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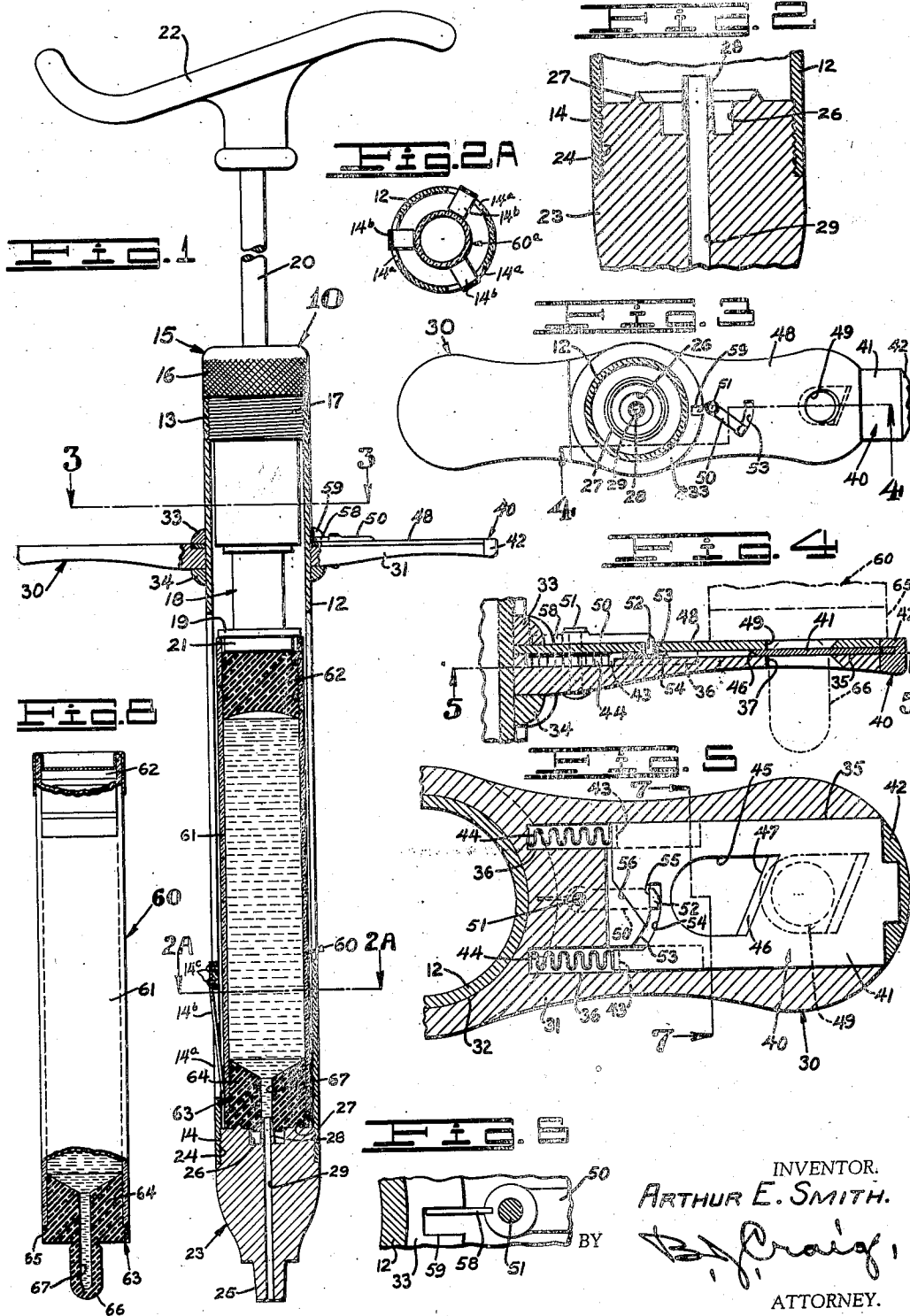
A. E. SMITH

