

[54] **COMBINED IRRIGATOR, INJECTOR AND EVACUATOR**[76] Inventor: **Oscar Malmin**, 127 E. Wayne Ave., Akron, Ohio 44301[22] Filed: **Jan. 3, 1972**[21] Appl. No.: **214,602**[52] U.S. Cl. **32/40 R, 32/57**[51] Int. Cl. **A61c 3/00**[58] Field of Search..... **32/40 R, 60, 22, 57**[56] **References Cited****UNITED STATES PATENTS**

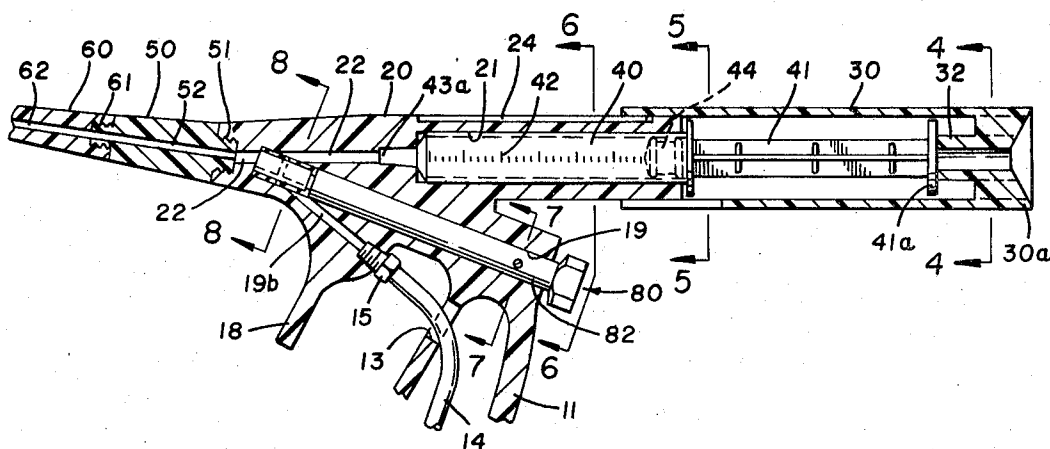
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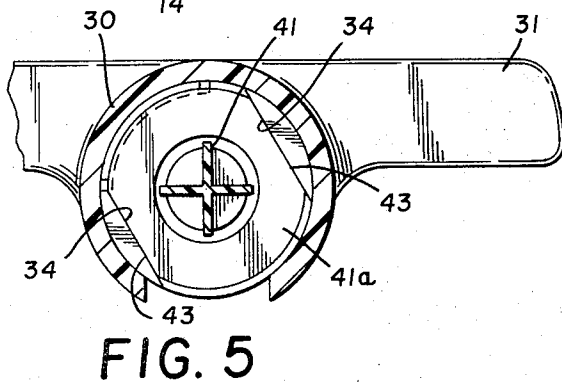
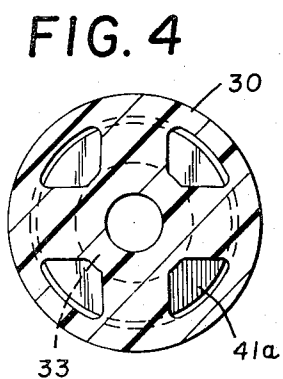
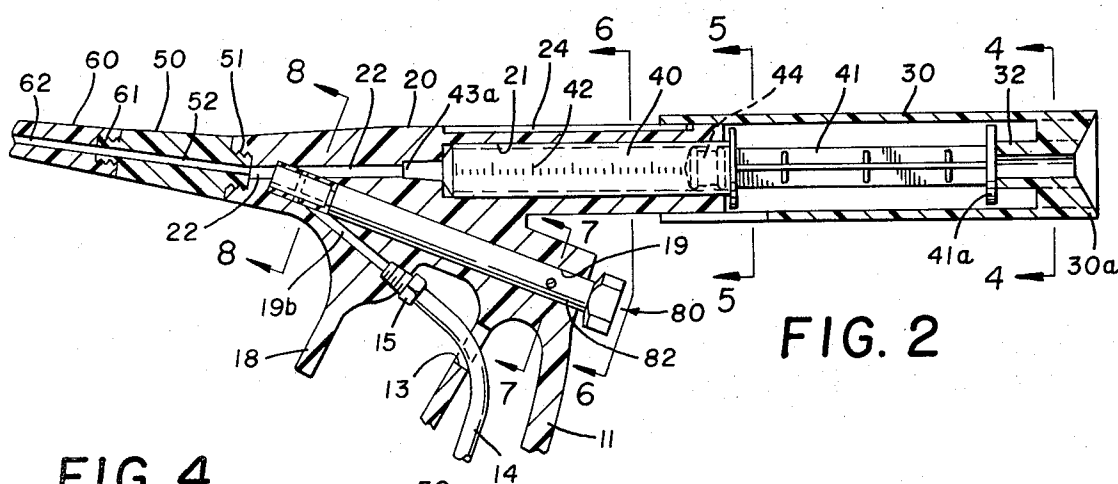
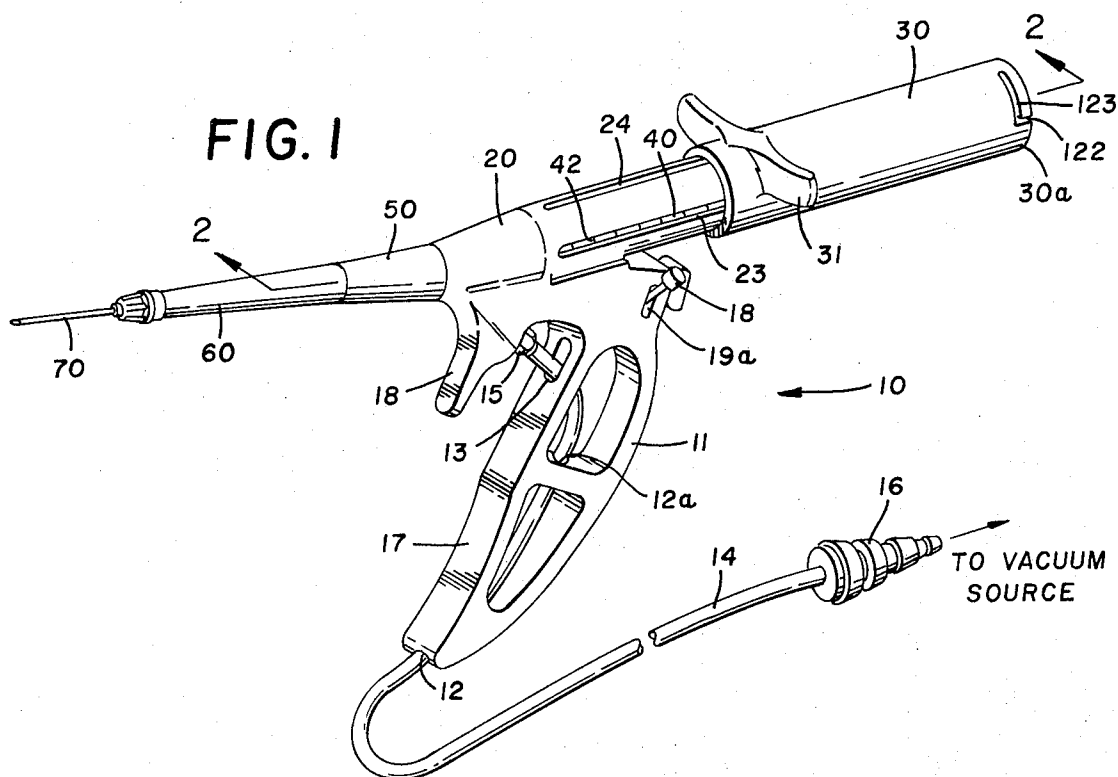
Primary Examiner—Robert Peshock

