April 23, 1935. F. S. DICKINSON 1,998,982

SYRINGE BARREL

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Fig. 1.

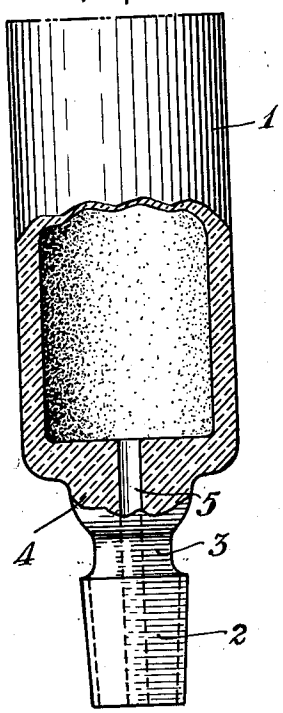
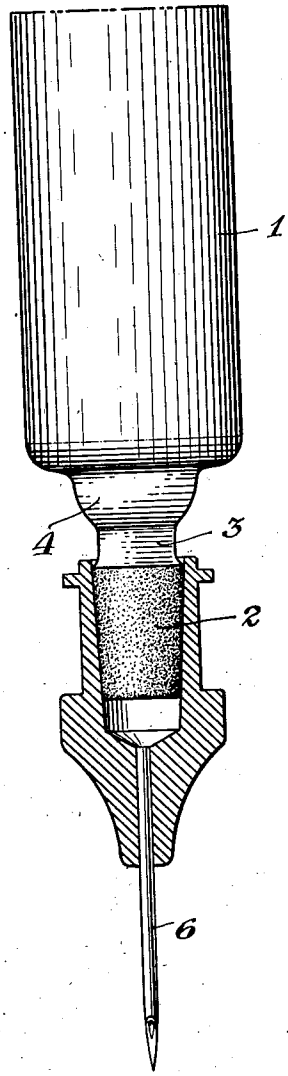


Fig. 2.



WITNESS

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SYRINGE BARREL

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2 Claims. (Cl. 128—218)

This invention relates to syringe barrels, particularly such as are made of glass and have a nozzle of exteriorly roughened or ground conical shape adapted to receive and to retain securely in place by frictional contact a sleeve or needle hub of smooth but conically similar interior configuration. The object of the invention is to improve the strength, fitting capability, and uniformity of product of this general type of syringe.

Heretofore glass syringe barrels were first prepared by the workmen applying a tool having a conical interior configuration to the forward end of the barrel after the same had been softened by heat. The result was a blank in which the fluid reservoir of the barrel terminated in a ducted portion projecting conically from the forward face of the bottom of the barrel, the tapered nozzle portion being, however of greater dimensions than those desired in the ultimate completed barrel. The operations and the tools adapted to bring about this result are within the knowledge of those skilled in the art of making syringe barrels. The blank thus produced was now subjected to an abrasive tool or grinding instrumentality which ground the taper of the nozzle down to the exterior dimensions required for the nozzle in the final product and at the same time roughened the outer surface of the nozzle. The result of this operation was that the ground tapered portion at its largest diameter projected from a ridge or shoulder whose outside dimensions were those of the original tapered portion of the blank, while the front face of the ridge represented the amount of glass which the grinding instrumentalities had removed, said front face having also a ground surface because the grinding tool had been operative in removing glass at that point. The grinding tool, in approaching the region of the ridge to which reference has been made, wears away at the grinding corner which moves toward the place where the ridge ultimately appears, so that very soon after a new grinding tool is begun to be used, the forward face of the ridges of the successively ground barrels will become more and more sloping at the ground forward ridge surface though constantly larger in cross-sectional dimensions than if the cone of the nozzle had been produced with an unworn tool. The result of this method of procedure was not only to introduce an element of maximum weakness in the region where the cone projected from the ridge in the finished barrel, but also that needle hubs due to the variations in the effective conical surfaces of different nozzles frequently would not obtain a secure hold upon some of the nozzles because they could not seat themselves further down than where the conical interior of the hub came into contact with the outermost sloping part of the ridge. Breakage was frequent as between the nozzle and the ridge and it was a source of great annoyance and trouble to physicians to have needle hubs loosen themselves from the nozzles of syringes in use or to have to take another syringe to fit a particular needle hub or to try to fit a series of needle hubs on to the syringe in hand.

