A syringe for injections has a scale and an index or comparison mark arranged for relative displacement so that they may be reset to zero before each injection thus to permit accurate determination of each dose.
INJECTION SYRINGE WITH SHIFTABLE COMPARISON INDICATOR

The present invention relates to an injection syringe, and more particularly to a syringe having means for determining the quantity delivered during injection, particularly partial quantities of a complete filling.

It is known to provide a scale on the cylinder of injection syringes and injection phials, which, for example, in mass vaccinations or other dispensation of preparations to several patients, makes it possible to read the dose delivered. However, in each injection, the quantity to be delivered must be deduced from the last gauge reading, calculating or reading mistakes are frequent.

We contribute, by the present invention, means to avoid the disadvantages of the known syringes and in particular to provide an injection syringe with which it is possible to assure the precision of injection deliveries of predetermined partial quantities.

According to the present invention, this problem is resolved by arranging a scale and/or an index or comparison mark so that the scale are relatively displacable with respect to each other and are settable to zero before each injection. The invention may also be advantageously used immediately for the delivery of medications by means of injection syringes or for dosing the components when composing infusion and rinsing solutions. In this case, it is possible to use all known types of injection syringes as well as ready-for-use syringes or phials which are to be used immediately as syringe cylinders and can be placed into syringe frames. In the latter case, the arrangement of the scale and of the comparison mark may either be provided on the phial carrier or, advantageously, directly on the phial.

The new syringe may be used with particular advantage for composing infusion or rinsing solutions if in combination with the scale settable to zero, the scale division itself, instead of being gauged in volume units, is gauged in percent proportionality with the composition of the syringe contents. Possible scale divisions may particularly be: Weight units of dissolved substances, insulin, vitamin, etc. units, molar units, millequivalents (mval), cation and/or anion units etc.

The present invention may be realized in a particularly simple manner in injection syringes with a transparent cylinder if the scale is displaceable on a scale support extending in the longitudinal direction of the cylinder. The comparison mark may then preferably be provided directly on the piston. Such a scale arrangement may, for example, be achieved by tubular segmental scale supports which may also be stacked subsequently onto conventional cylinders. A simple realization is also possible if the scale is arranged on a strip-shaped scale support shaped as a tubular segment encircling the cylinder by at least more than 180°, for example, which is fixed in a holder provided on the cylinder to be shiftable in the longitudinal direction thereof. Also, the scale support may be tubular and may be arranged on the cylinder to be shiftable on the same by means of a thread or by friction. As can be seen, in practical realization of the various embodiments, the scale support may also be fixed and analogously the comparison mark shiftable.

Especially when using injection phials with a closure plug to be used as a piston, the invention can be realized advantageously if the scale support is arranged in the piston rod and if the latter comprises a stop member for fixing the comparison mark in zero position upon extraction of the piston rod or upon shifting the comparison mark towards the cylinder. It is particularly simple in this way to achieve automatic resetting of the comparison mark to zero during insertion of the piston rod into the piston of the full or partially emptied phial by former injections. In this case, automatic resetting of the comparison mark to zero can be assured in subsequent injections if, on the support, there is provided a spring for shifting the comparison mark against the stop and, for fixing the comparison mark in zero position against the force of the spring before injection, there is provided a stop device between the comparison mark and the support. In practical use, zero position may hereby be achieved in a simple manner by disengaging the stop device before injection.

Such a device may be realized in a particularly simple manner if the holder is a transparent tube in engagement with the cylinder, the holder having frictionally supported therein a ring encircling the piston rod and bearing a comparison or index mark, and if the stop device is a complementary gearing provided in segments on the inside of the tube or on the outside of the comparison mark, which can be engaged or disengaged by rotation of the ring. Engaging or disengaging of the stop device is achieved in a most simple way by rotation of the tube or the comparison mark provided as a support. In order to further simplify the device, the ring of the comparison mark may also thus be arranged longitudinally on the piston rod so that rotation of the latter engages or disengages the gearing of the comparison mark ring and the tube.

To make dosing of partial quantities completely independent from reading, it is furthermore suggested to provide between the scale support and the comparison mark at least one further stop device at a distance from the zero position corresponding to a predetermined partial quantity, the stop device being thus engaged during injection so that the piston advance is blocked after the predetermined partial quantity has been reached. It may also be advantageous if, for adjusting to different dose quantities, the stop device is made adjustable.

