

SPECIFICATION

Composite writing instrument having a pencil unit and a ball point pen unit

- 5 The invention relates to a writing instrument, comprising an elongate tubular casing having a writing aperture at one end, a pencil unit provided with a reciprocatingly operable mechanism for feeding the pencil lead and a ball point pen unit held in said casing, both said units co-operating with actuating means for displaying said units axially in the casing which means are carried in a cap rotatably mounted on the end of the tubular casing remote from the writing aperture.
- 10 A writing instrument is known in which two-colour ball point pen units are held in a tubular casing and a cap holding a cam mechanism for engaging these units is rotated in two directions through a pre-determined angle about the axis of the casing, whereby said units are alternately made shiftable in writing position or holding position. However, the construction of such writing instrument does not permit the cap to be shifted in axial direction relative to the casing, so that even when a pencil unit is substituted for one of said ball point pen units the feed of the pencil lead cannot be effected by a reciprocating operation.

- The present invention consists in a composite writing instrument, comprising an elongate tubular casing having a writing aperture at one end, a pencil unit provided with a reciprocatingly operable mechanism for feeding the pencil lead and a ball point pen unit held in said casing in fixed diametrically opposed relationship, their writing ends pointing towards said writing aperture, a cap rotatably mounted on said casing at its end remote from said writing aperture and including actuating means engaging said units and causing them to be displaced alternately in axial direction towards said writing aperture upon rotation of said cap about the axis of said tubular casing, whereby to cause said units to be alternately advanced through the writing aperture to a writing position or to be retracted through said aperture to a holding position within said tubular casing, means being provided to enable said cap to be reciprocable within predetermined limits in axial direction relative to said tubular casing when said pencil unit is in the writing position in order to cause said mechanism to feed the pencil lead and to enable said cap to be arrested relative to the tubular casing when the ball point pen unit is in the writing position.

- In order that the invention may be more readily understood, reference is made to the accompanying drawings which illustrate diagrammatically and by way of example an embodiment thereof, and in which:-

- Figure 1* is a partly broken away sectional front view of a writing instrument according to the invention with a ball point pen unit and a pencil unit in a holding (retracted position);

Figure 2 is a partly broken away sectional front view of the rear side of *Figure 1*;

- Figure 3* is a partly broken away sectional front view similar to *Figure 1*, in which the pencil unit is

shown in a writing position brought about by the rotation of a cap of the writing instrument;

- Figure 4* is a similar view to that of *Figure 3*, in which the cap is downwardly displaced in axial direction for the purpose of feeding the lead of the pencil unit;

- Figure 5* is a partly broken away sectional front view in which the ball point pen unit is shown in a writing position, seen from the side of a curved casing;

- Figure 6 (a)* is a cross-section on the line A-A of *Figure 1*;

- Figure 6 (b)* is a cross-section on the line B-B of *Figure 1*;

- Figure 6 (c)* is a cross-section on the line C-C of *Figure 3*;

- Figure 6 (d)* is a cross-section on the line D-D of *Figure 4*;

- Figure 6 (e)* is a cross-section on the line E-E of *Figure 5*;

- Figure 7* is a partly broken away perspective view, showing a cam mechanism of the writing instrument;

- Figure 8* is a part-sectional front view of the pencil unit showing the lead feeding means;

- Figure 9* is an exploded view of each element of a cam mechanism; and

- Figures 10 (a), (b), (c) and (d)* are developed (planar) views of the cam mechanism for explaining the movement of the pencil unit and the ball point pen unit to the writing position, the holding position and the lead feeding position.

- In the drawings, reference numeral 1 denotes a lower tubular casing within which are accommodated, in diametrically opposed relationship, a pencil unit 3 and a ball point pen unit 3'. The upper ends of the units 3 and 3' are respectively connected, via connecting sleeves 4 and 4', to rods 5 and 5' which at their free upper ends are respectively provided with sliders 7 and 7'.

- In the upper portion of the interior of the tubular casing 1 there is located with a press fit a coupling sleeve 19 which in turn receives with a press fit a lower tubular portion of a cylindrical guide member 9. An annular projection or collar 21 is formed on the guide member 9 and abuts the upper end face of the casing 1. Thus, the lower tubular casing 1 and the guide member 9 are rigidly connected together.

