DOSE LIMITING MECHANISM FOR HYPODERMIC SYRINGES

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The invention aims to provide a dose limiting mechanism which may be readily applied to and carried by a hypodermic syringe without unduly encumbering the same, and which will act positively during the charging operation to limit the dose which a user may take into the syringe, and may be progressively pressed by the user against the plunger 6 of the barrel 5 of the syringe 4 therefrom. The invention is especially useful in instances where doses of prescribed amount are to be administered by others than specialists, the mechanism being accurately preset by the specialist and thereafter insuring against overdosing by the patient, and also minimizing the risk of air remaining in the syringe after the charging operation has been completed. In charging a syringe, if it is observed after initial withdrawal of the plunger, that the barrel contains an incorrect dose, supplementary adjustments of the plunger in an effort to correct the error may still result in over or under dosage or in the entrapment of air into the charge, the consequences of which may be very serious. An important object of the invention is to eliminate the need for such supplementary adjustments during charging, and to put the user that an accurate dose will be obtained by one retractive movement of the plunger to the limit which is determined by the setting of the mechanism.

In carrying out the invention, I provide a frame which is slidable mounted at its forward end portion, upon the barrel of the syringe, the barrel carrying a stop at its rearward end which limits the extent to which the frame can move rearwardly with respect to the barrel. Rearwardly along the forward end portion of the syringe, the frame carries a stop member aligned with the plunger and the position of which may be adjusted forwardly and rearwardly along the frame. During the charging operation, the user retracts the plunger of the syringe in the barrel as fully as he can, i.e. until the head of the plunger has engaged the stop member, and then adjusts the frame as above referred to, and thereby moves the frame rearwardly with respect to the barrel until the forward portion of the frame reaches the above mentioned stop on the barrel. The two stops positively limit the dose which can be taken into the syringe, and during discharge the frame or the stop member carried at the rear thereof may be progressively pressed by the user against the head of the plunger, moving the plunger and the frame forwardly with respect to the barrel until the discharge of the dose is completed. Preferably the mechanism includes a supplementary adjustment as hereinafter described, whereby the permitted rearward stroke of the plunger may be optionally and temporarily increased to a limited extent when desired, without permanently disarranging the setting of the mechanism for normal dose limiting purposes. Further objects and advantages of the invention will be in part obvious and in part specifically referred to in the description hereinafter contained which, together with the accompanying drawings, discloses a preferred form of dose limiting mechanism applied to a hypodermic syringe of known form. It should be understood, however, that changes may be made in the disclosed form of the invention without departing from the invention in its broader aspects.

In the drawings:

Fig. 1 is a perspective view of a hypodermic syringe of known form, having combined therewith a dose limiting mechanism constructed to operate in accordance with the invention.

Fig. 2 is a side view of the syringe and dose limiting mechanism shown in Fig. 1, such mechanism appearing in longitudinal section;

Fig. 3 is an exploded perspective view of the parts constituting the mechanism shown in Figs. 1 and 2;  
Fig. 4 is a perspective view illustrating the manipulation of the syringe and dose limiting mechanism during discharge of the dose; and  
Fig. 5 is a detail section taken along the line 5—5 of Fig. 2, looking in the direction of the arrows.

The invention is illustrated as applied to a hypodermic syringe of commonly used form, having a barrel 1, injection needle 2 and plunger 3 which works within the barrel during charging and discharging of the syringe.

The frame of the dose limiting mechanism is provided at its forward end portion with a guide indicated generally at 4 (Fig. 1) which fits slidesly around the barrel of the syringes so that the frame as a whole may move to a limited extent forwardly and rearwardly along the barrel. The frame also has at least one, and preferably two, supporting strips 5 which are connected to the guide 4 at their forward ends, these strips being located peripherally outwardly of the path of movement of the plunger head 6 of the barrel of the syringe, and the spaces on opposite sides of the strips 5 being open so that the head 6 of the plunger may be manually grasped and retracted in the barrel 1 when the strips 5 are in operation, preventing the frame from the operation of charging the syringe. The rearward end of the barrel 1 is shown as provided with a flange 7, which acts as a stop limiting the rearward movement of the frame with respect to the barrel. The frame and preferably the strips 5 lie along flattened opposite edges 7a (see Fig. 5) of such flange, to prevent the frame from twisting around with respect to the barrel.

The forward end portions of the strips 5 are connected to a cross piece 8 (see Fig. 3) which lies behind the path of movement of the plunger head 6, and a stop member 9 is aligned with the plunger head 6, and so that it may be set in different positions longitudinally of the frame.

