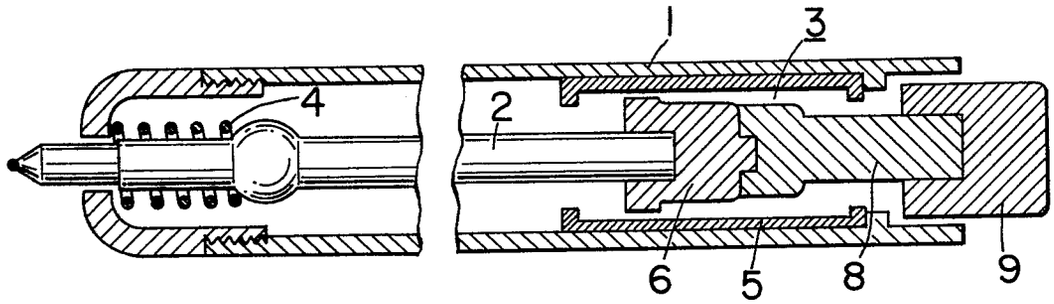


FIG.2

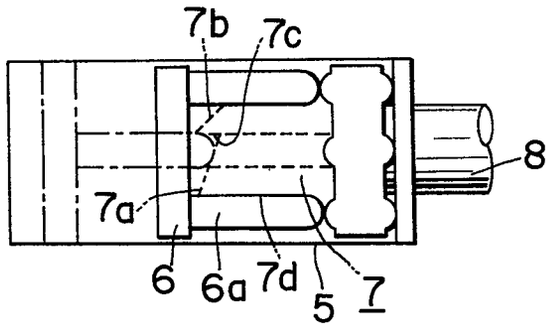


FIG.3

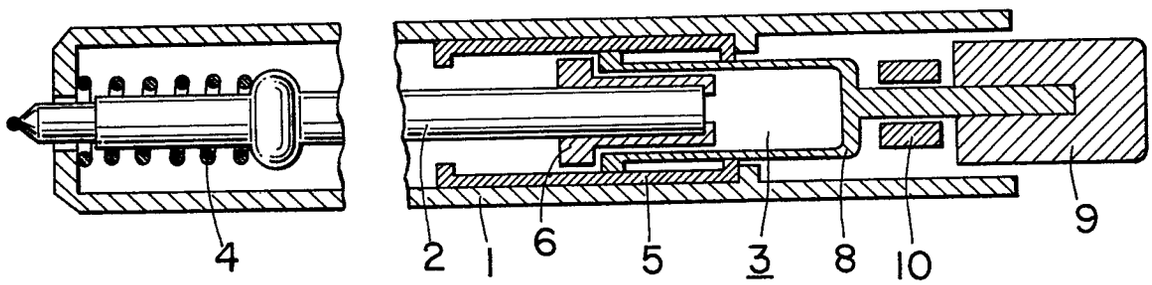


FIG.4

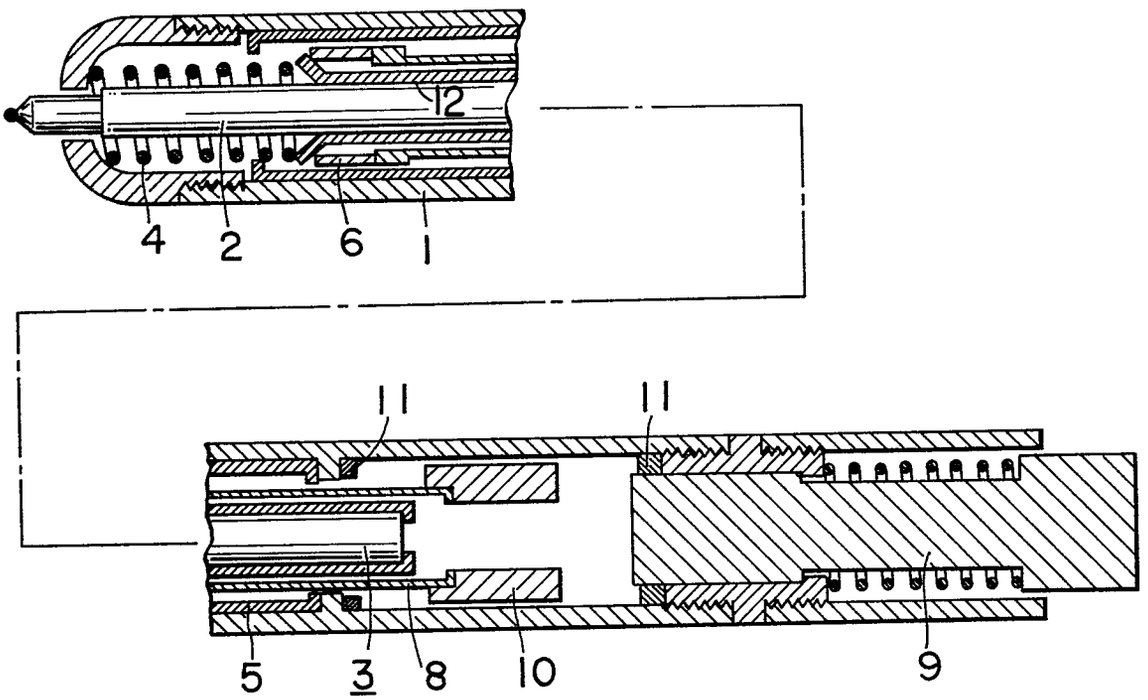


FIG.5

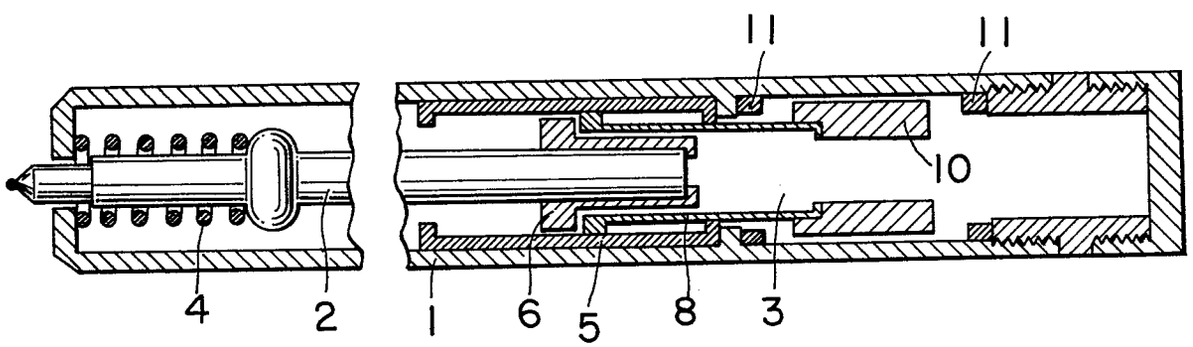


FIG.6

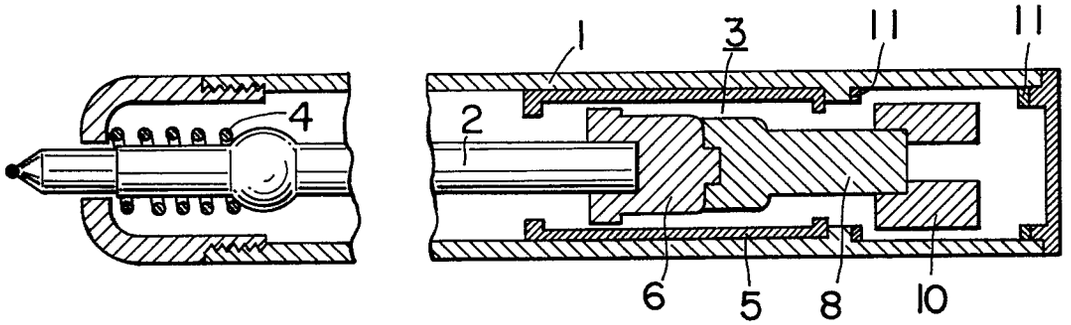
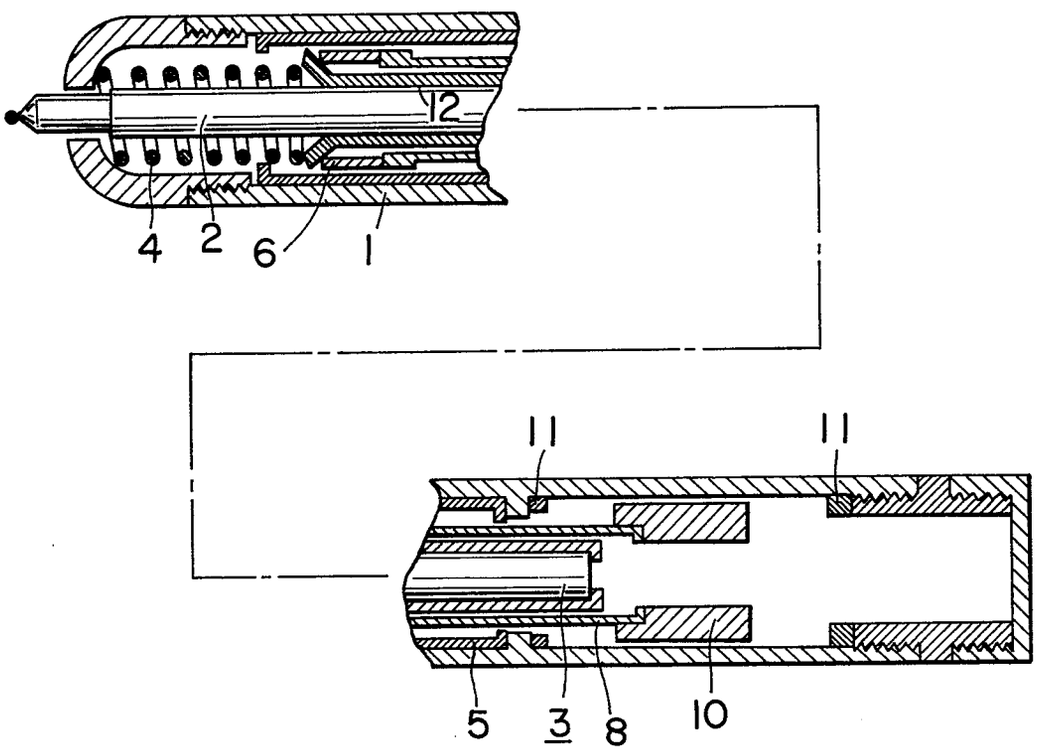


FIG.7



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EUROPEAN SEARCH REPORT

0153159

. Application number

EP 85 30 0989

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
