# PATENT SPECIFICATION

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*Date of Application and filing Complete Specification: Jan. 20, 1951.*

*No. 1576/51.*

*Complete Specification Published: Dec. 22, 1954.*

**Index at acceptance:—Class 146(3),** A11E1.

COMPLETE SPECIFICATION

## Improvements in or relating to Writing Instruments

We, W. A. SHEAFFER PEN COMPANY, a corporation organized under the laws of the State of Delaware, United States of America, of Fort Madison, Iowa, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to writing instruments and more particularly to self-filling fountain pens which utilize air pressure for deflating the ink-containing sac.

The present invention provides a compression unit for collapsing an ink sac in a writing instrument which includes a pair of telescopic tubular members forming a chamber adapted to receive the ink sac, said chamber being unvented to the atmosphere except through a passage-way between said tubular members, an air flow restricting member in said passageway, and a pair of spaced means on one of said tubular members for by-passing said air flow restricting member, whereby said chamber is freely vented to the atmosphere between said tubular members only when said tubular members are telescopically moved respectively to an extended position and to a returned position.

The present invention provides also a fountain pen including a barrel open at its rearward end, an ink sac within said barrel secured to the forward end thereof, a tube telescopically mounted through the rear end of said barrel defining an air passageway therebetween, said tube being open at its forward end and being unvented at its rearward end, said barrel and said tube defining a chamber about said sac, an annular air flow restricting member in said passage way intermediate said barrel and said tube supported by and adjacent the rear end of said barrel, an inwardly extending deformation adjacent the rear end of the outer surface of said tube adapted to span said air flow restricting member to provide free passage of air through said annular passageway and to by-pass said air flow restricting member when said barrel and tube are positioned in telescopically retracted position, and means in said tube forwardly of said deformation for by-passing the air flow restricting member when the barrel and tube are positioned in a telescopically extended position.

In the usual fountain pen of the nib type, the ink reservoir may comprise a collapsible rubber sac which contains the ink supplied to the pen point through a suitable feed means. In order to fill pens of this type a suitable presser bar has generally been provided which is actuated by a lever mounted on the side of the instrument. The presser bar upon movement of the lever collapses the ink sac. The pen point is then inserted into a body of ink, the lever and presser bar released, and the ink is thereby drawn into the sac by the tendency of the flexible sac to resume its normally distended condition. The use of presser bars of this type for deflating collapsible ink sacs in fountain pens has not been entirely satisfactory for the reason that the operating lever is unsightly in appearance and for the reason that sometimes the lever becomes accidentally displaced so that the ink is discharged accidentally from the pen when not so intended by the user. Also the presser bar activated filling means have been disadvantageous since it is not practically possible completely to collapse the ink sac in order to permit a full load of ink to be drawn up into the sac during the filling operation.

Accordingly it has been proposed in the past to utilize air pressure to deflate the sac prior to filling. One prior art device which has seen some commercial use is one in which the ink sac is contained within a chamber formed by a pair of

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telescoping tubular members. In this type of construction the chamber is substantially sealed from the atmosphere except for a small vent placed in the top of one of the telescoping tubes. The device was filled by retracting one of the tubular members, placing the finger over the vent hole, telescoping the members whereby the sac was deflated by compressing air in the chamber, inserting the pen point into a body of ink, and then removing the finger from the vent, thereby relieving the pressure in the chamber permitting the sac to become distended by its natural resiliency and to suck up a charge of ink into the sac reservoir. Pens of this character were not entirely satisfactory from a commercial view-point for the reason that sometimes the operator neglected to place his finger over the vent at the proper time during the filling operation and so was unable to obtain proper filling. Also under certain conditions the finger did not completely close the vent and the sack was only partially collapsed, resulting in only partial filling of the reservoir.

In order to remedy these last mentioned difficulties, other prior art investigators have proposed means for automatically venting the reservoir at the proper time during the filling operation.

Accordingly, it is one object of this invention to provide a self-filling fountain pen which utilizes air pressure for deflating the sac.

A further object of this invention is the provision of a self-filling fountain pen of the type in which the sac is deflated by air pressure wherein a minimum of moving parts and auxiliary valves are employed.

A further object of this invention is the provision of a filling device for a fountain pen which may be readily constructed and easily assembled for large scale commercial manufacture.

A still further object of this invention is the provision of a foolproof filling device which requires no skill or special care on the part of the operator to render it completely effective at all times.