- The cylindrical guide member 9 is provided on its periphery with two axially extending guide grooves 10 and 10' (*Fig. 10*) which are angularly spaced apart by 180° and respectively serve to guide the slides 7 and 7' in the axial direction. The lower portions of the guide grooves 10 and 10' are reduced in width to form shoulders 20' on which are supported the lower ends of coiled springs 6 and 6' which surround the upper portions of the rods 5, 5'. The upper ends of the springs 6 and 6' respectively abut the sliders 7 and 7' which are thus resiliently held in the guide grooves 10 and 10'.

- The top portion of the guide member 9 terminates in a shaft head 16 having a stub end 16' and a cam 18 formed thereon (see *Fig. 10* for developed planar view of cam 18), the cam 18 being so arranged on the shaft head 16 as to co-operate with an end face of an

abutment ring 17 secured to the stub end 16'. As seen from right to left of each Fig. 10, the cam 18 includes an abutment face 18a, a flat horizontal surface 18b, an oblique surface 18c and an abutment face 18d. Between the flat surface 18b and the top face of the guide member 9 there is a clearance t in which is located an abutment member 12 formed as a segment of a circle and more particularly referred to hereinbelow. Between the top end of the oblique surface 18c and the end face of the abutment face 18d there is formed a surface portion 17a which corresponds to inner face of central side of the stop member 12, so that said portion abuts the lower end face of the abutment ring 17.

As shown in Figs. 1 to 4 and Fig. 9, the guide member 9 is located within a rotatable tubular cam 8 which is secured to a cap member 2.

As can be seen from Figs. 9 and 10 in particular, a sliding cam face is formed on the cam 8. The sliding cam face has a flat portion 15 at its top and two sliding oblique faces 13 symmetrically arranged on either side with respect to the flat portion 15 and joined at their lower portions where a notched engaging portion 14 is formed at the junction of the oblique faces 13. The portion 14 is so formed as to be engaged by the tips of tapered portions 11 and 11' respectively provided on the outer surfaces of two sliders 7 and 7'. The oblique faces of the tapered portions 11 and 11' of said sliders engage the sliding cam face of the cam 8 and slide therealong corresponding to the rotation of the cam 8.

The above-mentioned abutment member 12 is formed inwardly on the upper end of the cam 8 as can be seen in Figs. 6, 7 and 9, and engages the cam 18 formed on the shaft head 16. After the cam 8 has been slid over the guide member 9 the abutment ring 17 is fitted on the shaft head 16. When the cam 8 is brought to a position shown in Fig. 3, the ring 17 co-operates with the abutment member 12 and serves to check upward displacement of the cam 8 due to the force of springs 6 and 6'.

The cap 2 secured to the outer periphery of the tubular cam 8 projects by the lower end portion of the cap over an upper portion of the tubular casing 1 and is in sliding contact with said upper portion. The cam 8 is rotatable relative to and co-axially with the axis of the guide member 9 by substantially 180° and when the pencil unit is in the writing position the cam 8 is shiftable axially within predetermined limits. Consequently, the cap 2 is similarly rotatable by substantially 180° relative to the tubular casing 1, and when the pencil unit 3 is in the writing position the cap is shiftable axially within predetermined limits (as more particularly described hereinbelow).

The pencil unit 3 comprises a chuck mechanism which is shown in Fig. 8. The rod 5 connected to the sleeve 4 serves as a magazine for leads 30. An intermediate sleeve 22 is secured inwardly to the lower portion of the sleeve 4, a split pawl chuck 25 being secured internally to the intermediate sleeve 22. The pencil unit 3 further includes a pencil body casing 3a at which tip end is formed a mouthpiece 3b. A connecting tube 3c is secured to the upper portion of the casing 3a, a spring 23 being located between the upper end of the tube 3c and the lower end of the

connecting sleeve 4. A casing 24 covers with overlap the annular gap between the connecting sleeve 4 and the connecting tube 3c and constitutes a part of the pencil body casing 3a. A clamping sleeve 26 which co-operates with the chuck 25 is slideably located in a space between the lower end of the connecting tube 3c and an internal shoulder 3e of the casing 3a. The bore of the sleeve 26 tapers so as to gradually enlarge towards the mouthpiece 3b.

Reference numeral 27 denotes a rubber-like resilient supporting ring located within the mouthpiece 3b.

An annular abutment portion 28 is formed on the upper portion of the mouthpiece 3b to abut against the inside of a tip mouth 29 of the tubular casing 1 when the pencil unit 3 is displaced towards the mouth 29 for the purpose of feeding the lead. The mode of feeding the lead according to this chuck mechanism will be described hereinbelow.

