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K. WEISSER

2,990,205

WRITING INSTRUMENT COUPLING

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FIG. 1

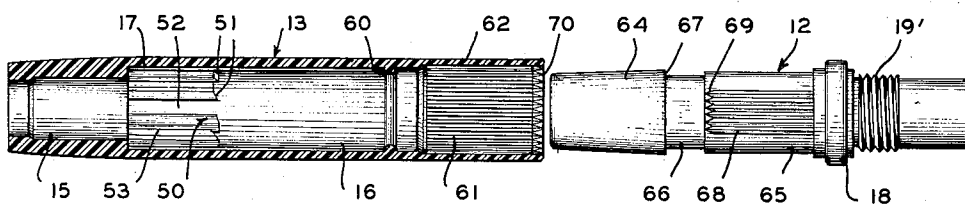


FIG. 2

FIG. 3

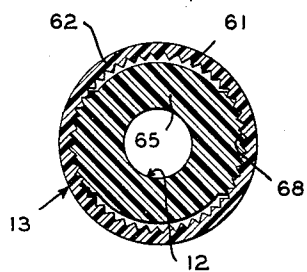
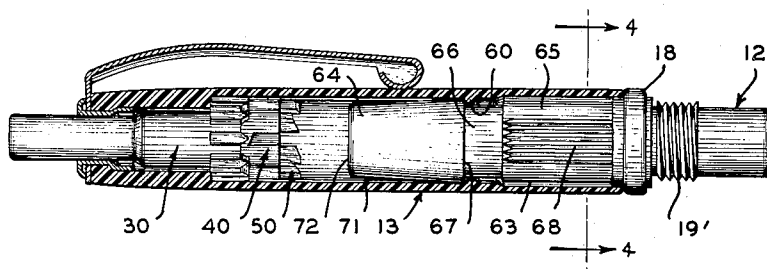


FIG. 4

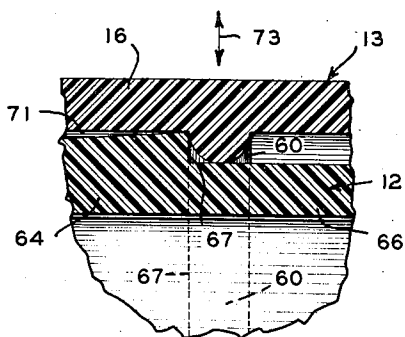


FIG. 5

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## WRITING INSTRUMENT COUPLING

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8 Claims. (Cl. 287-119)

The present invention relates to writing instruments and more particularly to a new and improved interconnection between an intermediate holder and an upper casing or cap such as in the writing instrument assembly disclosed in my prior copending application Ser. No. 531,460, filed August 30, 1955.

In accordance with the disclosure of my said application Ser. No. 531,460, a writing instrument is provided in which the protracting and retracting mechanism for the pen unit is wholly confined within an upper casing or cap. Included in this protract-retract mechanism is a push member and a rotatable member which are only loosely associated with the upper casing or cap and these are retained in the upper casing or cap by an intermediate holder which also serves to guide the pen unit into operative association with the rotatable member. In my said application, the intermediate holder is shown secured to the lower end of the upper casing by a threaded engagement.

The threaded engagement between the intermediate holder and the upper casing or cap serves to retain the push member and rotatable member in the upper end of the upper casing or cap in their normal association with the internal gear which is formed in the interior of the upper casing. However, there is extremely little need to remove the intermediate holder since once the push member and the rotatable member have been inserted in the upper casing and the intermediate holder is secured in place, the mechanism operates continuously and there is substantially no necessity for repair or adjustment. On the other hand, there is a very real need to prevent unnecessary removal of the intermediate holder, since, as will be evident, the push member and rotatable member can fall out of the upper casing or cap and become lost. Since writing instruments are traditionally disassembled by the young and curious, it is clearly desirable to provide a connection between the intermediate holder and the upper casing which will be resistant to ordinary efforts to disassemble the same. The ordinary threaded connection is easily unscrewed and this alone is not a fully satisfactory measure. In practice, the desirability of a connection which cannot be easily taken apart has led to the use of adhesive to supplement the threaded engagement. This provides a fully satisfactory connection, but the assembly operation requires extensive time, effort and care since the application of an adhesive requires that the intermediate holder be carefully coated with adhesive and the parts then immediately assembled.