A still further object of this invention is the provision of a fountain pen in which a cartridge comprising a pen and ink reservoir section is readily separable from the compression unit in order to provide for ease of disassembly and for independent replacement of parts.

For a more complete understanding of this invention, reference is now made to the accompanying drawing wherein:

Figure 1 is a broken longitudinal sectional view of a complete writing instrument constructed in accordance with one embodiment of this invention and showing the filling device in an inoperative or stand-by condition;

Figure 2 is a fragmentary sectional view of the writing instrument shown in Figure 1 illustrating the operation of the filling device with the tubular member moved to its full retracted or rearward position;

Figure 3 is similar to Figure 2 except that it shows the tubular member being telescoped into the barrel with the resulting pressure collapse of the ink sac;

Figure 4 is an enlarged broken detail view of the filling device in the position indicated in Figure 1;

Figure 5 is a cross-sectional view of the device taken along the line $5^1$—$5^1$ of Figure 4; and

Figure 6 is a cross-sectional view taken along the line $6^1$—$6^1$ of Figure 4.

With particular reference to the drawings and more specifically to Figure 1, a writing instrument is provided having a barrel portion 10 and the usual cap 12 and pocket clip 14. Mounted forwardly of the barrel 10 and threadably engaged therewith is a nib section 16 having the usual nib 18 and feed means 20 mounted in slip-fit relationship thereto. The nib section 16 is provided with an axial bore 22 which communicates with a collapsible ink sac 24 adhesively or otherwise secured to a projection 26 extending rearwardly of a reduced rear portion 28 of the nib section 16. Suitable ink feed passageways (not shown) are provided through the bore 22 and the ink feed means 20 in the manner that is well known in the art in order to supply ink to the nib 18 from the sac 24. The nib section 16 together with the pen 18, the feed means 20, the collapsible sac 24 and an associated sac protecting sheath 30 constitutes a removable cartridge which may be separated from the barrel 10 by unscrewing the nib section from the barrel at threads 36 (Figure 1). The sheath 30 is provided with lateral vents 32 and an end vent 34 and is slip-fitted in a removable manner over the rear end 28 of the nib section 16 so as to provide ready access to the collapsible sac 24 in the vent that such access is desired. The nib section 16 is provided with an annular groove 35 for receiving three spaced detents 37 (one only of which is shown in Figures 1 and 3) on the sheath 30. The forward end of the sheath is also provided with an annular depression 39 so that after the sac 24 has been shellacked on the projection 26 of the section 16, the annular depression 39 further tightens the sac on the projection 26 with the detents 37 snapping into position within the groove 35. To remove the

telescoping tubular members. In this type of construction the chamber is substantially sealed from the atmosphere except for a small vent placed in the top of one of the telescoping tubes. The device was filled by retracting one of the tubular members, placing the finger over the vent hole, telescoping the members whereby the sac was deflated by compressing air in the chamber, inserting the pen point into a body of ink, and then removing the finger from the vent, thereby relieving the pressure in the chamber permitting the sac to become distended by its natural resiliency and to suck up a charge of ink into the sac reservoir. Pens of this character were not entirely satisfactory from a commercial view-point for the reason that sometimes the operator neglected to place his finger over the vent at the proper time during the filling operation and so was unable to obtain proper filling. Also under certain conditions the finger did not completely close the vent and the sack was only partially collapsed, resulting in only partial filling of the reservoir.

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Accordingly, it is one object of this invention to provide a self-filling fountain pen which utilizes air pressure for deflating the sac.

A further object of this invention is the provision of a self-filling fountain pen of the type in which the sac is deflated by air pressure wherein a minimum of moving parts and auxiliary valves are employed.

A further object of this invention is the provision of a filling device for a fountain pen which may be readily constructed and easily assembled for large scale commercial manufacture.

A still further object of this invention is the provision of a foolproof filling device which requires no skill or special care on the part of the operator to render it completely effective at all times.

A still further object of this invention is the provision of a fountain pen in which a cartridge comprising a pen and ink reservoir section is readily separable from the compression unit in order to provide for ease of disassembly and for independent replacement of parts.

For a more complete understanding of this invention, reference is now made to the accompanying drawing wherein:

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Figure 3 is similar to Figure 2 except that it shows the tubular member being telescoped into the barrel with the resulting pressure collapse of the ink sac;

Figure 4 is an enlarged broken detail view of the filling device in the position indicated in Figure 1;

Figure 5 is a cross-sectional view of the device taken along the line $5^1$—$5^1$ of Figure 4; and

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sheath from the section, it is only necessary to rock it slightly while pulling to disengage the detents from the channel or groove 35. If it is desired to remove the ink feed means and the nib from the nib section 16 it is then only necessary to remove the sac 24 from the rear end of the nib section and thereafter punch the feed means 20 and the nib 18 from the bore 22. The various parts of the cartridge may be reassembled in the reverse order. As shown in Figure 1, a threaded collar 38 is secured to the nib section 16 for removable attachment of the cap 12 thereto in a manner that will be readily understood.

