

Jan. 22, 1935.

H. T. CAMPKIN

1,988,480

HYPODERMIC SYRINGE

Filed Oct. 22, 1932

Fig. 1.

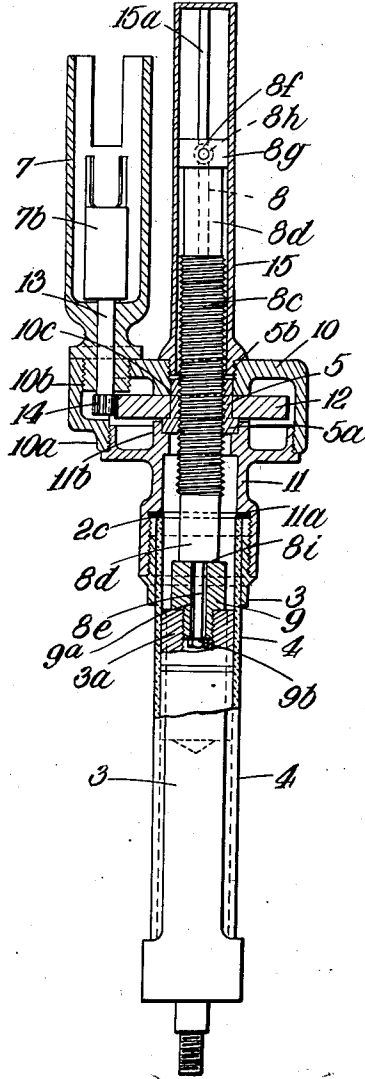
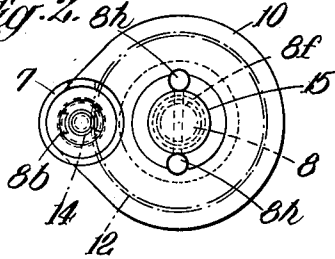


Fig. 2. 8h



Hugh Tittford Campkin

By Hoguet & Heary
His Attorneys

His Attorneys

UNITED STATES PATENT OFFICE

1,988,480

HYPODERMIC SYRINGE

Hugh Titford Campkin, London, England

Application October 22, 1932, Serial No. 639,014
In Great Britain May 13, 1932

3 Claims. (Cl. 128—218)

This invention relates to hypodermic syringes and particularly relates to means for the operation of such syringes.

Hypodermic syringes at present in commercial use are entirely hand-operated, the casing or body of the syringe having a yoke piece for engagement by the fingers of the operator, while the piston or plunger rod is fitted with a pressure plate or member for engagement by the ball of the hand so that by a closing movement of the hand the requisite pressure may be exerted while at the same time the needle of the syringe is directed to the desired position. Such hand-operated syringes have the disadvantage that the syringe is necessarily held at a substantial distance from the point of the needle and this, in conjunction with the fact that at times considerable pressure is necessary for the operation of the syringe, renders it very difficult to maintain the needle of the syringe steadily in the desired position and at the required depth and/or to prevent any cross-strain being put on the needle likely to result in its fracture, these disadvantages being particularly pronounced in giving dental injections.

The present invention has for its object to provide simple and effective means whereby these disadvantages referred to are obviated and whereby the operator is enabled to hold the syringe close to the needle and to operate the syringe with the utmost precision without having to exert pressure by the hand manipulating the syringe.

According to the present invention I provide mechanism adapted to be driven by a dental engine or other motor and to impart a relatively slow axial movement to the piston or plunger of a hypodermic syringe.

According to the invention, moreover, I provide a casing or the like adapted for connection to, or forming part of, the body of a syringe and mechanism in or carried by the said casing and adapted to be actuated by a dental engine or other motor, the mechanism comprising an axially movable member adapted to co-operate with the piston or plunger of the syringe. The mechanism is constructed and arranged so that the movement of the syringe piston or plunger is relatively slow and therefore readily controllable by the operator during the process of injection, and so that the possibility of a too rapid discharge of the syringe, as for instance when the needle passes suddenly from hard to soft tissue, may be avoided. In one embodiment, the movement of the syringe piston or plunger is effected by means of a co-

