the piston upwards and into the lower piston cylinder chamber **16**. At that point, the compression developed in both the lower and upper cylinder chambers causes the inlet one-way valve at **19** to close, the outlet one-way valve at **22** to open, wherein the high viscosity paste or fluid is delivered to the end of the cylinder chamber at **21**. Accordingly, when the pivotally mounted lever **11** is moved apart from the gripping handle **10**, a vacuum is developed within the cylinder chambers which causes the outlet one-way valve **21** to close, the inlet one-way valve **19** to open, and a flow of high viscosity paste or fluid into the device. FIG. **2** also illustrates that the position of the pivot point **13** can be altered to either increase or decrease the amount of force delivered to the piston through the piston advancing means. Accordingly, it can be appreciated that a variation in the location of the pivot point **13**, along with the length of the pivotally mounted lever **11** optionally provides an adjustment to the quantity of force required to deliver pastes or liquids of different viscosities. Finally, it can be appreciated that the geometry of the cam face can be adjusted so that the rise of the piston in the final stages of compression exerts a large force to the piston.

As shown in FIG. **3**, piston **15** optionally contains an elastomeric O-ring type seal which serves to sealingly engage the piston with the lower piston cylinder chamber **16**. It has been found that such O-rings can be manufactured from any type of elastomeric or rubbery material. For example, it has been found that silicon type elastomers are especially suited for this application. In general, those elastomers that are selected must physically withstand the pressures and vacuums required for delivery of a high high viscosity fluids or pastes, while at the same time remaining chemically inert so as not to significantly contaminate the fluid or paste that is finally delivered to a targeted location.

As noted supra, the injection syringe of the present invention has particular utility in the medical field, e.g. for introducing high viscosity fluids or pastes into a patient's body. The syringe is charged by drawing together the handle/lever combination against the retractive force of the tension spring followed by release wherein the lever returns to its original position and wherein the pumping action develops a repeated vacuum within the cylinders afforded by the piston downstroke. The vacuum within the cylinders operates to cause the one-way outlet valve to seal, the one-way inlet valve to open, which then charges and fills the syringe with a steady feed of material. Continued pumping action advances the fluid or paste wherein the upstroke of the piston provides compression to the cylinder chambers, at which point the one-way inlet valve seals and the outlet valve opens and the fluid or paste is delivered to a body cavity and further restricted from moving back into the syringe. To this end the high viscosity fluid or paste can be introduced to the instrument channel of a medical endoscope providing a method of treatment of vesicoureteral reflux and urinary incontinence, as well as treatment of other types of medical problems that require injection of a viscous medicament. The high viscosity fluids or pastes include materials such as collagen and polytetrafluoroethylene particles suspended in glycerine and polysorbate.

It has also been found that the injection syringe of the present invention has particular utility in connection with thrombolysis catheters which are used to treat emboli in the venous system. Currently, thrombolysis agents are used in conjunction with catheters of a small diameter, typically a 3 F injectable guide wire with a 0.025 inside diameter along with urokinase and TPA (tissue plasminogen activator), Prourokinese APSAC (antistreplase), Eminase and similar agents. The infusion of these agents has been hampered by current delivery systems which typically have been 1 or 2 cc syringes requiring frequent refilling and limited pressures to propel these agents through the small diameters and long lengths of the catheters used in these procedures. The new device addresses these problems by allowing a self-feeding system and the high pressure required for an effective procedure.

As described above, the current invention is useful in the medical arts for injecting or delivering high viscosity pastes, fluids or medicaments to a particular region of a body where a large force is required to advance such medications because of the elevated viscosity and/or the small diameter and long length of the cannula or catheter through which the medication is injected. The device incorporates a piston actuated by a lever which utilizes the mechanical advantage of a pivot arm and a piston advancing means which advances the piston in a lower cylinder chamber. The amount of pressure generated by the combination of the diameter of the cylinders, geometry of the piston advancing means, pivot point and lever arm, can be collectively tailored to a variety of medicament viscosities.

Those skilled in the art will recognize, or be able to ascertain, by no more than routine experimentation, many equivalents of the specific embodiments of the invention described herein. Moreover, the syringe may advantageously be used for injecting other liquids or pastes in non-medical applications, e.g. for delivering high viscosity glues or lubricants. Such equivalence are intended to be encompassed by the following claims.

What is claimed is:

1. An injection syringe for the injection of high viscosity paste or liquid, comprising a frame, a pair of handles mounted to said frame, at least one of which handles is a lever pivotally mounted to said frame incorporating a piston advancing means, an upper and lower cylinder chamber providing fluid connection therebetween, said upper chamber containing an inlet and outlet port, a one way ball-bearing inlet valve seated at the inlet port, a one way ball-bearing outlet valve seated at the outlet port, said lower cylinder chamber containing a piston having means connecting the piston to the piston advancing means on the lever pivot arm, wherein the inlet and outlet ball-bearings have durometers which are chosen to regulate the maximum internal delivery pressure in said upper cylinder chamber, wherein the piston advancing means comprises a semicircular cam track slidably engaging the piston connecting means for upwardly advancing said piston into said lower piston cylinder chamber as the piston connecting means slides along said cam track so that substantially all of the liquid or paste in the cylinders is forced through the one-way valve in the outlet cylinder chamber.

2. The injection syringe of claim **1** wherein the upper cylinder chamber projects beyond said frame.

3. The injection syringe of claim **1** which further includes an end space on the outlet side of the upper cylinder chamber to which an injection cannula can be mounted.

4. The injection syringe of claim **1** in which the inside diameter of the injection cannula at its end farthest from