[57] **ABSTRACT**

A dental irrigator and injector for utilization in root

canal therapy designed to be operated by one hand and which has a plurality of uses, both dental and medical. The instrument includes a handgrip portion, a body which is capable of receiving a disposable syringe or carpule, and means for actuating the syringe or carpule to force fluids contained therein into a bore passing through the body. The opposed end of the body contains a barrel, with or without an extension, and a needle, all of which have coaxial communicating through bores so that the irrigating or injecting material may be forced out of the medicator dental ampule, commonly called a "carpule," or syringe through the bores, and out through the needle. The handgrip portion also contains a through bore, valving means and means for attachment to a vacuum source so that by moving of the valving means, either the bore communicating with the syringe or carpule is opened and the bore leading to the vacuum source is closed or vice-versa depending upon the particular operation desired.

18 Claims, 17 Drawing Figures



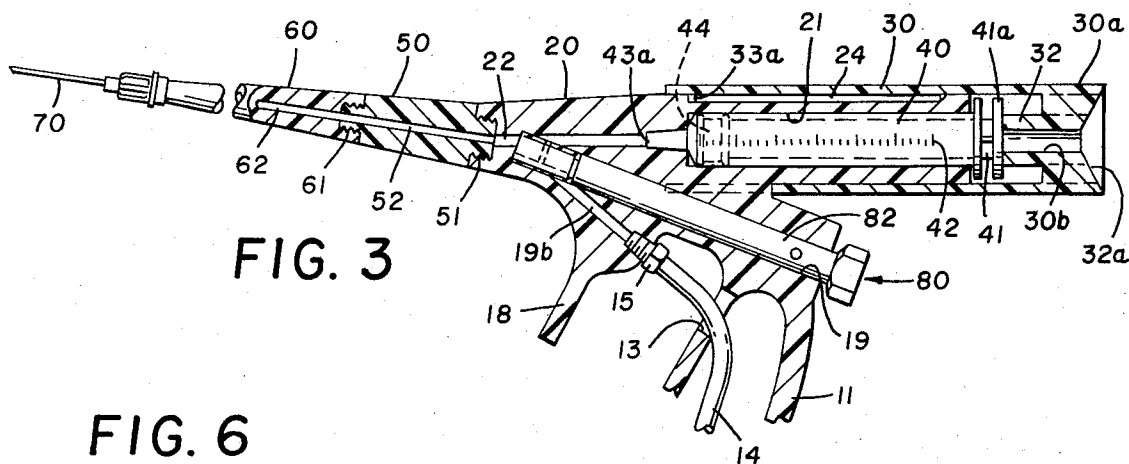


FIG. 3

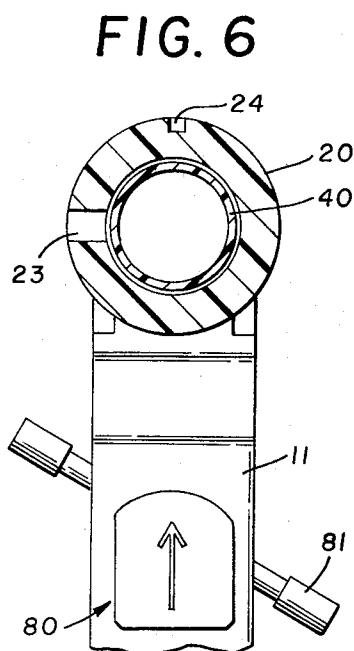


FIG. 6

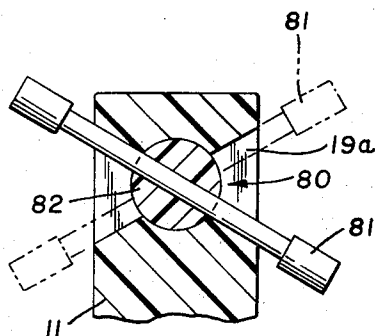


FIG. 7

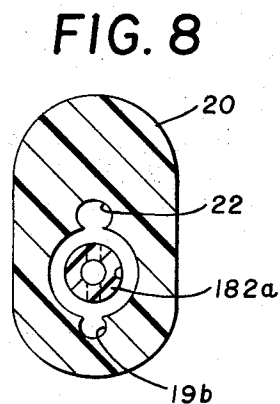


FIG. 8

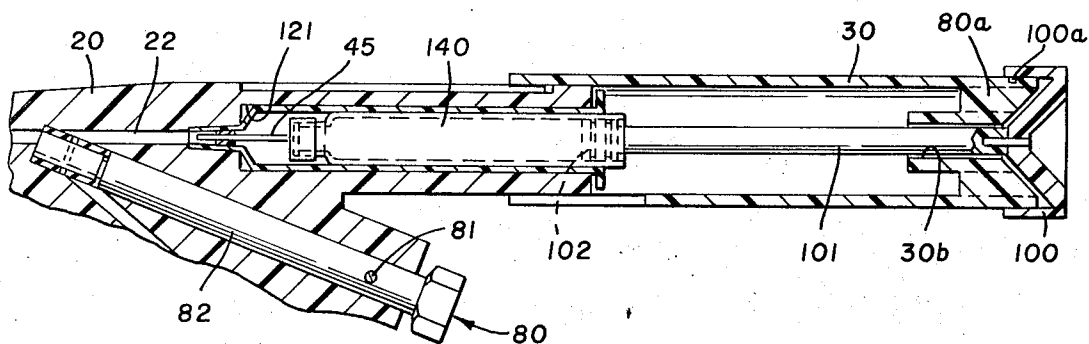


FIG. 9

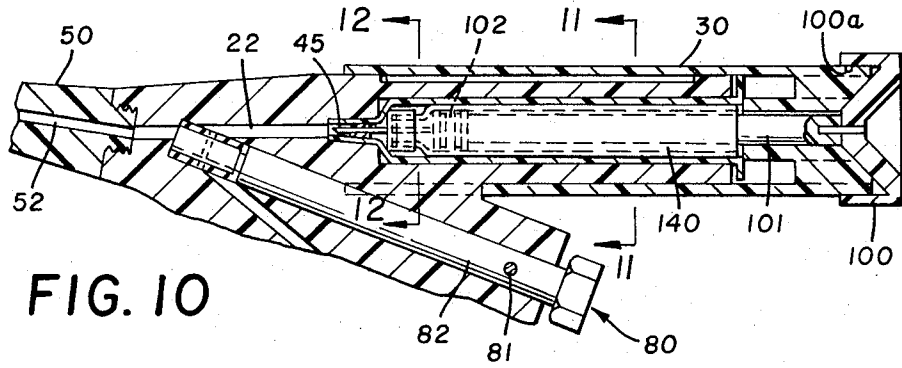


FIG. 10

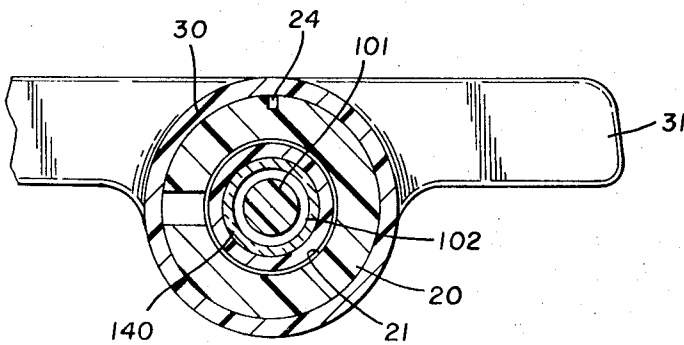


FIG. 11

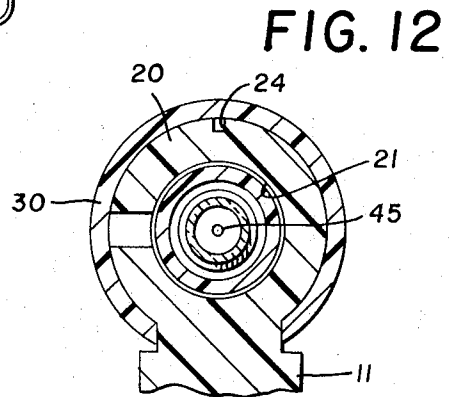


FIG. 12

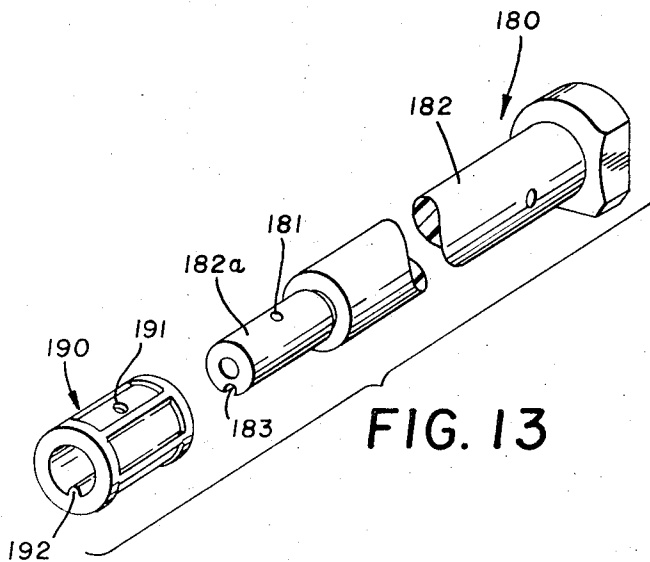
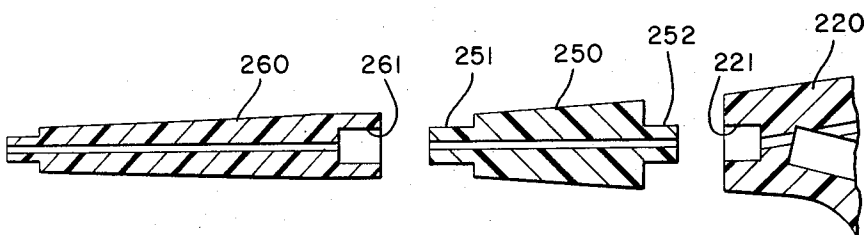
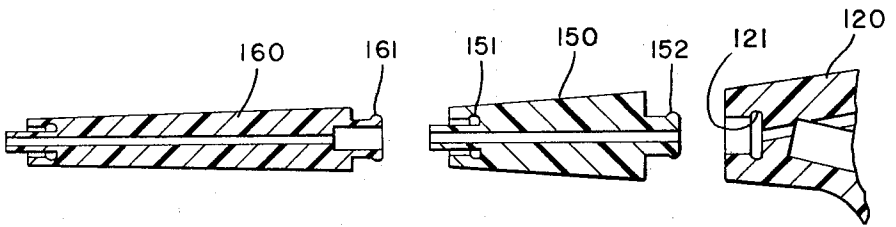
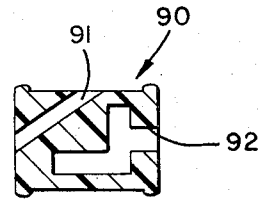
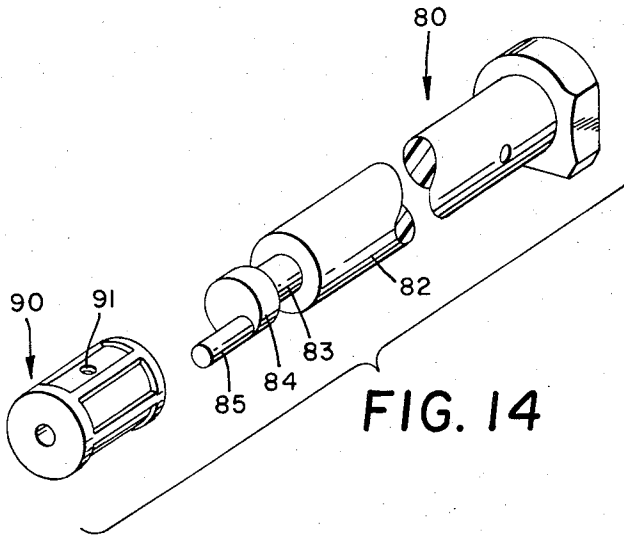