The compression unit for the fountain pen of this invention comprises the barrel 10 and a tube 40 having an open forward end and a closed rearward end mounted in telescopic relationship to the barrel between the inner side wall of the barrel 10 and the outer side wall of the sleeve 30. The rearward end of the telescopically mounted tube 40, as will be most apparent from Figure 2, is completely closed so that no venting can occur therethrough. A suitably threaded cap member 42 is secured to the rearward end of the tube 40 by means of a screw 44, a gasket being provided to prevent possible air leakage at this point. Cap 42 is provided with threads 48 which are adapted to engage threads 50 in the rearward end of barrel 10 when the tube 40 is moved to and secured in the returned or normal stand-by condition indicated in Figures 1 and 4.

The tube 40 is loosely mounted between the inner side wall of the barrel 10 and the outer side wall of the sheath 30 in order to provide an annular passage-way for the movement of air into and out of the chamber enclosing the sheath 30 and the sac 24 and formed by the barrel 10 and the tube 40. Thus when the tube 40 is reciprocated within the barrel 10, the chamber is considerably varied in size and the sole means provided for the entry and expulsion of air into and from the chamber is the annular passageway between the side walls of the tube 40 and the barrel 10.

The forward end of the tube 40 is provided with an enlarged head portion 52 which in cooperation with the forward limits of the threads 50 in the rear end of the barrel 10 provides a stop for limiting the rearward movement of the tube 40 with respect to the barrel 10. Also the head or enlarged portion 52 of the tube 40 has a substantial longitudinal dimension so that when the tube 40 is in the fully retracted position as shown in Figure 2 it will not have a tendency excessively to wobble with respect to the barrel 10. Thus a substantially straight line axial relationship is always maintained between the tube 40 and the barrel 10 to permit the operator to readily return the tube 40 to position without bending or binding these respective elements. It will be noted that the head or enlarged portion 52 does not fit tightly within the barrel 10 and the free passage of air between the head 52 and the barrel 10 is always permitted when the tube 40 is reciprocated in either direction.

In order to provide means for operatively sealing the chamber containing the ink sac during the compression stroke of the piston or tube 40, there is provided a ring packing gland 54 seated within an annular groove 56 provided adjacent the rearward end of the barrel 10. The packing gland is thus fixed with respect to the barrel 10 and the tube 40 is slidable therethrough as will be well understood. The function of this packing gland is to seal off the chamber during the compression stroke of the tube 40 so that the air pressure built up during this operation will collapse the sac in the manner indicated in Figure 3. However, in order to relieve the pressure within the chamber after the tube 40 has been moved to its forward position thus permitting the sac to expand, there is provided in the tube 40 one or more grooves 58 in the rear end thereof. These grooves preferably extend longitudinally and are of sufficient length to span the packing gland 54 when the tube 40 is in its return position and prior to the time that the cap 42 is screwed on to the barrel portion 10 by means of the cooperating threads 48 and 50. Thus the groove 58 provides a by-pass for the packing gland 54 so that the chamber is freely vented to the atmosphere shortly before the tube 40 reaches its fully returned position. By venting the chamber through the groove 58 the sac is permitted to become distended by its natural resiliency and it draws a full charge of ink into itself when the nib 18 and the ink feed means 20 are immersed in a suitable liquid ink supply during the filling operation.

One or more longitudinally extending grooves 60 are also provided on a forward end of the tube 40 so that when the tube is in the fully retracted position the groove 60 spans the packing gland 54, thus again venting the chamber to the atmosphere. Thus any vacuum created when the tube 40 is retracted is dispelled through the groove 60 prior to the time that the compression stroke is commenced as above described. In addition, tube 40 is provided with one or more vent holes 61 in the groove or grooves 60, these vent

holes also being positioned so that they are positioned to the rear of the packing gland 54 when the tube is fully retracted. If desired, the grooves 60 may be omitted, the function thereof being supplied by the vent holes 61. In such a case any vacuum created in the chamber will, upon full retraction of the tube 40, be dispelled through the vent holes 61 and the annular passageway between the tube 40 and the sheath 30.