There has thus been outlined rather broadly the more important features of the invention in order that the detailed description thereof that follows may be better understood, and in order that the present contribution to the art may be better appreciated. There are, of course, additional features of the invention that will be described hereinafter and which will form the subject of the claims appended hereto. Those skilled in the art will appreciate that the conception upon which this disclosure is based may readily be utilized as a basis for the designing of other structures for carrying out the several purposes of the invention. It is important therefore, that the claims be regarded as including such equivalent constructions as do not depart from the spirit and scope of the invention.

Specific embodiments of the invention have been chosen for purposes of illustration and description, and are shown in the accompanying drawings, forming a part of the specification wherein:

FIG. 1 is a fragmentary view, partially in cross section, illustrating an injection phial of a type contemplated;
device 12. The function can be seen from FIGS. 2a - 2c.

Before injection, the ring 11 is shifted to the end of the handle 8 by pressure on the piston rod 9. Because of frictional engagement with the handle 8, the ring 11 remains in this position until it is shifted by stop device 12 during insertion of the piston rod 9 into piston 3. According to FIG. 2b, the special arrangement of the stop assures that the scale is compulsorily reset to zero before beginning an injection. As shown in FIG. 2c, the exact reading of the dispensed partial quantity is made possible during injection.

FIG. 3a shows a partial section through a modified embodiment of the invention in which the ring 11, which carries the comparison mark 10, is biased against stop device 12 by spring 13. The handle 8 and the ring 11 are provided according to FIG. 3b with complementary gearings 16, 16a in segments so that the ring may selectively be engaged with or disengaged from the handle 8 by rotation around its axis. The piston rod 9 and the ring 11 are then engaged via grooves 17 and projections 18 so that rotation of the ring 11 and therefore engagement or disengagement of the handle 8 can be obtained by rotation of the piston rod 9. In operation, the chosen arrangement makes it possible to disengage the ring 11 from the handle 8 before each injection by rotation of the piston rod 9 so that, because of biasing by spring 13, zero position of the comparison mark 10 on the stop device 12 is obtained. Rotation of the piston rod 9 then re-engages the gearing 16 so that ring 11 is locked against the biasing tension of spring 13 and the piston advance during injection can be read by comparison of the position of scale 5 with the position of the comparison mark 10. After delivery of a partial quantity, the rotation of piston rod 9 again effects resetting to zero in a simple manner, whereby it is again possible in the next injection to effect readings starting with zero.

FIGS. 4a and 4b show an injection syringe in which a transparent inner tube having inner gear segments is rotatably supported in a transparent handle, the phial-side end of the inner tube 14 preventing rotation with respect to the inserted cylinder 1, for example by means of cams or the friction surface 15. The ring 11, gearing in segments on the outside and transparent at least within the range of the comparison mark 10 comprises a spring 13 pressing against the back end of the inner tube. The piston rod 9 with scale 5 is provided with one or several longitudinal grooves 17 the front ends of which are stop devices of safety elements for the index support to prevent relative rotation thereof and furthermore to assure the transmission of the rotation of the handle 8 to the piston rod 9 by means of the cams 23 of the handle, and therefore also to the ring 11 and to the comparison mark 10.

The pressure spring 13 brings ring 11, and therefore comparison mark 10 as well as piston rod 9, into its original position according to FIG. 2a. Upon insertion into the cylinder 1, as in FIG. 2b, the piston rod 9 and the ring 11 are shifted backwards into zero position, and a tight connection is created between cylinder 1 and inner tube 14. The movement of rotation with which the handle 8 and the cylinder 1 are locked by bayonet holder 24, is transmitted to the piston rod 9 and the ring 11 which is longitudinally fixed by the outer gearing 16 now entering into engagement with the inner gearing 16a of the inner tube 14. The proce-
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Procedure is now prosecuted as shown in FIG. 2c. Resetting to zero is effected by spring 13 upon disengaging and re-engaging the handle 8 with the partially emptied cylinder 1, i.e., by two opposite rotational movements of the handle 8 with respect to the inner tube 14 fixed on cylinder 1.