FIG. 13



COMBINED IRRIGATOR, INJECTOR AND EVACUATOR

RELATED APPLICATIONS

This application is an improvement on Applicant's co-pending application, Ser. No. 147,769, filed May 28, 1971, and now Pat. No. 3,745,655 issued July 17, 1973 and entitled "Endodontic Irrigating Instrument."

BACKGROUND OF THE INVENTION

This invention primarily deals with a combined instrument capable of injecting, irrigating, and evacuating root canals in endodontic work. In this regard the term "irrigating" is used herein to describe an operation in which fluid is forced into a root canal to lavage it to eliminate debris. The invention specifically relates to a multi-purpose instrument capable of performing all of the above-noted functions and is not intended to be limited to dental applications in that the injecting function could also have utility in a medical application as well as a practically foolproof method of aspirating to avoid injecting into a blood vessel accidentally and to deliver a hypodermic injection as well.

DESCRIPTION OF THE PRIOR ART

Numerous injectors and irrigators have been utilized in the past for irrigating and chemically cleansing a root canal after it has been mechanically opened.

There are also known means for vacuuming the chemical from the root canal.

The present invention, however, involves an instrument which is capable of performing all of these functions. It is capable of being utilized in a "one-hand" operation which is an improvement over the prior art in existence and known to Applicant which generally require separate instruments, and is a further refinement and an improvement upon the above-noted co-pending application of Applicant.

SUMMARY OF THE INVENTION

It has been discovered that by providing a lightweight plastic body having a handgrip portion and a capsule-receiving portion, with the capsule-receiving portion being adapted to receive a disposable syringe or an ampule as the case may be and the handle portion being adapted to receive a tube leading to a vacuum source, both irrigation-injection and evacuation of the root canal of a tooth can be accomplished.

It has also been found that by providing a telescoping depressor member which telescopes over the capsule-receiving portion of the body and has thumb projections thereon, that the material in the ampule or disposable syringe can be ejected by the operator utilizing one hand while still holding the instrument in the same hand.

It has also been found that by providing a unique valving arrangement, either a passageway leading from the needle, which is carried on the outboard end of the body to the ampule or disposable syringe, or the passageway leading to the vacuum source can be selectively opened or closed as desired, again all by the use of one hand on the part of the operator.

It has also been found that provision of a disposable valve member will minimize sterilization and contamination problems, and further it has been found that the instrument, which will be described in greater detail be-

low, has utility in medical as well as dental circumstances.

Accordingly, production of an improved irrigating, injecting and evacuating instrument of the character abovedescribed becomes the principal object of this invention, with other objects thereof becoming more apparent upon a reading of the following brief specification and claims, considered and interpreted in view of the accompanying drawings.

OF THE DRAWINGS

FIG. 1 is a perspective view of one form of the invention.

FIG. 2 is a sectional view taken along the line 2—2 of FIG. 1 and showing the device assembled for utilization with a disposable syringe showing the instrument in its extended position.

FIG. 3 is a sectional view similar to FIG. 2 showing the depressor in its compressed condition.

FIG. 4 is a sectional view of the outboard end of the depressor member.

FIG. 5 is a sectional view taken along the line 5—5 of FIG. 2 showing the outboard end of the syringe and its associated depressor and the internal configuration of the depressor member.

FIG. 6 is a sectional view taken along the line 6—6 of FIG. 2 showing the outside configuration of the valving means.

FIG. 7 is a sectional view taken along the line 7—7 of FIG. 2 showing the operating handle for the valving means.

FIG. 8 is a sectional view taken along the line 8—8 of FIG. 2 showing the actual valving configuration.

FIG. 9 is a partial sectional view similar to FIGS. 1 and 2 showing a modified form of the invention utilized in connection with a capsule.

FIG. 10 is a view similar to FIG. 9 showing the form of the invention in FIG. 9 in a compressed condition.

FIG. 11 is a sectional view taken along the line 11—11 of FIG. 10.

FIG. 12 is a further sectional view taken along the line 12—12 of FIG. 10.