The procedure followed for discharging and filling of the pen will be apparent from the above description. Also the foregoing description makes it clear how the various parts may be readily assembled to produce a highly satisfactory commercial article. The sheath 30 for the ink sac 24 is provided to prevent the collapse of the sac in a longitudinal direction (i.e. in the manner of an accordion) and also to prevent contact of the sac with the tube 40. If such contact were permitted the frictional engagement of the tube with the sac during the filling operation would have a tendency to twist, stretch, or bend the sac resulting in undue wear and would prematurely expel any used ink that may be contained within the reservoir. Also the sheath by virtue of its snug fit around the sac 24 serves to prevent the collapsible sac from being pulled out of shape when a suction or vacuum is applied in the chamber upon the withdrawal of the tube 40 to the retracted position. As pointed out above, the sheath by virtue of the annular depression 39 tends to tighten the fit of the sac 24 on the rear portion of the nib section 16 by a squeezing action. The openings 32 and 34 in the sheath 30 are necessary in order to provide free access of the compressed air to the sac to permit of the collapsing operation. The sheath 30 has been shown in the form of a metal sleeve. However, it will be apparent that it may be formed of plastic, or, in fact, any material that is sufficiently rigid to hold the sac from collapsing when not intended by the user. In this respect, the sheath could be formed of metallic or plastic screening material such as that employed in window screens to repel insects.

It will be noted that the barrel 10 is provided with a vent 62 adjacent the rear end thereof between the packing gland 54 and the lower limit of the cap 42 when the latter is fully screwed into the rear end of the barrel 10 to the position shown in Figures 1 and 4. This vent is provided so that when the cap 42 is screwed on to the barrel 10 a pressure will not form within the chamber which would cause a partial expulsion of the ink from the sac. The vent 62 also serves to permit the air chamber to "breathe" when the instrument is assembled ready for use, thus preventing leakage of the pen upon fluctuation of atmospheric pressure or temperature conditions, as is well known in the art.

It will be understood that the packing gland 54 may be formed of any material which will serve as a means for restricting the passage of air through the annular passageway formed between the tube 40 and the barrel 10. For example, the packing gland may be formed of rubber, felt, nylon or other suitable material. As a matter of fact, the packing gland itself may be dispensed with and a suitable shoulder or ridge may be provided to form the desired air flow restricting means in the passageway. It is not necessary that the seal formed by the air restricting means be perfect. It should be sufficiently loose to as to permit free reciprocation of the tube 40 but sufficiently tight to permit the desired pressure to build up on a normal compression stroke so as to substantially completely collapse the ink sac immediately prior to filling. If desired, a suitable lubricant may be employed to avoid any possible undesired frictional resistance in the reciprocation of the tube 40 through the packing gland.

In the foregoing a preferred embodiment of this invention has been described. However, it will be apparent that certain modifications may be made. For example, the ink sac need not be received within the tube 40 but may be remote therefrom. Also, if desired, the tube 40 may be of increased diameter so that it slides over the barrel 10 instead of within it. In such a construction the annular packing gland 56 may be mounted in fixed relationship to the inside wall of the tube 40 adjacent its forward end and suitably spaced longitudinally extending grooves adapted to span the gland or other vent means to bypass the gland may be provided in the walls of the barrel 10 as will be understood.

Longitudinally extending grooves 58 have been specifically shown for venting the chamber when the tube 40 is moved to a returned position. If desired, however, such venting means could take the form of a reduced cylindrical portion of the tube in the embodiment shown.

While a particular embodiment of this invention is shown above, it will be understood, of course, that the invention is not limited thereto, since many modifications may be made, and it is contemplated, therefore, by the appended claims, to cover any such modifications as fall within the scope of this invention.

What we claim is:—

1. A compression unit for collapsing an ink sac in a writing instrument which includes a pair of telescopic tubular members forming a chamber adapted to receive the ink sac, said chamber being unvented to the atmosphere except through a passageway between said tubular members, an air flow restricting member in said passageway, and a pair of spaced means on one of said tubular members or by-passing said air flow restricting membered whereby said chamber is freely vented to the atmosphere between said tubular members only when said tubular members are telescopically moved respectively to an extended position and to a returned position.

2. A compression unit according to claim 1, including means defining a vent in a side wall of the other tubular member at one end thereof for venting said chamber when said tubular members are moved to a relatively extended position, and said by-passing means including an area of reduced cross-section at the rear end of said one tubular member for spanning said air flow restricting member and venting said chamber to the atmosphere when said tubular members are moved to relatively returned position.