This is a difficult matter, especially where the presence of adhesive in and around the internal gear can foul the operating mechanism. Moreover, there are times when it is desirable to remove the intermediate holder and the adhesive substantially prevents such removal. Thus, defective parts may be accidentally incorporated and discovered at a subsequent inspection. The adhesively bonded unit then becomes a total loss since replacement of the defective part is unduly difficult. Also, parts can be broken to necessitate replacement and mechanisms can be fouled through carelessness et cetera to require cleaning. While such repair or replacement may be rare, it is still desirable to provide for it.

In accordance with the invention, a new and simplified interengagement is provided which can be rapidly constructed without the exercise of care and which enables disassembly to be effected while preventing the same by

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normal manipulation. More particularly, the interior of the upper casing is formed with an inwardly projecting bead which extends transversely with respect to the longitudinal axis of the casing and the intermediate holder is provided with an upwardly projecting portion having an upwardly tapering plug having a transversely extending downwardly facing shoulder so that the upper casing is stretched and enlarged by the action of the tapered plug as the same passes the bead and the casing snaps back to its normal dimension after the plug has passed the bead to place the bead in locked position behind the shoulder.

The upwardly projecting portion is provided with a circumferential recess adjacent the downwardly facing shoulder of the upwardly tapering plug and the bead is received within this recess. Preferably, the bead on the interior of the casing extends around the entire interior circumference of the casing in a direction perpendicular to the longitudinal axis of the casing. As a result, the intermediate holder can only be removed by a strong axial pull which is far greater than can be carelessly applied and which is greater than a child could apply without the use of tools such as a vise and a pair of pliers.

Further, initial inter-engagement is achieved by a simple axial thrust and this can be done more rapidly than by the use of a threaded inter-engagement and much more rapidly than an adhesively bonded connection and without the need for skill or careful attention. Still further, it is desirable to provide a sealed-in feel and appearance to the upper casing since this is attractive and discourages unnecessary disassembly efforts. In accordance with the invention, this is provided by longitudinal flutes on the interior of the upper casing which inter-engage with longitudinal ribs on the intermediate holder and which do not interfere with the permanence of the securement between the upper casing and the intermediate holder or the facility with which this securement may be achieved.

The improved inter-engagement will now be described in conjunction with the accompanying drawing in which:

FIG. 1 is a longitudinal sectional view of an upper casing or writing instrument cap modified in accordance with the invention;

FIG. 2 is a side elevation of an intermediate holder constructed in accordance with the invention;

FIG. 3 is a side elevation of the assembled protract-retract mechanism on an enlarged scale and showing the push button and rotatable member trapped within the upper casing by the intermediate holder, the upper casing or cap being shown in section to reveal the parts therein;

FIG. 4 is a section on an enlarged scale and taken on the line 4-4 of FIG. 3 to further illustrate the manner in which the intermediate holder is fixedly mounted and prevented from rotating; and

FIG. 5 is a partial cross-section on an enlarged scale and showing the inter-engagement between the circumferential bead on the upper casing and the shouldered plug of the intermediate holder.

Referring more particularly to the drawing, FIG. 1 shows an upper casing or cap 13 constituted by a single integral molded piece, which is preferably composed of a plastic material, and having an upper end 15 of reduced internal diameter and a lower end 16 of enlarged internal diameter and an intermediate portion which is formed with an internal gear 50 which comprises a continuous cam having spaced longitudinally extending radially deep channels 52 separated by two downwardly directed teeth 51. The teeth 51 define therebetween a stop surface offset from but intermediate the length of the channel 52. The internal gear includes longitudinally extending radially shallow channels 53 which extend forwardly to the stop surface between the two teeth 51.