FIG. 13 is an exploded perspective view showing one form of valving means.

FIG. 14 is an exploded perspective view showing a second form of valving means.

FIG. 15 is a sectional view of the valve head of FIG. 14.

FIGS. 16 and 17 are sectional views showing modified methods for attaching the barrel and extension barrel to the body of the instrument.

BRIEF DESCRIPTION OF THE PREFERRED EMBODIMENTS

Turning first to FIG. 1, it will be noted that the instrument, generally indicated by the numeral 10, includes a handgrip portion 11, a body portion 20, a telescoping depressor member 30, a barrel 50, an extension barrel 60, a disposable syringe 40, and valving means 80 (see FIG. 2).

Considering in some detail then FIGS. 1 and 2, it will be noted that the body of the instrument 10 has a handgrip portion 11 which has a finger-receiving gripping surface 17 contoured to comfortably fit the hand of the user. A finger extension member 18 is also provided, and in use it is contemplated that the index finger of the

user would be placed thereon for greater control of the instrument.

The handgrip portion 11 also includes a plurality of bores 12, 12a, and 13 through which is passed a tube 14. This tube has a connector on one end indicated by the numeral 16 and is connected at that end to a vacuum source (not shown). The opposed end of the tube has a connector 15 which is connected to the body member 10 that communicates with a bore 19b, which in turn communicates with a through bore in the capsule or syringe-receiving portion of the instrument.

Considering in particular FIGS. 1 and 2 again, the capsule or disposable syringe receiving portion 20 will be seen to have a large bore 21 therein, with this bore communicating with a through passageway 22 leading to the left-hand side of FIG. 2, for example, and ultimately to needle 70. Received within the bore 21 in FIGS. 1 and 2 is a disposable syringe 40 which has a plurality of indicia 42 thereon which would indicate to the user the amount of fluid in the syringe itself.

The syringe also has a projecting plunger 41 with an enlarged head 41a on the outboard end thereof and a second head 44 on the inboard end thereof. It is believed apparent that depression of the plunger 41 by moving it from the right to the left of FIG. 2 would force fluid contained in the syringe out through the opening 43a and into passageway 22.

Telescoped over the outboard end of the member 20 is a depressor member 30. This member is generally hollow in configuration and has a locating member 33 on one end thereof. This member 33 fits into the groove 24 in the body 20 and serves to locate the depressor member in the configuration shown in FIG. 1. Body member 20 also has a through slot 23 so that once the syringe is properly located within the body 20, the indicia 42 will be visible to the user.

The depressor member 30 also includes an outboard end 30a which has an inward projection 32 and a cap 32a thereon. It is intended that the cap 32a would contact the end 41a of the plunger of the syringe so that pressure on thumb grip 31 would cause movement of the barrel 30 from right to left and would move the plunger 41 itself from the position of FIG. 2 to the position of FIG. 3, thereby expelling the fluid from the syringe into the passageway 22.

It should be noted also that the normal plunger 41 has flats 43,43 on the head 41a thereof. In this regard the interior of the depressor member 30 also has flats 34,34 to enable proper registry between the depressor member 30 and the plunger 41.

Turning next to the valving means 80, it will be noted that these means include an elongate body portion 82 which is received in the bore 19 of the handgrip portion of the instrument 10. Valving means such as 90 or 190 are received on the inboard end of the body portion 82.

Considering the two alternative forms of the valving means, attention is first directed to FIGS. 14 and 15.

Thus, in FIGS. 14 and 15 the body 82 has a reduced diameter projection 83, an enlarged member 84, and a projecting pin 85. It is contemplated that the actual valve 90 which has a through bore 91 therein can be press-fit over the members 84 and 85 to securely lock the actual valve itself onto the body 82.

Referring back to FIG. 1, it will be seen that a slot 19a is provided in the handgrip portion, and a valve actuating handle 81 is fit through it and pinned to valve

body 82 so that it can move from the full-line position of FIG. 7 to the dotted-line position thereof, thereby selectively aligning the bore 91 with either the passageway 19b leading to the vacuum source or the passageway 22 leading to the syringe. In this fashion, of course, it is possible to close off one passage and open the other depending upon whether the operator desires to inject fluid into the canal or evacuate the fluid therefrom.

FIG. 13 shows an alternative form of the valving means, generally indicated by the numeral 180. In this form the body 182 has a reduced diameter projection 182a and a through bore 181 therein. Along the bottom surface of the projecting member 182a is a notch 183 which is intended to engage a rib 192 in the valve 190. The valve 190 also has a through bore 191 therein, and when the valve 190 is telescoped over the projection 182a, bores 181 and 191 will be in alignment. Operation of this form of the valving means is identical to the form shown and described in connection with FIGS. 14 and 15.