1,993,630

SYRINGE

Filed Jan. 9, 1933

2 Sheets-Sheet 1



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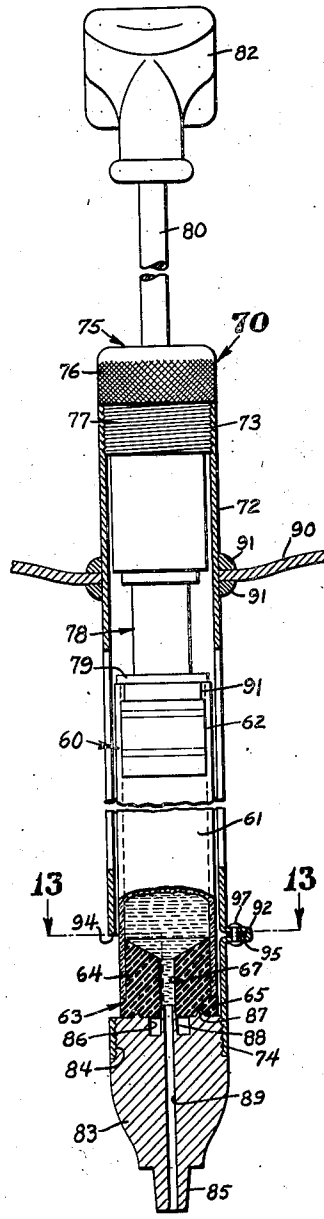
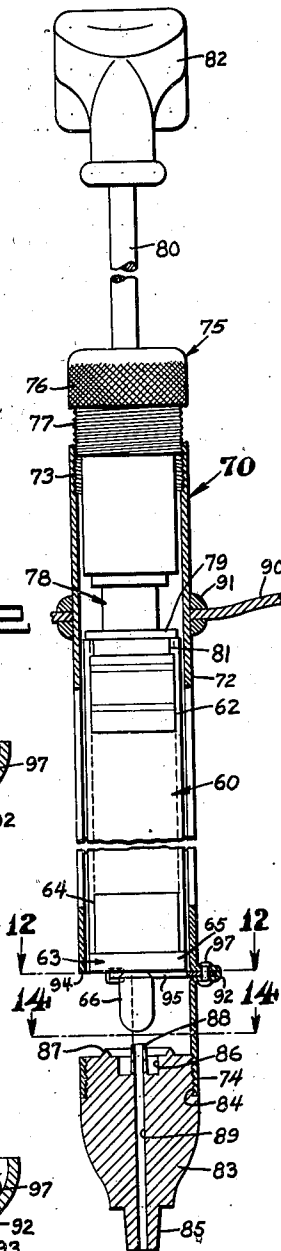
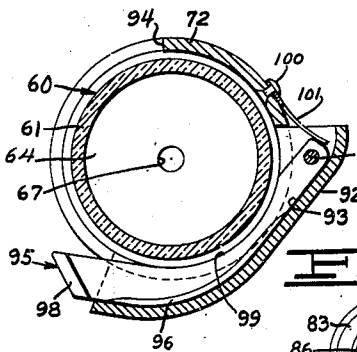
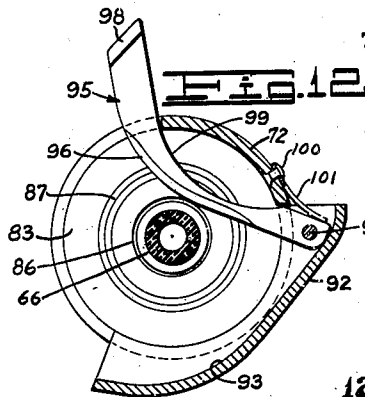
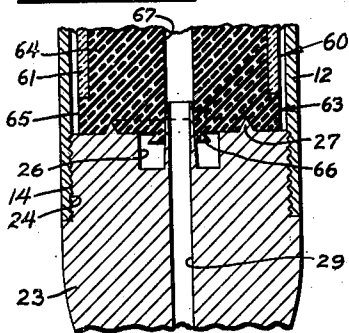
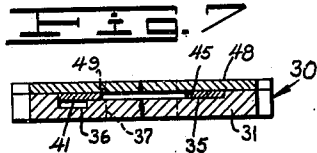
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1,993,630

SYRINGE

Arthur E. Smith, Los Angeles, Calif.