It is the object of the present invention to do away with all these difficulties by a reconstruction of the syringe barrel along simple and inexpensive lines and thereby to avoid and obviate the defects of the existing structures.

The invention is shown in the accompanying drawing in which Fig. 1 represents in elevation the blank from which the new syringe barrel is made, and Fig. 2 represents a similar view of the completed product.

In the drawing numeral 1 represents the conventional fluid reservoir portion of the ordinary glass syringe, the inner surface of which is usually ground while the outer surface is smooth and continues as a smooth surface all the way to the front edge of the nozzle portion 2. In forming this blank the tool used by the operator in shaping the nozzle portion is one that is adapted to the formation of the relatively heavy or massive circular glass portion 4, the tapered nozzle portion 2 and, between the massive circular portion 4 and the widest part of the tapered portion 2, a groove 3. The walls of the massive circular glass portion 4 are materially thicker than the walls of the syringe barrel 1, said massive glass portion 4 being integral with and extending from the ejecting end of the barrel 1. The outer surface of the portion 4, as well as of the groove 3 are smooth and remain smooth, that is the skin of the glass remains unbroken. It is to be noted that the groove 3 is not in the nature of a bend in the glass wall but of a depressed surface condition on a part of the glass which is supported by the relatively massive section 4 and in turn connects with the tapered section 2. These features are of importance in imparting to the structure the necessary strength to prevent breakage under all ordinary conditions in the region of the groove 3. The duct 5 is the passageway through which fluid may be drawn into or ejected from the barrel 1 through the needle 6. Positioning the groove 3 at the point indicated results in abridging the length of the tapered section 2 to such an extent that, as indicated in

Fig. 2, the whole of the tapered section 2 will be enclosed by and be in contact with the hub section of the standard needle hubs to receive which these syringes are made. Accordingly, when the parts are assembled as in Fig. 2, no forces are developed within the area of the ground glass surface of the tapered section 2 which would tend to cause breakage of that section and whereby the burden of resisting breakage under transverse strains is carried by the grooved section 3. Due to the smooth contour of the groove 3 and the support which the grooved section 3 receives from the relatively massive section 4, the grooved section 3 is caused to acquire sufficient inherent strength to resist breakage under all normal conditions of use and to acquire a strength which is far in excess of that possessed by the older syringes which had no such groove at all or by syringes which had a groove resulting from a mere bending of the glass walls immediately adjacent to an unreinforced forward portion of the barrel.

When the blank shown in Fig. 1 has been shaped, the front edge of the nozzle is usually ground off and thereupon the grinding instrumentality or grinding tool moving from the forward edge of the nozzle in a direction toward the groove 3 grinds down the nozzle to the dimensions indicated in Fig. 2 and the dotted lines of Fig. 1. The edge of the grinding tool which moves toward the groove 3 may be worn, but in completing the grinding of the tapered portion of the nozzle forward of the groove, the worn edge of the grinding tool will extend over the groove without doing any work at that point while the rest of the face of the grinding tool will complete the grinding of the tapered section of the nozzle. The presence of the groove therefore reflects beneficially upon the action of the grinding tool and results in the production of an effective tapered length of nozzle which is uniform for all syringes of the same size and character and with respect to all needle hubs or sleeves adapted for cooperation with such a barrel. Thus, if the relation between a needle hub or sleeve and the new tapered tip is such that the hub section requires to be pushed a little further down upon the nozzle than the line represented by the sharp edge between the tapered nozzle and the groove, the hub will still securely seat itself upon the nozzle, the widest part of the hub interior taper in that case overhanging the groove as indicated in Fig. 2. The new structure never presents any obstruction which will prevent proper seating of the needle hub against the tapered nozzle as was frequently the case in the prior construction. It was also found that by reason of the fact that the groove is of glass of unbroken surface and joins the roughened exterior of the tapered nozzle at the widest part of said nozzle, the structural strength of the nozzle, instead of being diminished by the reduction in glass thickness resulting from the presence of the groove, was greatly increased and that breakage of the nozzle, instead of being a frequent occurrence, occurred only under unusual conditions of strain where the nozzle would break in any event. In the new structure the skin of the glass is unbroken at that part of the structure where breakage might be expected to occur and this feature contrasts with the old form of syringe barrels where the skin of the glass was always broken at the very point or line where breakage was expected to occur and where consequently the break did occur in practically every instance where the tip was broken off.