FIG. 5 shows an injection syringe which constructively corresponds to the example of FIG. 3 to a great extent. However, instead of stopping the comparison mark by the described gearing, there is only provided on the handle a resiliently biased stop device 19 which is engaged with ring 11 through an opening in the handle 8. The zero position of scale 5 and of comparison mark 10 is possible in a simple manner by temporarily disengaging the stop device 19.

FIG. 6 shows an injection syringe the construction of which approximately corresponds to the example of FIG. 2. For the sake of clarity, the stop device of ring 11 has not been shown, but of course any such device, for example those of FIGS. 3, 4 or 5, may be provided.

As shown, the piston rod 9 is provided with an outer threading 21 so that a screwnut with inner threading provided as stop device 22 can be adjusted by choice. As can be seen, the stop device 22 becomes engaged with the comparison mark during advance of the piston, whereby further injection is stopped upon corresponding stopping of ring 11 by means of handle 8. The quantity to be delivered may consequently be thus pre-selected by correspondingly adjusting the stop device 22 so that it cannot be exceeded during injection once the desired quantity has been preselected.

The ring 11 of the chosen construction serves to lock the stop device 22 and also to support the comparison mark 10. Naturally, a separate element may be provided instead without departing from the scope of the present invention.

It should also be considered as equivalent to provide, instead of simple longitudinal shifting of the comparison mark 10, or of the scale support 4, corresponding threadings on the scale support 4 and/or on the comparison mark 10 and to obtain zero resetting analogously by rotation of the elements of the syringe.

We believe that the construction and operation of our novel syringe will now be understood and that the advantages thereof will be fully appreciated by those persons skilled in the art.

We claim:

1. Injection syringe comprising cylinder means having a closed end receiving one end of a cannula therethrough, a piston in said cylinder means, means for shifting said piston longitudinally in said cylinder means to dispense a dose of fluid from said cylinder through the cannula, a dosage scale associated with said means for shifting said piston, and a dosage comparison indicator positioned in a portion of said cylinder means to indicate the dosage discharged upon movement of said piston in said cylinder means, said indicator being shiftable in said cylinder to reset the dosage indication at the starting point after each discharge.

2. Injection syringe according to claim 1, wherein the means for shifting the piston comprises a stop device for moving the comparison indicator into zero position upon insertion of the means for shifting the piston into the piston.

3. Injection syringe according to claim 1, wherein the comparison indicator is arranged shiftably in a portion of the cylinder means, a spring is provided for urging the comparison indicator against the stop device and in that, for fixing the comparison indicator in zero position against the force of the spring before injection, stop means are provided between the comparison indicator and said portion of the cylinder means.

4. Injection syringe according to claim 3, wherein said portion of the cylinder means comprises a transparent tubular extension of the cylinder means, said comparison indicator comprises a ring encircling the means for shifting the piston and in that the stop means is a complementary gearing provided in segments on the inside of the tubular extension and on the inside of said ring which can be engaged or disengaged by rotation of the ring.

5. Injection syringe according to claim 4, wherein a tube member having inner gearing is provided within said extension and the comparison indicator or ring and means for shifting the piston and tubular extension are provided with complementary longitudinal guiding grooves wherefore rotation of the extension with respect to the cylinder means or the tube member engages or disengages the complementary gearings on the ring and on the tube member.

6. Injection syringe according to claim 4, wherein the comparison indicator or ring and means for shifting the piston are provided with complementary longitudinal grooves wherefore rotation of the means for shifting the piston engages or disengages the complementary gearings on the ring and on the tubular extension.

7. Injection syringe according to claim 4, wherein the comparison indicator comprises a ring encircling the means for shifting the piston, and the stop device is a lever passing through the tubular extension for ratcheting engagement with the surface of the ring with the comparison indicator directed in one direction.

8. Injection syringe according to claim 7, wherein the means for shifting the piston comprises at least one limit stop at a distance corresponding to a predetermined partial dosage, the stop being indirectly engageable with the cylinder means during discharge, wherefore the piston advance is locked after delivery of the predetermined partial dosage.

9. Injection syringe according to claim 8, wherein the distance of the stop from the cylinder means can be adjusted to select various dosages.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,905,366 Dated September 16, 1975

Inventor(s) GEORGE EDGAR CALLAHAN et al.

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 6, line 41, change "4" to -- 3 --.

Signed and Sealed this sixth Day of January 1976

[SEAL]

Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents and Trademarks
UNIVERSAL STATES PATENT OFFICE
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