Application January 9, 1933, Serial No. 650,832

3 Claims. (Cl. 128—218)

This invention relates to improvements in syringes.

The general object of the invention is to provide a syringe adapted to receive an ampule and wherein improved means is provided for making a fluid tight seal between the syringe and the discharge end of the ampule.

Another object of the invention is to provide a novel syringe adapted to receive an ampule, the ampule including a tip adapted to be severed therefrom and the syringe including means to sever the tip of the ampule.

Other objects and the advantages of this invention will be apparent from the following description taken in connection with the accompanying drawings wherein:

Fig. 1 is a side elevation partly in section of my improved syringe.

Fig. 2 is a fragmentary enlarged view of the device.

Fig. 2A is a section taken on line 2A—2A of Fig. 1.

Fig. 3 is a section taken on line 3—3 of Fig. 1.

Fig. 4 is an enlarged section taken on line 4—4 of Fig. 3.

Fig. 5 is a section taken on line 5—5 of Fig. 4.

Fig. 6 is a fragmentary enlarged detail.

Fig. 7 is a section taken on line 7—7 of Fig. 5.

Fig. 8 is a side elevation partly in section of an ampule adapted to be used in combination with my improved syringe.

Fig. 9 is a view similar to Fig. 2 showing an ampule operatively positioned in the syringe.

Fig. 10 is a fragmentary view similar to Fig. 1 showing a modified form of syringe with an ampule in one position therein.

Fig. 11 is a view similar to Fig. 10 showing the ampule in another position.

Fig. 12 is an enlarged section taken on line 12—12 of Fig. 10.

Fig. 13 is an enlarged section taken on line 13—13 of Fig. 11, and,

Fig. 14 is a section taken on line 14—14 of Fig. 10.

Referring to the drawings by reference characters, I have indicated my improved syringe generally at 10. As shown the syringe 10 includes a hollow barrel 12 which is threaded at one end as at 13 and at the opposite end as at 14. In the barrel 12 adjacent the threads 14, I provide a plurality of apertures 14^a which are shown as three in number (see Fig. 2A). Resilient centering fingers 14^b are positioned in the apertures 14^a. The upper ends of the fingers 14^b are secured to the barrel 12 as at 14^c and the lower ends

extend through the apertures into the barrel. The end 13 is adapted to receive a cap member 15 which is shown as similar in construction to the cap shown and described by me in my co-pending application Serial No. 591,825, filed February 9, 1932. The cap 15 includes a head 16 having a threaded portion 17 thereon which is adapted to engage the threads 13 of the barrel 12. The cap 15 further includes a spring pressed telescopic portion 18 having a head 19 thereon which is adapted to engage the end of an ampule in the barrel 12. The cap 15 carries a plunger rod 20 which is slidable therethrough and at one end includes an enlarged head 21 which is adapted to engage the stopper of an ampule in the barrel 12. The opposite end of the plunger includes an enlarged operating portion 22 by means of which the plunger rod is adapted to be moved.

The end of the barrel 12 opposite the cap end is adapted to receive a tip member 23 which adjacent one end includes a threaded portion 24 adapted to engage the threaded portion 14 of the barrel 12. The opposite end of the tip 23 terminates in a reduced tapered portion 25 on which a hypodermic needle (not shown) is adapted to be positioned. The tip 23 includes a recess 26 which opens through the upper face thereof and surrounding the recess on the upper face of the tip intermediate the periphery thereof and the recess 26 I provide an annular flange 27. The flange 27 is preferably triangular in cross section to provide a sharper upper edge.