3. A compression unit according to claim 2, wherein said area is formed by a longitudinal groove in the rear end of said one tubular member.

4. A compression unit according to any of the preceding claims, wherein one of said members is closed at one end and the other is open at the opposing end for receiving an ink sac and feed means for a writing instrument, said flow restricting member comprising an annular member positioned between said member in fixed relationship to one of them.

5. A compression unit according to any of the preceding claims, including a first tubular member open at its rear end, a second tubular member telescopically mounted through the rear end and within said first tubular member, said second tubular member having an open forward end and a closed unvented rearward end, means in the forward end of said first tubular member for securing feed means for a writing instrument, an ink sac secured to said feed means within said first tubular member and a packing gland intermediate said tubular members retained in an annular groove adjacent the rear end of said first tubular member.

6. A compression unit according to claims 2 and 5, including means at the rearward end of said first tubular member for removably securing said second tubular member in said telescoped position, said vent being positioned in the side wall of said first tubular member between said last mentioned means and said packing gland, and said area of reduced cross section being formed in the forward end of said second tubular member for by-passing the packing gland when said tubular members are positioned in a telescopically extended position.

7. A compression unit according to claim 5 or 6, including stop means adjacent the rearward end of said first tubular member and the forward end of said second tubular member to prevent separation of said members when extended, said stop means including an enlarged head on the forward end of said second tubular member having a substantial longitudinal dimension whereby relative wobbling of said tubular members is substantially prevented when in the extended position.

8. A fountain pen embodying the compression unit set forth in claim 1, said tubular members being arranged whereby said chamber may be enlarged by retracting said tubular members with respect to each other and whereby said chamber may be reduced to its normal size by returning said tubular members to their original position to compress the air therein and collapse the ink sac, said tubular members being closed at their opposite ends to prevent venting to the amosphere therethrough, said air flow restricting member being intermediate said tubular members and positioned in fixed relationship to said other tubular member, and said spaced means comprising a pair of longitudinally spaced grooves on said one tubular member adapted to span said air flow restriction member.

9. A fountain pen including a barrel open at its rearward end, an ink sac within said barrel secured to the forward end thereof, a tube telescopically mounted through the rear end of said barrel defining an air passageway therebetween, said tube being open at its forward end and being unvented at its rearward end, said barrel and said tube defining a chamber about said sac, an annular air flow restricting member in said passageway intermediate said barrel and said tube supported by and adjacent the rear end of said barrel, an inwardly extending deformation adjacent the rear end of the outer surface of said tube ~~adaped~~ adapted to span said air flow ~~resisting~~ restricting member to provide free passage of air through said annular passageway and to by-pass said air flow restricting member when said barrel and tube are positioned in telescopically retracted position, and means in said tube forwardly of said deformation for by-passing the air flow restricting member when the barrel and tube are

positioned in a telescopically extended position.

10. A fountain pen according to claim 9, including a longitudinally extending groove on the forward end of said tube of sufficient length to span said air flow restricting member whereby said chamber is freely vented to the atmosphere between said barrel and said tube when the latter is positioned in its rearward position.

11. A fountain pen according to claim 9, having a cartridge comprising the ink feed means, a nib section having a center bore, a nib secured in the front end of said nib section in communication with said bore, said nib section have a rear end of reduced diameter, a vented ink sac protecting sheath removably secured to said rear end, and the ink sac also being secured to said rear end and positioned within said sheath.

12. A fountain pen according to claim 11 wherein said sheath has a deformation urging said sac toward a tight fit on the rear end of said nib section.

13. A fountain pen according to claims 9 and 11, or 12, wherein said ink sac protecting sheath comprises a sleeve having openings in its front and rear portions, said sheath being mounted in slip-fit relationship on said rear end of the nib section and spaced from the inner side wall of said barrel, said tube being mounted in telescopic relationship with said barrel between the inner side wall of said barrel and the outer side wall of said sheath.

14. A compression unit for collapsing an ink sac in a writing instrument constructed and adapted to operate substantially as herein described with reference to the embodiment shown in the accompanying drawings.

15. A fountain pen constructed and adapted to operate substantially as herein described with particular reference to the embodiment shown in the accompanying drawings.

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Chartered Patent Agents,
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Leamington Spa: Printed for Her Majesty's Stationery Office, by the Courier Press.—1954.
Published at The Patent Office, 25, Southampton Buildings, London, W.C.2, from which copies may be obtained.