In use or operation of the form of the invention shown in FIGS. 1 through 8 and 13 through 15, it is merely necessary to pass the tube 14 through the holes in the handgrip portion 11 and attach the connecting member 16 to the vacuum source and end 15 to the body. Following this, the disposable syringe 40 would be inserted into the opening in the body portion 20, and the depressor 30 would be telescoped over the end of the body portion 20 as shown in FIG. 1.

Assuming then that the device is assembled as shown in FIG. 1 and it is desired to inject fluid into a root canal, for example, it is merely necessary to insert the needle 70 into the canal and by means of thumb pressure on member 31 to move the depressor barrel 30 from the right to the left of FIG. 2, for example, thereby moving the plunger 41 from the position of FIG. 2 to the position of FIG. 3 and forcing fluid contained in the syringe out through the end 43 thereof into the passageway 22. It will be assumed at this time that the valve means are in full-line position of FIG. 7, in which case the passageway 91 or 191 of the valve, depending upon which valve is utilized, will have closed off passageway 19b to the vacuum source and opened up passageway 22.

When it is desired to evacuate the fluid and the loose material in the canal, it is simply necessary to flip the handle 81 of the valving means to the dotted-line position of FIG. 7. At this point passageway 22 is closed off and passageway 19b is open. In this fashion the material can be pulled through the bores 52 and 62 of the barrel and barrel extension and out through the tube 14.

Considering next then the modified form of the invention shown in FIGS. 9 and 10, it will be seen that the basic principles of the invention remain the same, but that this form of the invention is intended to be utilized in connection with an ampule which does not contain its own plunger.

Accordingly then, the outboard end 80a of the depressor member 30 will be seen to have a through bore 30b therein. It is simply necessary to slip the cap 100 of the plunger over the outboard end of the member 30, with the shank 101 of the plunger being inserted through the bore 30b. It will be noted that cap 100 has a projection 100a on its inner surface, and this projection is received in groove 122 and 123 of the depressor member. By sliding projection 100a into groove 122

and then turning the cap, the projection slides into groove 123 thereby locking the cap in place. FIG. 9 shows the instrument assembled in this fashion.

It should be noted that the interior of the instrument varies only slightly in this instance, and that is because a puncturing needle 45 is provided so that when the carpule 140 is pressed to the left in bore 121, the rubber cap at the end thereof will be punctured to permit the fluid to be forced out of the capsule.

The valving arrangement is substantially similar, and in operation it is again merely necessary to utilize the thumb pressure member 31 to move the member 30 and the plunger 101 from the position of FIG. 9 to the position of FIG. 10, and in this fashion, of course, the head 102 of the plunger will force the capsule against the needle, perforating it and forcing the fluid out through the passageway 22 and ultimately to the needle as described above.

It should be noted here that the vacuuming function is provided and operated in the same fashion as described with regard to the first form of the invention discussed.

It will also be noted from FIG. 1 that a barrel 50 and a barrel extension 60 have been provided, and in the form illustrated in FIG. 1 these members are screwed into each other as at 51 and 61. FIGS 16 and 17 show different methods of attaching the device to the body, with FIG. 16 showing a luer-type of attachment, while FIG. 17 shows a simple press-fit attachment.

To this end FIG. 16 shows the main body portion 120 having a luer-type female connection 121 which engages the male connector 152 of the barrel 150. The barrel 150 also has on its opposed end a female luer-type connection 151 for engagement with the male luer-type projection 161 of the extension barrel 160.

FIG. 17 shows a simply press-fit in which the body 220 has a female opening 221 for engagement with the projection 252 of barrel 250. Similarly, the opposed end of the barrel 250 has a male projection 251 which engages with the female opening 261 of the extension barrel 260. It should be understood that the invention is not intended to be limited to any particular form of connection between the body, the barrel, and the extension barrel, with the forms described herein being illustrative only and not intended to be exhaustive.

Depending upon the intended use of the instrument, the barrel 50 could be made integral with the body 20. In fact, it is contemplated that a one-piece device probably would be preferred in practice.

It would also be possible to eliminate the extension barrel 60 and affix the needle directly to barrel 50 if desired.

It should also be noted that valve 90 or 190 can both be made of a disposable nature to avoid reuse and possible contamination in view of the fact that when the evacuation mechanism is actuated, material which has been inside the mouth and root canal of the patient will be extracted through this valve. It is believed to be desirable to make it disposable, if possible, to minimize sterilization and contamination problems, particularly if it is to be used as an aspirating/hypodermic syringe.

While no material has been described and the invention is not intended to be limited to any material, it is contemplated that the entire device, with the exception, of course, of the tubing and the needle, could be made of lightweight clear plastic which is intended to

be economical in manufacture and also to be easier to use because of the weight which would minimize the strain on the dentist's hand.

It should also be noted that the utilization of the instrument described herein is not in any way intended to be limited to dental operations. It is believed evident that the instrument would have utility in medical applications, particularly with regard to the injection function which is capable of performing.