Extending upward from the bottom of the recess 26 to a distance above the flange 27, I provide an annular boss or stem 28 which is integral with the tip and may be slightly tapered as shown. The tip 23 further includes a central discharge aperture 29 which at one end opens through the lower end of the reduced portion 25 and at the opposite end opens through the upper end of the stem 28.

Intermediate the length of the barrel 12, I provide a cross arm indicated generally at 30. As shown the cross arm 30 comprises a body portion 31 having an aperture 32 therein in which the barrel 12 is adapted to be positioned. The cross arm 30 is adapted to be rigidly secured to the barrel 12 by top and bottom rings 33 and 34 respectively which surround the barrel and are secured thereto by soldering or brazing. At one side of the aperture 32 the body includes a rectangular recess 35 in the upper surface thereof. One end of the recess 35 opens through the adjacent end of the body 31 while the opposite end terminates a distance spaced from the aperture

32. The body 31 further includes a pair of reduced recesses 36 which are positioned one adjacent each side of the recess 35. The recesses 36 are preferably of greater depth than the recess 35 and entered from a point intermediate the length of the recess 35 beyond the closed end thereof to a point spaced from the body aperture 32. (See Figs. 4 and 5).

Adjacent the outer end of the recess 35 the body 31 includes an aperture 37 which extends therethrough at right angles to the bottom of the recess 35. Positioned on the body 31 I provide a cutting member indicated generally at 40. As shown the cutting member 40 includes a flat blade portion 41 which is positioned in the recess 35 and is slidable therein. One end of the blade 41 has an enlarged head 42 thereon which is shaped to conform to the shape of the end of the body 31 which is shown as rounded. The opposite end of the blade includes a pair of spaced downwardly extending finger portions 43 which are positioned one in each of the body recesses 36. Positioned in each of the recesses 36 between the ends thereof adjacent the body aperture 32 and the fingers 43 of the blade 41, I provide flat serpentine spring members 44 which resiliently urge the cutting member to an extended position.

The blade 41 intermediate the length thereof includes an aperture 45. The end of the aperture 45 adjacent the head 42 is preferably arranged at an angle and beveled upward as indicated at 46 to form a sharp cutting edge 47. The blade 41 and the springs 44 are retained in positions in the body 31 by a cover plate 48 which may be soldered or brazed to the body 31. The cover plate 48 includes an aperture 49 therein which is coaxial with the aperture 37 in the body 31.

For retaining the cutting member 40 in a closed position as shown in Figs. 4 and 5 I provide a latch member 50 which is mounted on the upper face of the cover plate 48 and is pivotally secured in position by a rivet 51. The latch member 50 includes a downwardly extending finger 52 which is positioned in an arcuately shaped slot 54 provided in the blade 41.

As shown the slot 54 includes a flattened portion 55 adjacent the center of the blade and a portion of the inner end of the blade is beveled as at 56. The inner end of the bevel 56 meets the slot 54 at a point spaced between the center of the blade and one of the fingers 43 thereby forming an opening of a size to permit the finger portion 52 of the latch member 50 to pass therethrough. The latch member 50 is adapted to be resiliently retained in a locking position with the finger thereof positioned adjacent the longitudinal center of the cross bar by a flat spring member 58 one end of which is suitably secured to the latch 50 and the opposite end slidably positioned in a slot 59 provided in the ring 33, (see Fig. 6). When the cutting member 40 is in a closed position as shown in Figs. 4 and 5 the latch finger 52 is positioned in the blade slot 54 and engages the flat portion 55 thereof thereby preventing the springs 44 from moving the cutting member to an extended position.