Thus in charging the syringe, once the stop member 9 has been set, the user pays no particular attention to the position the frame happens to assume at the time, but grasps the plunger head 6, which is accessible in the spaces between the strips 5, and retracts the plunger until the guide 4 engages the stop flange 7a at the rearward end of the barrel and the plunger head 6 engages with the stop 9 at the rearward end of the frame. This insures that a full charge will be taken in, with no possibility of an overdose.

In the illustrated form of the invention, the normal dose limiting setting of the stop member 9 is determined by a threaded stud 10, with respect to which the member 9 is normally fixed in position. This stud 10 is shown as engaged in a threaded plate 11 (Fig. 3) having grooves 11a into which the strips 5 fit to hold the plate 11 against rotation. A lock nut 12 also threadedly engages the stud 10, the latter passing loosely through a hole 8a (Fig. 3) in the cross piece 8. The lock nut preferably is somewhat cup shaped as shown in Fig. 2, to receive plate 11 and hold the adjacent parts in place.

The stud 10 is shown as having a finger piece 13 at its rearward end and thus when lock nut 12 is loose, the dose limiting position of stop member 9 may be adjusted by appropriately turning the finger piece 13 one way or the other. With the frame in the position shown in Fig. 1 and the plunger head 6 in contact with stop member 9, the inner end of the plunger 3 will indicate the dose for which the mechanism is set, by reference to the scale 14 shown in Fig. 1. After the desired setting has thus been obtained, the lock nut 12 is tightened up against the outer face of cross piece 8 to lock the stop member 9 in set position with respect to the frame.

Preferably the stop member 9 is provided with a supplementary adjustment to allow limited additional retractive movement of plunger 3 when desired. As shown, the stop member 9 is carried on a shaft 15 which is loosely received within the stud 10, but normally held fixed with respect to the stud by a hook 16 (see Fig. 3) extending from a finger piece 17 carried by the shaft 15 and extending through a slot 18 (Fig. 3) to engage against a face of the finger piece 13. So long as the finger pieces 13 and 17 are thus locked together, the
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The mechanism functions as above described. But by twisting the finger piece 17 so that its, until the twist appears in Fig. 1, the hook 16 becomes released from the finger piece 13, whereupon the stop member 9 becomes free to move to the right with respect to the stud 10, as the parts appear in Fig. 1, until the stop member 9 engages the inner end of the stud 10 as shown in Fig. 5. This allows limited additional retractive movement of the finger piece 13 as already described, to return the plunger to the actual dose setting, with the result that the blood which entered the syringe during the test will be returned to the patient's blood system. After such a test the barrel will still contain the dose for which the mechanism is set and the dose may even be injected in the area just tested without producing unsatisfactory results. If the needle is not removed too quickly after the injection has been completed, but it is better to allow a reasonable length of time to elapse so as to allow the dose to become absorbed; or the test may be repeated for injection in another area if desired, but this seldom becomes necessary.

During the normal operation of injecting a dose, the operator grasps the portions of the flange 7 which are exposed to his grasp, and presses the finger piece 17 to the left as the parts appear in Fig. 4. During this stage of operation, the stop member 9 progressively pushes the plunger 5 further into the barrel 1 while the guides 4 and adjacent parts of the frame move along the outer surface of the barrel.

In the illustrated form of the invention the guide 4 is constituted by arcuate pieces 19 (Fig. 3) which are connected respectively to the strips 5 and are surrounded by a collar 20. After moving this collar to the left from the position shown in Fig. 1, the strips 5 may be forced apart and the dose limiting mechanism removed from the syringe, as will be done when the plunger 8 is to be completely removed from the barrel. At other times, the mechanism will usually be left on the syringe and loosely carried thereby, the frame being usually constructed of metal such as stainless steel or chromium plated steel which may be left in place while the assembled syringe is being sterilized. So long as carried by the syringe, the mechanism prevents the plunger from falling out of the barrel. The fall of the plunger to a hard surface usually renders both the barrel and the plunger useless, since they customarily are individually fitted during manufacture so as not to be separately interchangeable or replaceable.

Once the stop member 9 is accurately set, the mechanism enables the user to charge the syringe by a single retrograde movement of the plunger head against the stop, with assurance that no more or less than the proper dose will be charged in. Thus no minor supplementary adjustments are required in setting in which supplementary adjustments may still result in over or under dosage, or in the entrainment of air into the charge, or in wastage of the liquid. During injection, the mechanism may conveniently apply to the actuating force to the plunger, without unduly encumbering the syringe either during use or storage, or while being sterilized.

While the invention has been disclosed as carried out by a mechanism of the above described specific form, it should be understood that changes may be made, without departing from the invention in its broader aspect, within the scope of its appended claims.