The new syringe barrel, instead of being used to support the hub of a needle directly, can, of course, also be used to support a sleeve such as is illustrated in Figs. 1 and 2 of my Patent No. 1,742,497, the sleeve being in that case held upon the nozzle with accented force by using the process described in my Patent No. 1,727,755. In this case, where such a sleeve is used, the same effect with respect to any slight over-hang of the sleeve beyond the edge of the groove is obtained as was described in connection with the needle hub illustrated in Fig. 2.

The present invention results in a better taper of the nozzle, a more uniform taper, a stronger tip, a more reliable support for a hub or a sleeve, a support which can be adapted to function correctly irrespective of minor variations, dimensions of the tapered nozzle itself or any hub or sleeve intended to fit upon it. A better fit for the needle hub is obtained and increased longevity results from the presence of the smooth glass groove 3. The effect of the mechanical strains set up by breaking the skin of the glass due to the operation of grinding, is minimized by the new formation.

A syringe barrel is, of course, generally made of glass, but the principal principle of the present improvement may also be used when the syringe barrel is made of other materials. The groove 3 is most effective when continuously circular, but the inventive concept of the new structure would still be involved if the groove were composed of longitudinal undulations or of a series of depressions separated by relatively small webs or spacing walls.

I claim:

1. A glass syringe barrel having a cylindrical fluid reservoir with a plunger-engaging face extending across the discharge end of the reservoir at right angles to the cylindrical walls of the reservoir, a glass section integral with and extending from said discharge end of said reservoir, the walls of said glass section being thicker than the cylindrical walls of the reservoir and thereby buttressing the connection between the barrel and the said section against breakage due to compression strains radially applied to the forward part of the syringe, an integrally tapered glass nozzle forming a continuation of the glass section, a uniformly cylindrical bore extending from the plunger-engaging face of the reservoir through the glass section and the nozzle, said nozzle having a ground exterior surface and walls thicker than the diameter of the passage and thereby buttressed against breakage due to compression strains radially applied to the nozzle and, intermediate between the buttressed glass section and the buttressed nozzle and integral with both, a depressed portion in the nature of a smooth-surfaced groove of reduced exterior dimensions with respect to both the nozzle and the glass section, the tapered ground surfaced nozzle being so dimensioned with relation to the standard needle hub for the reception of which the syringe is made that substantially the whole of its ground glass surface will be enclosed by and in contact with such hub when positioned thereon so as to relieve the ground glass surface of shearing strains and to throw the effect of such strains on the smooth-surfaced depressed groove portion.

2. A glass syringe barrel having a cylindrical fluid reservoir with a flat face extending across the discharge end of the reservoir at right angles to the axis of the barrel, said face being arranged

as a seat for a flat-ended plunger to enable complete discharge of fluid from the barrel, a glass nozzle supporting section integral with and extending from said flat inner face of the reservoir, an integral tapered glass nozzle forming a continuation of said nozzle-supporting section, a uniformly cylindrical bore extending from the flat plunger engaging face of the reservoir through the glass nozzle-supporting section and through the nozzle, said glass structure, save for said bore, being solid glass, said nozzle having a ground exterior surface and walls thicker than the passage and, intermediate between the glass nozzle-supporting section and the nozzle and integral with both, a smooth surfaced groove pressed into the solid mass of glass constituting the nozzle-supporting section and of reduced exterior dimensions with respect to the dimensions of both the walls of the adjacent nozzle and nozzle-supporting sections, said groove forming a wall of less thickness at the grooved region than the thickness of the walls of the adjacent parts of the nozzle and of the nozzle-supporting section, the tapered ground surface nozzle being so dimensioned with relation to the standard needle hub for the reception of which the syringe is made that substantially the whole of its ground surface will be enclosed by and in contact with such hub and positioned thereon so as to relieve the ground glass surface of shearing strains and to throw the effect of such strains on the relatively thin walled smooth surfaced groove portion.

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