The operation of advancing and retracting the pencil unit and the ball point pen unit to the writing position and the holding position within the writing instrument will now be explained with reference to the planar (developed) view of Fig. 10.

Fig. 10 (b) shows both of the writing units 3, 3' in a holding position (neutral position). In this condition, the oblique faces of the tapered engaging portions 11 and 11' of the sliders 7 and 7' respectively guided in the guide grooves 10 and 10' of the member 9 respectively abut in a resilient manner against substantially the middle portions of the oblique faces of the tubular cam 8 by virtue of the action of the springs 6 and 6' on the sliders 7 and 7'. At this moment the abutment member 12 at the top portion of the cam 8 abuts against the oblique face 18c of the cam on the shaft head 16. A chain line below the writing units 3, 3' denotes the relative position of the mouth 29 of the tubular casing 1.

In order to advance the ball point pen unit 3' to the writing position, the cap 2 and with it the cam 8 secured thereto is rotated relative to the member 9 to a position shown in Fig. 10 (a). Upon this rotation, the oblique right-hand (as viewed in the Figure) face of the tapered engaging portion 11 of the pencil unit 3 slides along the adjacent oblique face 13 of the cam 8 until the portion 11 reaches the upper end of the guide groove 10 to be stopped there, where at this time the flat portion 15 is in alignment with the upper end of the guide groove 10.

Simultaneously, the tapered engaging portion 11' of the ball point pen unit 3' slides downwardly along the other oblique face 13 of the cam 8 until it reaches the apex of said sliding oblique face to engage the notched portion 14. At this time, the abutment member 12 of the cam 8 comes to lie in the clearance t , formed between the lowermost flat face 18b of the cam 18 and the top face of the guide member 9, and abuts against the abutment face 18a. Thus, the cam 8 is displaced a small distance downwardly compared with the position of Fig. 10(b). Due to the fact that the abutment member fits in the clearance t , the cam 8 is prevented from axial displacement relative to the guide member 9. In the condition of Fig. 10(a), the ball point pen unit 3' is thus brought to the writing position.

In order to advance the pencil unit 3 to writing

position, the cap 2 and with it the cam 8 secured thereto is rotated relative to member 9 to a position shown in Fig. 10 (c) respectively through 180° from the position of Fig. 10(a) and through 90° from the position of Fig. 10(b) in an opposite direction to that for advancing the ball point pen unit from the position of Fig. 10(b). Upon this rotation, the oblique right-hand (as viewed in the Figure) face of the tapered engaging portion 11 of the pencil unit 3 slides downwardly along the adjacent oblique face 13 of the cam 8 until said portion reaches the apex of the sliding oblique face to engage the notch of the portion 14 and to stop there. Thus the pencil unit 3 is brought to the writing position. During this operation, the abutment member 12 of the cam 8 slides upwardly on the oblique face 18c of the cam 18, after leaving the clearance *t* (when considering position of Fig. 10 (a)), to a position 17a and up to the abutment 18a of the cam 18. In this position the abutment member 12 is released from the engagement with the cam 18 and, as shown in Fig. 3, abuts against the lower end face of the abutment ring 17 fitted on the shaft stub 16', so that upward escape of the cam 8 due to the action of the spring 6 is prevented. Furthermore, as the result of the abutment member 12 being brought into this position, the position of the cam 8 relative to the guide member 9 is upwardly shifted corresponding to the shift of the member 12.

As mentioned above, in the condition of Fig. 10(c) the abutment member 12 is at a position 17a released from the oblique face 18c of the cam 18 and abuts against the ring 17 due to the action of the spring 6. In this state the abutment member 12 may be displaced at will to a position shown in Fig. 10(d) without any obstruction by pushing the cam 8 or more particularly the cap 2, downwardly relative to the member 9. Due to the shift of the cam 8 in axial direction, the pencil unit 3 is also shifted axially. According to the exemplary embodiment of the present invention, in the state of Fig. 10(c), the distance between the lower end face of the abutment member 12 and the top face of the guide member 9, i.e. the distance *d* through which the abutment member 12 is axially displaceable, is so determined that the axial displacement of the pencil unit 3 combined with the axial displacement of the cam 8 is of such a magnitude as to enable feeding operation of the lead when the portion 28 of the casing 3a abuts the mouth 29 of the tubular casing 1. Thus, by pushing the cap 2 with the cam 8 secured thereto axially relative to the member 9 and releasing the cap 2 to move axially in opposite direction (reciprocating movement), the feeding operation of the lead of the pencil unit is effected smoothly and reliably, resulting in a state of writing being possible.