I claim:

1. A dose limiting mechanism for hypodermic syringes comprising a frame having a stop member and a sliding portion a ring-like member constructed to engage the barrel of a syringe, the forward portion of said frame being constructed to engage the barrel structure of the syringe to act as a stop preventing rearward movement of the frame with respect to the barrel, said frame having at least one supporting strip connected to said member and extending rearwardly therefrom to a point rearwardly of the path of movement of the plunger of the syringe, said supporting strip extending peripherally outwardly of the path of movement of the head of the plunger through said spaces when said strip is in operating position, said frame having a cross piece connected to the rearwardly extending portion of said strip to lie behind the plunger, said cross piece carrying a stop member located rearwardly of and positioned to lie behind the head of the plunger, and means for adjusting said stop member to limit to various extents, retractive movement of the syringe plunger with respect to the barrel, to thereby limit the dose which can be charged into the syringe, and supplementary means operable to alter the setting of said stop member as determined by said first mentioned adjusting means, to afford limited retractive movement of the plunger additional to that afforded by said first mentioned adjusting means.

2. A dose limiting mechanism for hypodermic syringes comprising a frame having at its forward end portion a ring-like member constructed to engage the barrel of a syringe, the forward portion of said frame being constructed to engage the barrel structure of the syringe to act as a stop preventing rearward movement of the frame with respect to the barrel, said frame having at least one supporting strip connected to said member and extending rearwardly therefrom to a point rearwardly of the path of movement of the plunger of the syringe, said supporting strip extending peripherally outwardly of the path of movement of the head of the plunger through said spaces on the opposite sides of said strip being open to afford manual grasping of the head of the plunger and the spaces on opposite sides of said strip being open to afford manual grasping of the head of the plunger through said spaces when said strip is in operating position, said frame having a cross piece connected to the rearwardly extending portion of said strip to lie behind the plunger, said cross piece carrying a stop member located rearwardly of and positioned to lie behind the head of the plunger, and means for adjusting said stop member to limit to various extents, retractive movement of the syringe plunger with respect to the barrel, to thereby limit the dose which can be charged into the syringe, and supplementary means operable to alter the setting of said stop member as determined by said first mentioned adjusting means, to afford limited retractive movement of the plunger additional to that afforded by said first mentioned adjusting means.

3. A dose limiting mechanism for hypodermic syringes comprising a frame having at its forward end portion a guide constructed to fit slidably around the barrel of a syringe to guide the frame for movement along the barrel, the forward portion of said frame being constructed to engage a stop located at the rearward end of the barrel to limit the rearward movement of the frame with respect to the barrel, said frame having at least one supporting strip connected to said frame and extending therefrom to a point rearwardly of the path of movement of the plunger of the syringe, said supporting strip extending peripherally outwardly of the path of movement of the head of the plunger and the spaces on opposite sides of said strip being open to afford manual grasping of the head of the plunger through said spaces when said strip is in operating position, said frame having a cross piece connected to the rearwardly extending portion of said strip to lie behind the plunger, said cross piece carrying a stop member located rearwardly of and positioned to lie behind the head of the plunger, and means for adjusting said stop member to limit to various extents, retractive movement of the syringe plunger with respect to the barrel, to thereby limit the dose which can be charged into the syringe, and supplementary means operable to alter the setting of said stop member as determined by said first mentioned adjusting means, to afford limited retractive movement of the plunger additional to that afforded by said first mentioned adjusting means.
means adjustable to hold said stop member selectively in positions spaced different distances from said guide, said stop member engaging the head of the plunger and the forward portions of the frame engaging said first mentioned stop, upon manual retraction of the plunger to charge the syringe, thereby to limit the dose which can be charged into the syringe.

4. A dose limiting mechanism for hypodermic syringes comprising a frame having supporting strips spaced apart to receive the plunger head of a syringe therebetween, means for detachably holding the forward end portions of said strips in position to slide longitudinally along the barrel of the syringe, the forward portion of the frame being engageable with the barrel structure of the syringe to limit the rearward movement of the frame with respect thereto, a cross piece extending between the rear end portions of the strips to lie behind the plunger of the syringe, a threaded stud extending through said cross piece, a nut held between said strips forwardly of said cross piece and threadedly engaging said stud, a lock nut located rearwardly of said cross piece and threadedly engaging said stud, a stop member carried at the forward end of said stud in position to engage the head of the plunger upon retractile movement of the plunger, releasable means for locking said stop member against sliding movement with respect to said stud, said stud and said stop member each carrying finger pieces at the outer end portions thereof, to afford supplementary adjustment of said stop member and manipulation thereof by its finger piece, when said locking means is released.

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