X	FR-B- 72 009 (GOSSIAUX) * Page 2, column 1, line 20 - page 3, column 2, line 35 *	1	B 43 K 24/02 B 43 K 24/08
X	* Page 3, column 2, lines 20-26 *	5	
X	* Page 3, column 1, lines 4-41 *	8	
X	* Page 3, column 1, lines 42-51 *	7	
A	* Page 3, column 1, lines 42-51 *	4	
	---		TECHNICAL FIELDS SEARCHED (Int. Cl.4)
X	FR-A-1 129 101 (GOSSIAUX) * Page 1, column 2, line 26 - page 2, column 2, line 28 and in particular page 2, column 2, lines 18-23 *	1,2	B 43 K
Y		1-3,5,8	

Y	GB-A- 941 984 (RIEPE WERK) * Page 1, line 63 - page 2, line 31 *	1-3,5,8	
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	30-05-1985	VAN OORSCHOT J.W.M.

CATEGORY OF CITED DOCUMENTS

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EUROPEAN SEARCH REPORT

0153159
Application number

EP 85 30 0989

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
X	CH-A- 558 724 (FARINE) * Column 1, line 9 - column 2, line 5; figure *	1,7,8	
A	GB-A- 785 249 (DÖTTLINGER) * Page 2, line 105 - page 3, line 32 *	1-3,5, 8	
			TECHNICAL FIELDS SEARCHED (Int. Cl.4)

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