To move the cutting member 40 to an extended position the operator swings the latch member 50 about its pivotal point 51 towards the outer end of the aperture 53 as shown in Fig. 3. As the latch member 50 is thus moved the finger portion 52 thereof moves in the blade slot 54 away from the flat portion 55 thereof and when it reaches the opening out of the slot 54 the springs 44 move

the cutting member 40 outward until the blade fingers 43 engage the ends of the recesses 36 whereupon further outward movement of the cutting member is restricted. When the inner end of the blade 41 moves out of the path of movement of the latch finger 52 the spring 58 returns the latch 50 to its initial position.

When the cutting member 40 is in an extended position the blade aperture 45 registers with the body aperture 37 and the cover aperture 49 as shown by the dotted lines in Fig. 3 and indicated by the broken lines in Fig. 5 thereby providing a passageway through the cross bar. When the cutting member 40 is moved towards a closed position the bevel 56 of the blade 41 engages the latch finger 52 and swings the latch on its pivot until the finger reaches the opening into the blade slot 54 whereupon it enters the blade slot 54 and the spring 58 returns the latch to a locked position wherein the finger 52 engages the plate portion 55 of the slot 54 and prevents the springs 44 from moving the cutting member to an extended position.

In Fig. 8, I have indicated an ampule generally at 60 of a type adapted to be used in combination with my improved syringe 10. The ampule 60 is similar to the ampule shown in Fig. 2 of my co-pending application Serial No. 591,825, filed February 1, 1932.

As shown the ampule 60 comprises a tubular glass body portion 61 having a rubber stopper 62 therein adjacent one end. The opposite end of the body 61 is closed by a rubber end member 63 which includes a stopper portion 64 positioned in the body and an enlarged flange portion which engages the end of the body. Extending from the outer face of the flange 65 the end member 63 includes a reduced tip 66.

The end member 63 further includes a recess 67 which opens through the inner face of the stopper portion 64 and the bottom of which is spaced inward from the outer end of the tip portion 66. The ampule body 61 may contain any desired liquid medicament or anaesthetic desired.

When an operator desires to expel the contents of the ampule 60 with the syringe 10 he removes the syringe cap 15 from the barrel 12 and swings the latch member to an unlocked position as shown in Fig. 3 whereupon the cutting member 40 is moved to an extended position as previously described. The operator then inserts the tip 66 of the ampule end member in the apertures 49 and 37 of the cross bar 30 and then moves the cutting member 40 to a closed position. As the cutting member is moved to a closed position the cutting edge 47 of the blade 41 severs the tip 66 from the ampule end member 63 whereupon the recess 67 of the end member 63 becomes an aperture therethrough open at both ends.

After serving the tip 66 from the end member 63 the operator inserts the ampule 60 in the syringe barrel 12 with the ampule end member positioned adjacent the inner face of the syringe tip 23 as shown in Fig. 1. When the ampule 60 is positioned in the barrel it is engaged by the resilient fingers which correctly center the ampule in the barrel. The operator then replaces the syringe cap 15 whereupon the head 19 of the telescopic portion 18 engages the end of the ampule adjacent the stopper 62 and moves the opposite end of the ampule into firm engagement with the tip 23. When the ampule is thus positioned in the syringe the outer face of the ampule flange 65 engages the annular flange 27 of the tip 23 and the end of the stem 28 enters the aperture 67 of

the ampule end member and the portion of the ampule tip 66 remaining on the ampule end member is positioned in the recess 26 of the syringe tip 23. When the head 19 of the telescopic member 18 engages the end of the ampule the plunger rod head 21 engages the ampule stopper 62.

To expel the contents of the ampule the operator moves the plunger rod 20 towards the syringe tip 23. As the plunger rod is thus moved the head 21 thereof forces the ampule stopper 62 towards the ampule end member 63. Thus the stopper 62 acts as a piston to expel the contents of the ampule therefrom through the aperture 67 of the end member 63 into the aperture 29 of the syringe tip 23. As pressure is applied to the ampule stopper to expel the contents of the ampule the entire ampule is forced towards the syringe tip 23 whereupon the syringe tip flange 27 becomes embedded in the face of the flange 65 tightly engages the upper face of the syringe tip thereby forming a fluid tight seal between the discharge end of the ampule and the syringe as shown in Figs. 1 and 9. The greater the pressure required to expel the contents of the ampule the tighter seal formed between the discharge end of the ampule and the syringe. When an ampule of less diameter than the ampule 60 is employed such as the ampule indicated at 60^a in Fig. 2A the resilient fingers engage the ampule and correctly center it in the barrel.