The lower end 16 of the upper casing or cap 13 is

closed with an intermediate holder 12 having an intermediate band 18 and a lower threaded portion 19' to which a lower casing is eventually secured. The intermediate holder 12 is a cylindrical member and in the completed writing instrument, the rear end of the pen unit extends through the intermediate holder and projects into the upper casing 13 where the unit engages the rotatable member of the protracting and retracting mechanism.

The assembled position of the upper casing 13 and the intermediate holder 12 can be seen in FIG. 3 where it will be observed that the portion of the holder 12 above the band 18 is inserted in the open lower extremity of the lower end 16 of the upper casing 12 and projects into the lower end 16 to trap the push member 30 and the rotatable member 40 in the upper end of the upper casing 13 in the region of the internal gear 50.

In accordance with the invention, the lower end 16 of the upper casing 13 is formed with an inwardly projecting circumferential bead 60. The bead 60 is positioned intermediate the length of the lower end 16 and extends in plane at right angles to the longitudinal axis of the upper casing 13.

The invention further includes the provision of longitudinally extending radially directed flutes or channels 61 which extend into the casing 13 at the lower open end 62 of the upper casing 13. It is preferred that there be no loss in the effective diameter of the lower open end 62.

The upper end of the intermediate holder 12 above the band 18 is constituted by an upwardly projecting portion having an upwardly tapered upper plug 64, a longitudinally ribbed lower end 65 adjacent the band 18 and an intermediate circumferentially recessed portion 66. The lower end of the plug 64 terminates at the intermediate recessed portion 66 in a downwardly or forwardly facing inwardly directed circumferential shoulder 67. The shoulder 67 is intended to engage the bead 60 and to effectually resist removal of the intermediate holder 12 unless an extremely vigorous force is applied.

It is preferred that the distance between the upper surface of the band 18 and the shoulder 67 be only slightly greater than the distance between the open forward extremity of the casing 13 and the upper extremity of the bead 60 so that the shoulder 67 will pass the bead 60 only when the upwardly projecting portion of the holder 12 has been fully inserted (the upper surface of the band 18 is in substantial engagement with the lower extremity of the casing 13). As a result, the holder 12 is rendered substantially immobile with respect to a longitudinal pull of insufficient force to extract the same and cannot be partly withdrawn from its intended position within the casing by the application of a slight force.

The lower end 65 has a diameter approximately equal to the internal diameter of the lower open end 62 of the upper casing 13 and at least a portion of the lower end 65 is provided with outwardly projecting longitudinally extending ribs 68 which mesh with the flutes 61 for inter-engagement with the side walls thereof. It is preferred that the entire circumference of the lower open end 62 be fluted while only a portion, e.g. two spaced bands, of the lower end 65 are formed with ribs 68. This enables the desired inter-engagement to be produced irrespective of the rotational direction in which the holder 12 is positioned while at the same time facilitating production of the ribs 68. This is because a split mold is preferably employed in the production of the holder 12 and the presence of ribs 68 at the region of the split would introduce manufacturing difficulties. Also, the lower end 65 is tapered so that the lower extremity is slightly larger than the lower open end 62. In this fashion a sealed appearance and feel is achieved by the rigidity of the coupling. When the ribbing 68 is formed in spaced bands, slight distortion of the lower end 62 is permitted without the use of excessive inserting pressure. It will be understood that the preferred fluting 61 and

ribbing 68 which are shown in the drawings are illustrative and the invention is not intended to be limited thereby.

The upper end of the ribs 68 taper inwardly at 69 and the lower end of the flutes 61 taper outwardly at 70 to facilitate meshing engagement therebetween. It is also preferred to point the upper extremity of the ribs 68 at 69 and enlarge the lower end of the flutes 61 at 70 to further facilitate engagement.

The inter-engagement of the flutes 61 and ribs 68 is more clearly shown in FIG. 4 where it can be seen that rotational movement of the holder 12 within the upper casing 13 is precluded by the inter-engaging flutes and ribs.