Furthermore, the terms "ampule," "carpule," "cartridge," and "disposable syringe" have been used interchangeably herein, and it is believed apparent that any such device could be received in bores 21 and 121.

While a full and complete description of the invention has been set forth in accordance with the dictates of the Patent Statutes, it is to be understood that modifications may be resorted to without departing from the spirit hereof or the scope of the appended claims.

What is claimed is:

1. A dental injection and evacuation instrument for use endontics with a vacuum source and a fluid-containing ampule having a self-contained plunger, comprising:

A. an elongate body having

1. an ampule-receiving bore in one end of said body and
2. a through central bore interconnecting said ampule-receiving bore and the opposed end of said body;

B. a handgrip

1. secured to said body
2. and having a through bore therein that interconnects with said through central bore of said body between said opposed end of said body and said ampule-receiving bore
3. and adapted to be connected to said vacuum source;

C. valve means carried by said body and said handgrip and including an elongated body received in said handgrip and a valve resealably received on the inboard end of body and projecting into the point of interconnection of said central bore of said body and said bore of said handgrip for selectively closing off said bore in said handgrip and opening said bore in said body; and

D. depressor means telescopically carried by one end of said body for forcing fluid from said ampule into said through central bore in said body and having contact means adapted to contact the plunger of said ampule.

2. The instrument of claim 1 wherein

A. said sleeve has

1. an open end and
2. a substantially closed end; and

B. said contact means include

1. an axially inwardly extending projection adjacent said closed end.

3. The instrument of claim 1 further characterized by the presence of a needle releasably carried by said opposed end of said body and having a through central bore in coaxial alignment with said through central bore of said body.

4. The instrument of claim 1 further characterized by the presence of a barrel having one end releasably attached to said opposed end of said body and having a through bore in coaxial alignment with said through central bore of said body.

5. The instrument of claim 4 further characterized by the presence of a needle releasably attached to the opposed end of said barrel and having a through bore in coaxial alignment with said through central bore of said body.

6. The instrument of claim 4 further characterized by the presence of an extension barrel having one end releasably attached to the opposed end of said barrel and having a through bore in coaxial alignment with said central bore of said barrel.

7. The instrument of claim 6 further characterized by the presence of a needle releasably attached to the opposed end of said extension barrel and having a through bore in coaxial alignment with said through bore of said extension barrel.

8. A Dental injection and evacuation instrument for use with a vacuum source and a fluid-containing ampule, comprising;

A. an elongate body having

1. an ampule-receiving bore in one end of said body and
2. a through central bore interconnecting said ampule-receiving bore and the opposed end of said body;

B. a handgrip

1. secured to said body
2. and having a through bore therein that interconnects with said through central bore of said body between said opposed end of said body and said ampule-receiving bore
3. and adapted to be connected to said vacuum source;

C. valve means carried by said body and said handgrip and projecting into the point of interconnection of said central bore of said body and said bore of said handgrip for selectively closing off said bore in said handgrip and opening said bore in said body; and

D. depressor means telescopically carried by one end of said body for forcing fluid from said ampule into said through central bore in said body.

9. The instrument of claim 8 further characterized by;

A. said body of said valve means being rotatably received in said handgrip;

B. an operating handle carried on the opposed projecting end of said body.

10. The instrument of claim 9 wherein said depressor means include

A. a hollow sleeve having

1. an open end

2. a substantially closed end with a through bore therein and

3. a plunger having

a. a cap releasably secured to said substantially closed end of said sleeve and

b. a plunger rod projecting from said cap through said through bore of said closed end and adapted to contact one end of said ampule.

11. The instrument of claim 10 further characterized by the presence of means disposed in said central bore of said body and adapted to puncture the opposed end of said ampule.

12. The instrument of claim 10 further characterized by the presence of locking means carried by said cap of said plunger and said sleeve for releasably interconnecting said plunger and said sleeve.

13. The instrument of claim 9 further characterized by the presence of a needle releasably carried by said opposed end of said body and having a through central bore in coaxial alignment with said through central bore of said body.

14. The instrument of claim 9 further characterized by the presence of a barrel having one end releasably attached to said opposed end of said body and having a through bore in coaxial alignment with said through central bore of said body.

15. The instrument of claim 14 further characterized by the presence of a needle releasably attached to the opposed end of said barrel and having a through bore in coaxial alignment with said through central bore of said body.

16. The instrument of claim 14 further characterized by the presence of an extension barrel having one end releasably attached to the opposed end of said barrel and having a through bore in coaxial alignment with said central bore of said barrel.

17. The instrument of claim 16 further characterized by the presence of a needle releasably attached to the opposed end of said extension barrel and having a through bore in coaxial alignment with said through bore of said extension barrel.

18. The instrument of claim 1 further characterized by;

A. said body of said valve means being rotatably received in said handgrip;

B. An operating handle carried on the opposed projecting end of said body.

* * * * *