axially disposed spindle having a screw-threaded portion of fine pitch engaging with a rotatable nut carried by a tubular casing connected to or forming part of the body of the syringe, the spindle being adapted for connection to the usual flexible or other drive from a dental engine or other motor. In this embodiment, particularly suitable for dental injections where high pressure is sometimes required, the screwed spindle is non-rotatable and is engaged by the rotatably mounted nut driven through reduction gearing from a spindle adapted to cooperate with the flexible or other drive. Preferably, the rotatable nut carries or forms part of a gear wheel which meshes with a small pinion mounted on a shaft disposed parallel with the screwed spindle and adapted to co-operate with the flexible or other drive. Owing to the fine pitch of the screw-threaded portion of the spindle, the axial movement of the syringe piston or plunger is very slow in relation to the speed of the engine or motor, and is readily controllable by the usual foot-operated switch controlling the dental engine, while any sudden acceleration of the forward movement of the piston or plunger, such as would cause a too rapid ejection of the contents of the syringe, is rendered impossible. Advantageously, the spindle referred to is so mounted and arranged that at each end of its travel the screw-threaded part disengages completely from the nut, thus preventing any damage to the mechanism by over-running of the dental engine or motor.

The device such as before described may be operated directly or through a flexible drive from any suitable electric, manual or other motor which, in the case of an electric motor, may be controlled by a switch which may be foot-operated or may be associated with the mechanism attached to the syringe for operation by the hand.

The invention is hereinafter described by way of example with reference to the accompanying diagrammatic drawing, in which:

Figure 1 is a part longitudinal section illustrating a hypodermic syringe provided with mechanism according to the invention;

Figure 2 is an end elevation corresponding to Figure 1.

In carrying the invention into effect according to the construction illustrated in the drawing injections where exceptionally high pressure may be required, a casing 10 is provided for the accommodation of a small reduction gear, such casing having at the front an internally screw-

threaded boss 10a adapted for the reception of a tubular connecting piece 11, which latter at its front end is internally screw-threaded for engagement with the body 3 of the syringe and is formed with an internal flange or shoulder 11a by which the glass tube 4 of the syringe is held in position preferably with the interposition of a leather or other suitable washer 2c. The screw-threaded boss 10a on the front of the gear casing 10 is of such bore as to permit the insertion of the gear wheel 12 of the reduction gear therethrough into its position in the housing 10. At the rear the casing is formed with a screw-threaded hole 10b or boss for the connection of a tubular member 7 formed in the usual manner to engage with the stationary part of the flexible or other drive and carrying a short spindle 13 which at the front end is fitted with a pinion 14 adapted to mesh with the gear wheel 12, and at its rear end is fitted with a spiked or other coupling piece 7b for engaging with the corresponding part of the flexible or other drive. The pinion 14 is smaller than the hole 10b or boss into which the connecting member 7 is screwed so that the pinion 14 thus may be inserted into its position in the casing 10 through such hole 10b or boss. The spindle 13 carrying the pinion 14 may project for engagement with a co-axial hole in the front wall of the housing. The gear wheel 12 is mounted on a screwed nut 5 which preferably is formed with an outwardly extending flange 5a at its front end, such nut 5 being rotatably mounted in the casing 10 co-axial with the piston or plunger 3a of the syringe by the engagement of the flange 5a of the nut 5 with the interior of an inwardly extending cylindrical flanged portion 11b of the tubular connecting piece 11 and by the engagement of a rearwardly projecting portion 5b of the nut 5 with a corresponding bore 10c or recess in the rear wall of the housing 10. The bore 10c also is provided with an internally screwed part at the rear for the mounting of a tubular guide 15 for the rear end of a screwed spindle 8 which, as before described, preferably is provided at each end of the screw-threaded part 8c with non-screw-threaded parts 8d adapted to run free in the nut 5 at each end of the travel of the spindle 8. In order to prevent rotation of the spindle 8, a transverse pin 8f may be fixed to an extension 8g at the rear end thereof, such transverse pin 8f engaging with longitudinal slots 15a in the guide tube 15 and preferably having projecting knobs 8h or the like which may serve for effecting the initial engagement of the screwed part 8c of the spindle 8 with the nut 5 and also, if desired, for observing the progress of the injection. In order to ensure that the rear end of the screwed spindle 8 is maintained in alignment with the axis of the nut 5, the extension 8g at the rear end of the spindle 8 may be adapted to slide in the guide tube 15, which latter it will be understood extends parallel with the connecting member 7 for attachment to the flexible or other drive and preferably is more or less co-extensive therewith. At its front end the screwed spindle 8 is connected to the piston or plunger 3a preferably by the provision of a pin 8e fixed to, or forming part of, the spindle 8 and passing through a clearance hole 9a in a screw or plug 9 screwed into the piston or plunger 3a and co-operating with a shoulder 8i at the end of the spindle 8, the pin 8e being provided with a nut 9b or head to engage the inner end of the screw or plug 9. The screwed spindle 8 preferably has a comparatively fine thread, for example about 60 threads