The feeding of the lead 20 of the pencil unit 3 will be explained with reference to Fig. 8.

When the pencil unit 3 is brought to the writing position shown in Fig. 10(c) and the lower tubular casing 1 is held fast, then the upper portion of the pencil unit 3 is further displaced downwardly, as shown in Fig. 10(d), by pushing the cap 2 and with it the cam 8 in the direction of the arrow, the lower portion of the pencil unit 3, i.e. the casing 3a with the casing 24 remaining in abutment with the mouth 29

of the tubular casing 1 *v/a* the portion 28 of the pencil unit 3. When the cam 8 is pushed downwardly, the connecting sleeve 4 fast with the rod 5 slides towards the tip end of the pencil unit 3 relative to the casing 24 against the force of the spring 23. As a result of the sliding of the connecting sleeve 4, the intermediate shift sleeve 22 and the split pawl chuck 25 secured thereto are displaced towards the tip end of the pencil unit 3, whereupon the lead 30, which is frictionally engaged by the co-operation of the split pawl chuck 25 with the clamping sleeve 26, is fed to the tip end of the pencil unit. During this displacement of the split pawl chuck 25, the clamping sleeve 26 is stopped by abutment against the shoulder 3e in the casing 3a, so that the chuck 25 separates from the clamping sleeve 26 and the lead 30 is released from the engaging force of the chuck 25 and now held by the resilient ring 27. Thus, the lead 30 is fed a distance corresponding to the shift distance of the clamping sleeve 26 upon actuation of the connecting sleeve 4. Next, when the load on the cam 8, i.e. the cap 2 is released, the chuck 25, the intermediate shift sleeve 22, the connecting sleeve 4 and the rod 5 are restored to their previous position, whereby the chuck 25 will again frictionally engage the lead 30. By repeating the reciprocating movement of the cap 2, the lead 30 may be fed from a mouth 3d (Fig. 8) of the mouthpiece 3b into a favourable position for writing. Spare leads may be stored in a cavity 5a of the rod 5, and these spare leads may be continuously fed in succession to the lead 30. Supply of the spare leads into the cavity 5a may be effected by making the connecting sleeve 4 detachable from the rod 5.

The fed out lead may be returned to its original position by pushing the lead into the tip of the mouth piece, with the cap 2 in the displaced position (arrow in Fig. 10(d)), that is to say with the chuck 25 in its released position.

As mentioned above, the construction of the writing instrument in accordance with the invention enables the pencil unit and the ball point pen unit to be smoothly and reliably brought into writing position and holding position alternately by rotating the cap, and when the pencil unit is in the writing position lead feeding operation of the axially reciprocating kind may be effected, by displacing the cap in axial direction, whereby a composite writing instrument having a simple construction and good durability is provided.

CLAIMS

1. A composite writing instrument, comprising an elongate tubular casing having a writing aperture at one end, a pencil unit provided with a reciprocatingly operable mechanism for feeding the pencil lead and a ball point pen unit held in said casing in fixed diametrically opposed relationship, their writing ends pointing towards said writing aperture, a cap rotatably mounted on said casing at its end remote from said writing aperture and including actuating means engaging said units and causing them to be displaced alternately in axial direction towards said writing aperture upon rotation of said



position, the cap 2 and with it the cam 8 secured thereto is rotated relative to member 9 to a position shown in Fig. 10(c) respectively through 180° from the position of Fig. 10(a) and through 90° from the position of Fig. 10(b) in an opposite direction to that for advancing the ball point pen unit from the position of Fig. 10(b). Upon this rotation, the oblique right-hand (as viewed in the Figure) face of the tapered engaging portion 11 of the pencil unit 3 slides downwardly along the adjacent oblique face 13 of the cam 8 until said portion reaches the apex of the sliding oblique face to engage the notch of the portion 14 and to stop there. Thus the pencil unit 3 is brought to the writing position. During this operation, the abutment member 12 of the cam 8 slides upwardly on the oblique face 18c of the cam 18, after leaving the clearance *t* (when considering position of Fig. 10(a)), to a position 17a and up to the abutment 18a of the cam 18. In this position the abutment member 12 is released from the engagement with the cam 18 and, as shown in Fig. 3, abuts against the lower end face of the abutment ring 17 fitted on the shaft stub 16', so that upward escape of the cam 8 due to the action of the spring 6 is prevented. Furthermore, as the result of the abutment member 12 being brought into this position, the position of the cam 8 relative to the guide member 9 is upwardly shifted corresponding to the shift of the member 12.