In accordance with the invention, the holder 12 is simply inserted within the lower open end 62 of the upper casing 13 and the holder and casing are then forced together until the shoulder 67 projects beyond the bead 60. The action which occurs will be apparent from a consideration of FIG. 3 taken in conjunction with the partial section of FIG. 5 which shows the inter-engaged parts on an enlarged scale.

More specifically, the outer surface of the tapered plug 64 forms a conical cam surface 71 which tapers inwardly at a very slight angle with respect to the longitudinal axis of the upper casing 13. The upper extremity 72 of the plug 64 is preferably of smaller diameter than the internal diameter of the bead 60 and fits within the space formed by the bead. As the holder 12 is forced home, a given thrust will be transmitted from the plug 64 to the bead 60 and will result in an outward radial stressing of the casing 13 in the area of the bead. The outward force applied to the casing will be very large because of the mechanical advantage achieved through the cam surface 71. As a result, the casing 13 bulges in the area of the bead 60 until the shoulder 67 has passed the bead.

At this time, the casing 13 in the area of the bead 60 snaps back to substantially its original diameter and the bead 60 is lodged behind the shoulder 67. The movement of the casing 13 is indicated by the double-ended arrow 73. However, shoulder 67 extends at approximately a right angle to the longitudinal axis of the upper casing 13 and, as a result, an axial pull on the holder 12 will transmit a very limited outward radial force to the casing. As a result, a very large pulling force is required to extract the holder 12 after it has been fully inserted.

The ratio of forces necessary to insert and extract the holder 12 can be adjusted by suitable variation in the angle of the shoulder 67 and the cam surface 71. Thus, extraction can be facilitated by reducing the angle of the shoulder 67 to a taper of 60°. It will be appreciated that the dimensions of the shoulder 67, the bead 60 and the angles of the surfaces 71 and 67 may be varied to achieve any desired ease of insertion in combination with any desired resistance to extraction.

To illustrate preferred construction, the internal diameter of the upper casing or cap is .311 to .312 inch and the bead 60 extends inwardly a radial distance of .003-.004 inch. The external diameter of the shoulder 67 is .309-.310 inch and the plug 64 tapers over a distance of about .46 inch to a diameter of .292-.297 inch. The diameter of the recessed portion 66 is .292-.297 inch. To further facilitate insertion of the holder, the interior of the casing 13 may taper outwardly .002" from the bottom of the internal gear 50 to the lower open end of the casing. The internal diameter of the casing at its lower open end is .313-.314 inch and the channels 63 are formed to a depth of .006-.007 inch. The external diameter of the member 65 between its smooth surfaces is .311-.312 inch and the flutes 68 project in diametrically opposed areas to a span of .325 inch at the upper extremity to .327 inch at the lower end. As a result, when the holder 12 is fully inserted, the flutes 68 at their lower ends are in firm engagement with the channels 63.

The present invention is particularly adapted to assembly operations in which each writing unit is individually

ested. Thus, with a glued threaded joint between the holder and the upper casing, it was necessary to first effect a threaded connection without adhesive, test the writing unit and then, if the unit was satisfactory, to unscrew the holder, apply the adhesive and then re-thread the adhesively coated holder into the upper casing. This required considerable effort. In contrast, in the invention, the holder can be partly inserted and the unit tested by assembling the partly completed upper casing with the remainder of the writing unit and operating the protracting and retracting mechanism. If the unit is satisfactory, all that remains to be done is to thrust the upper casing down upon the holder until the bead 60 passes the shoulder 67. This single thrust provides practically instantaneous assembly and can be contrasted with the previous task of disassembly, gluing reassembly.