In Figs. 10 to 14 inclusive I have indicated a modified form of my invention generally at 70. As shown the syringe 70 is similar to the syringe 10 and includes a hollow barrel 70 threaded at one end as at 73 and at the opposite end as at 74. The end 73 receives a cap member 75 similar to the cap 15 of the device 10 and includes a head 76 having a threaded portion 77 thereon which is adapted to engage the threads 73 of the barrel 72. The cap 75 includes a spring pressed telescopic portion 78 having a head 79 thereon adapted to engage the end of an ampule positioned in the barrel 72. The cap 75 like the cap 15 carries a plunger rod 80 which is slidable therethrough and at one end includes an enlarged head 81 which is adapted to engage the stopper of an ampule positioned in the barrel 72. The opposite end of the plunger rod 80 includes an enlarged operating portion 82 by means of which the plunger rod is adapted to be moved.

The end of the barrel 72 opposite the end 73 is adapted to receive a tip member 83 similar in construction to the tip member 23 of the syringe 10. Adjacent one end the tip 83 includes a threaded portion 84 which is adapted to engage the threads 74 of the barrel 72. The opposite end of the tip 83 terminates in a reduced tapered portion 85 on which a hypodermic needle (not shown) is adapted to be positioned. The tip 83 includes a recess 86 which opens through the upper face thereof and surrounding the recess 86 on the upper face of the tip intermediate the periphery thereof and the recess 86 I provide an annular flange 87 which is preferably triangular in cross section to provide a sharp upper edge thereon. Extending upwardly from the bottom of the recess 86 to a distance above the flange 87 I provide an annular boss or stem 88 which is integral with the tip and may be slightly tapered as shown. The tip 83 further includes a central discharge aperture 89 which at one end opens through the lower end of the reduced portion 85 and at the opposite end opens through the upper end of the stem 88.

Intermediate the length of the barrel 72 I provide thereon a finger engaging cross bar 90 which

may be of any convenient shape and is shown as retained in position by upper and lower collars 91 which are secured to the syringe barrel in any desired manner. Above the tip 83 the barrel 72 is flared outwardly to form a housing 92 which includes a recessed chamber 93 opening into the interior of the barrel. A portion of the barrel 72 between the upper surface of the chamber 93 and the upper face of the tip 83 is cut to form an aperture as indicated at 94. (See Fig. 14).

Positioned in the chamber 93, I provide a cutting member 95 which includes a sharpened cutting surface 96. Adjacent one end the cutting member 95 is pivotally secured to the housing 92 as at 97 while the opposite end projects out of the barrel 72 through the aperture 94 where it includes an enlarged head portion 98. The edge of the cutting member 95 opposite the sharpened portion 96 is arcuately shaped as indicated at 99. The radius of the arcuate portion is the same as that of the barrel 72. Secured to the barrel 72 as at 100 adjacent the pivot 97 I provide a flat spring member 101 which engages the cutting member 95.

As shown the syringe 70 is adapted to operate in combination with the ampule 60 shown in Fig. 8 and previously described in combination with the syringe 10.

When an operator desires to expel the contents of the ampule 60 with the syringe 70 he removes the cap 75 from the barrel 72 and swings the cutting member 95 from an inoperative position within the chamber 93 as shown in Fig. 13 across the barrel 72 to an operative position as shown in Fig. 12. When in an operative position the cutting member 95 engages one side of the aperture 94 and a portion of the cutting member partly restricts the passageway through the barrel. The cutting member 95 is retained in this restricting operative position by the spring 101 as clearly shown in Fig. 12.