to the inch, so that with the aid of the reduction gear a very slow movement of the piston or plunger 3a in relation to the speed of the dental engine may be obtained with consequent increase in the pressure that can be obtained and in the ease of control.

It will be understood that the invention is not limited to the particular details of construction hereinbefore described.

What I claim is:—

1. In a power drive for a hypodermic syringe, a casing arranged co-axially with the syringe piston and rigidly connected to the syringe barrel, a nut mounted in said casing, an axially movable spindle operatively connected at one end to said piston, said spindle having a screw-threaded portion arranged to engage with said nut and to pass completely through said nut at each end of the travel of said spindle and having non-screw-threaded portions arranged to run in the nut when the latter is disengaged from the screw-threaded portion of said spindle, means for operatively connecting said spindle with a drive shaft and causing said spindle to move axially of and within said casing for reciprocating the syringe piston, means comprising said casing for enclosing said axially movable spindle in all stages of its axial movements with said piston, said casing having a longitudinally-extending slot, and means connected to said spindle and engaging said slot for holding said spindle against rotation.

2. In a power drive for a hypodermic syringe, a casing arranged co-axially with the syringe piston and rigidly connected to the syringe barrel, a nut mounted in said casing, an axially movable spindle operatively connected at one end to said piston, said spindle having a screw-threaded portion arranged to engage said nut and to pass completely through the latter at each end of the travel of said spindle and having non-threaded portions arranged to run in the nut when the latter is disengaged from the threaded portion of said spindle, means for operatively connecting said spindle with a drive shaft to effect movement of said spindle axially of and within said casing for reciprocating the syringe piston, means comprising said casing for enclosing said axially movable spindle in all stages of its axial movements with said piston, said casing having a longitudinally-extending slot, means connected to said spindle and engaging said slot for holding said spindle against rotation to cause axial movement thereof, and a grasp associated with said last-mentioned means and extending exteriorly of said casing for manipulation to re-engage the threaded portion of said spindle with said nut.

3. Means for driving the piston of a hypodermic syringe from a rotary motor, comprising a gear casing, a member having a screw-threaded bore and mounted rotatably in the said gear casing, a gear wheel on the said rotatable member, a tubular fitting fixed to the gear casing to extend from one end face thereof parallel with the axis of the said rotatable member, a driving spindle rotatably mounted in the said tubular member and having a part projecting into the said gear casing, a pinion mounted upon the inwardly projecting part of the said driving spindle and engaging with the said gear wheel, an axially movable spindle having a screw-threaded portion engaging with the screw-threaded bore in the said rotatable member, a tubular casing fixed to the gear casing co-axially with the said rotatable

member and extending parallel with the said tubular member, and enclosing the outer end of the axially movable spindle in all stages of its movement, said casing having longitudinally extending slotted portions for engaging with means 5 carried by said spindle for preventing rotation of said spindle, a tubular part rigidly connected to the syringe barrel and extending co-axially with the said rotatable member from the end face of the gear casing opposite to that from which the said tubular member and tubular element extend, and means for connecting the syringe 5 piston to the said axially movable spindle.

H. TITFORD CAMPKIN.

CERTIFICATE OF CORRECTION.

Patent No. 1,988,480.

January 22, 1935.

HUGH TITFORD CAMPKIN.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 1, second column, line 51, after "drawing" insert the words which is particularly suitable for dental or other; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 5th day of March, A. D. 1935.

(Seal)

**Leslie Frazer
Acting Commissioner of Patents.**