I claim:

1. In a writing instrument having an upper tubular casing and a detachable intermediate holder normally firmly secured within the lower end thereof, the improvement wherein said casing has an interiorly disposed intermediately positioned inwardly projecting bead extending transversely to the longitudinal axis of said casing, said intermediate holder having an upwardly projecting portion adapted to be received within the lower end of said casing, said upwardly projecting portion having an intermediately positioned circumferential recess and an upwardly tapering plug positioned above said recess, the lower end of said plug having an external diameter exceeding the internal diameter of said bead and being formed with a transversely extending downwardly facing shoulder adjacent said circumferential recess, said shoulder being inserted beyond said bead and said bead being received within said recess, the longitudinal extent of said recess being greater than the longitudinal extent of said bead, said casing and intermediate holder including interengaging flute means and rib means to prevent relative rotation between said casing and holder and to maintain said casing and holder in frictional engagement, said intermediate holder and said casing being separable without destroying either of them by applying to each an axial force in opposite directions, said force being greater than that normally encountered in the normal use of the writing instrument, at least one of said flute means and rib means being formed in circumferentially spaced bands.

2. A writing instrument as recited in claim 1 wherein said flute means comprises longitudinal flutes formed on the lower open end of said casing and wherein said rib means comprises outwardly directed longitudinally extending ribs on the lower end of said projecting portion of said intermediate holder, said ribs meshing with said flutes.

3. The improvement recited in claim 2 in which the upper extremity of said ribs are inwardly tapered and pointed.

4. The improvement recited in claim 3 in which the lower extremity of said flutes are wider than the main body of said flutes to facilitate reception of the forward pointed extremity of said ribs.

5. The improvement recited in claim 2 in which the upper end of said upper casing has trapped therewithin a push member and a rotatable member loosely associated therewith.

6. In a writing instrument having an upper tubular casing and a detachable intermediate holder normally firmly secured within the lower end thereof, the improvement wherein said intermediate holder has an upwardly projecting portion received within the lower end of said casing, said upwardly projecting portion and the interior of said casing including interlocking means for releasably locking the holder within the casing, said casing and in-

intermediate holder including inter-engaging flute means and rib means to prevent relative rotation between said casing and holder and to maintain said casing and holder in frictional engagement, said intermediate holder and said casing being separable without destroying either of them by applying to each an axial force in opposite directions, said force being greater than that normally encountered in the normal use of the writing instrument, at least one of said flute means and rib means being formed in circumferentially spaced bands.

7. In a writing instrument, an upper tubular casing and an intermediate holder secured within the lower end thereof, said casing being preformed and having an interiorly disposed intermediately positioned inwardly projecting preformed bead extending transversely to the longitudinal axis of said casing, said intermediate holder being preformed and having an upwardly projecting portion adapted to be received within the lower end of said upper casing, said upwardly projecting portion having an intermediately positioned preformed circumferential recess and an upwardly tapered plug positioned above said recess, the longitudinal extent of said recess being greater than the longitudinal extent of said bead, the lower end of said plug having an external diameter exceeding the internal diameter of said bead and being formed with a transversely extending downwardly facing shoulder adjacent said circumferential recess whereupon when said intermediate holder is inserted in said casing the tapered plug outwardly radially stresses the casing in the area of the bead until the shoulder passes the bead whereupon the bead is received within the recess, said casing and said intermediate holder including inter-engaging means to prevent relative rotation between said casing and said holder and to maintain said casing and said holder in frictional engagement, said interengaging means being constituted by the lower end of said casing being formed with longitudinal flutes and the lower end of said projecting portion of said intermediate holder being formed with outwardly directed, longitudinally extending ribs meshing with said flutes, said flutes extending entirely around the internal circumferences of the lower open end of said casing and said ribs being formed on said projecting portion in circumferentially spaced bands, the diameter of the lower open end of said casing being slightly less than the distance between the ribs on opposed spaced bands so that when said ribs are inserted in said flutes the lower end of said casing is distorted, said intermediate holder and said casing being operable without destroying either of them by applying to each an axial force in opposite directions, said force being greater than that normally encountered in the normal use of the writing instrument.

8. A writing instrument as recited in claim 7 in which said intermediate holder is formed with a centrally disposed enlarged band and the distance from the upper end of said band to said shoulder only slightly exceeds the distance from the lower open end of the casing to the upper end of said circumferential bead.

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