The operator then inserts the ampule 60 in the syringe barrel 72 with the ampule tip 66 towards the syringe tip 83. As the ampule 60 is inserted in the syringe barrel it can move downwardly therein towards the tip 83 until the outer face of the ampule end member 63 engages the cutting member 95 in which position the ampule tip 66 extends below the cutting member 95 as clearly shown in Fig. 10. The operator then replaces the cap 75 but preferably only engages a few of the cap threads 77 with the barrel threads 73, (see Fig. 10). As the cap 75 is thus replaced the head 79 of the telescopic portion 78 engages the end of the ampule and retains the ampule in firm engagement with the cutting member. The operator then preferably turns the syringe on its side with the aperture 94 facing downward and then swings the cutting member 95 from the position shown in Fig. 12 to an inoperative position shown in Fig. 13. The spring 101 also retains the cutting member in an inoperative position in the chamber 93 as clearly shown in Fig. 13. As the cutting member 95 is thus moved the cutting edge 96 thereof severs the ampule tip 66 therefrom which falls out of the barrel 72 through the aperture 94.

After the cutting member 95 has severed the ampule tip and is positioned in the chamber 93 as shown in Fig. 13 the annular portion 99 of the cutting member conforms to the shape of the interior of the barrel 72 whereupon the telescopic member 78 of the cap 75 moves the ampule into engagement with the tip 83.

The operator then fully engages the cap 75

threads 77 with the barrel threads 73 as shown in Fig. 11. The operation of the syringe 70 to expel the contents of the ampule 60 is the same as previously described in connection with the syringe 10 and the portions of the syringe tip 83 and the ampule end member 63 co-act in the same manner to form a fluid tight seal between the syringe and the ampule.

From the foregoing description it will be apparent that I have provided a novel syringe which is simple in construction and highly efficient in use.

Having thus described my invention, I claim:

1. A syringe including a barrel adapted to receive an ampule, said syringe including a cutting member pivotally mounted on said barrel and being transversely movable across said barrel from an inoperative position to an operative position, means to retain said cutting member in an inoperative position and in an operative position said cutting member including a portion which in an operative position restricts complete passageway through said barrel.

2. In combination with a syringe including a barrel, an ampule, said ampule including a discharge aperture at one end initially closed by a tip portion of severable material, said syringe barrel being closed at one end by an end member including means coacting with said ampule to form a fluid tight seal between the discharge end of said ampule and said syringe, said syringe including a cutting member, said cutting member being positioned intermediate said syringe end member and the opposite end thereof, said cutting member being pivotally mounted on said barrel, said member being transversely movable across said barrel from an inoperative position to an operative position, means to resiliently retain said cutting member in an inoperative posi-

tion and in an operative position, said cutting member including a part which in an operative position restricts complete passageway through said barrel and which when said cutting member is in an inoperative position does not restrict passageway through said barrel, said ampule when correctly inserted in said barrel when said cutting member is in an operative position engaging said cutting member and said ampule tip extending beyond said cutting member towards said syringe end member whereupon when said cutting member is moved from an operative position to an inoperative position said ampule tip will be severed therefrom and said discharge aperture will be exposed whereafter said ampule may be moved into engagement with said syringe end member.

3. In combination with a syringe including a barrel, an ampule, said ampule having a closure at one end and said closure including a discharge aperture initially closed by a projecting tip portion of severable material, said syringe barrel being closed at one end by an end member including means coacting with said ampule closure to form a fluid tight seal between the discharge end of said ampule and said syringe, said syringe including a cutting member, means to mount said cutting member for movement across said barrel from an operative position to an inoperative position, said ampule when correctly inserted in said barrel when said cutting member is in an operative position engaging said cutting member and said ampule tip extending beyond said cutting member towards said syringe end member whereupon when said cutting member is moved from an operative position to an inoperative position said ampule tip will be severed therefrom and said discharge aperture will be exposed.

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