As mentioned above, in the condition of Fig. 10(c) the abutment member 12 is at a position 17a released from the oblique face 18c of the cam 18 and abuts against the ring 17 due to the action of the spring 6. In this state the abutment member 12 may be displaced at will to a position shown in Fig. 10(d) without any obstruction by pushing the cam 8 or more particularly the cap 2, downwardly relative to the member 9. Due to the shift of the cam 8 in axial direction, the pencil unit 3 is also shifted axially. According to the exemplary embodiment of the present invention, in the state of Fig. 10(c), the distance between the lower end face of the abutment member 12 and the top face of the guide member 9, i.e. the distance *d* through which the abutment member 12 is axially displaceable, is so determined that the axial displacement of the pencil unit 3 combined with the axial displacement of the cam 8 is of such a magnitude as to enable feeding operation of the lead when the portion 28 of the casing 3a abuts the mouth 29 of the tubular casing 1. Thus, by pushing the cap 2 with the cam 8 secured thereto axially relative to the member 9 and releasing the cap 2 to move axially in opposite direction (reciprocating movement), the feeding operation of the lead of the pencil unit is effected smoothly and reliably, resulting in a state of writing being possible.

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of the tubular casing 1 via the portion 28 of the pencil unit 3. When the cam 8 is pushed downwardly, the connecting sleeve 4 fast with the rod 5 slides towards the tip end of the pencil unit 3 relative to the casing 24 against the force of the spring 23. As a result of the sliding of the connecting sleeve 4, the intermediate shift sleeve 22 and the split pawl chuck 25 secured thereto are displaced towards the tip end of the pencil unit 3, whereupon the lead 30, which is frictionally engaged by the co-operation of the split pawl chuck 25 with the clamping sleeve 26, is fed to the tip end of the pencil unit. During this displacement of the split pawl chuck 25, the clamping sleeve 26 is stopped by abutment against the shoulder 3e in the casing 3a, so that the chuck 25 separates from the clamping sleeve 26 and the lead 30 is released from the engaging force of the chuck 25 and now held by the resilient ring 27. Thus, the lead 30 is fed a distance corresponding to the shift distance of the clamping sleeve 26 upon actuation of the connecting sleeve 4. Next, when the load on the cam 8, i.e. the cap 2 is released, the chuck 25, the intermediate shift sleeve 22, the connecting sleeve 4 and the rod 5 are restored to their previous position, whereby the chuck 25 will again frictionally engage the lead 30. By repeating the reciprocating movement of the cap 2, the lead 30 may be fed from a mouth 3d (Fig. 8) of the mouthpiece 3b into a favourable position for writing. Spare leads may be stored in a cavity 5a of the rod 5, and these spare leads may be continuously fed in succession to the lead 30. Supply of the spare leads into the cavity 5a may be effected by making the connecting sleeve 4 detachable from the rod 5.

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CLAIMS

1. A composite writing instrument, comprising an elongate tubular casing having a writing aperture at one end, a pencil unit provided with a reciprocatingly operable mechanism for feeding the pencil lead and a ball point pen unit held in said casing in fixed diametrically opposed relationship, their writing ends pointing towards said writing aperture, a cap rotatably mounted on said casing at its end remote from said writing aperture and including actuating means engaging said units and causing them to be displaced alternately in axial direction towards said writing aperture upon rotation of said

cap about the axis of said tubular casing, whereby to cause said units to be alternately advanced through the writing aperture to a writing position or to be retracted through said aperture to a holding position
5 within said tubular casing, means being provided to enable said cap to be reciprocable within predetermined limits in axial direction relative to said tubular casing when said pencil unit is in the writing position in order to cause said mechanism to feed the pencil
10 lead and to enable said cap to be arrested relative to the tubular casing when the ball point pen unit is in the writing position.

2. A composite writing instrument substantially as herein described with reference to and as shown
15 in the accompanying drawings.

Printed for Her Majesty's Stationery Office, by Croydon Printing Company Limited, Croydon, Surrey, 1982.
Published by The Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.

