This invention relates to a novel and improved construction for a water bag syringe.

Conventional syringe devices are ordinarily made of relatively expensive durable material which is adapted for repeated use. When used in a clinic or hospital, the complete device must be sterilized after each use, entailing a considerable amount of expense and handling of the devices and requiring a large supply of syringes to be kept on hand in order to have a sufficient number ready for use at any time. For individual personal use in the home, it is also customary to use a similar, re-usable type of device which, even if not sterilized, must be washed, dried and stored after each use, occasioning inconvenience in the home and still greater inconvenience while traveling.

Objects of the present invention are to provide a syringe of very inexpensive construction and one which is readily disposable so that it may be used once and then discarded to obviate the problems attending the re-use of such devices. Other objects are to provide a novel type of syringe device which may be made at low cost from paper or other inexpensive sheet material; to provide a syringe device made from a single blank of material which is rolled, folded and sealed in a novel manner; and to provide a complete syringe device including a water bag, connecting tube and nozzle made entirely from paper or other sheet or film material. Other objects reside in the novel form of the blank from which the device is made, the provision of a bag which may be carried in an inverted position without a stopper, the manner in which the seams are formed, the manner in which the nozzle is formed, and in the method of forming the device from a blank of material.

The present device comprises a water bag, connecting tube and nozzle which may be of unitary construction formed from a single piece or blank of flat material. Different kinds of waterproof flexible sheet material may be used for the blank as will occur to persons skilled in the art, one such material which is particularly suitable for making an inexpensive and easily disposable syringe being a waterproof paper parchment. Also various sealing means may be used to unite the joints in the paper, such as a waterproof glue, a plastic heat sealing coating, or the blank itself may be cut from a material which may be heat sealed by applying heat to the surfaces to be united. The blank is first cut to a pattern to form the bag, connecting tube and nozzle, and if the blank itself is not formed from a heat sealing material it is coated with the waterproof sealing material, as will presently be explained in detail. The blank may be merely coated on its surface with heat sealing, waterproof material in the form of a film, or it may be thoroughly impregnated therewith, and in either case the material may be applied only in certain areas, or throughout. The nozzle is formed by rolling up a sufficient length of a portion of the paper blank to form a stiff tube having the desired nozzle length and diameter. After the nozzle has been rolled to form the stiff tube, the rest of the blank forming the water bag and connecting tube is folded over and the edges sealed together to form a liquid container. As a final step the nozzle is preferably dipped in a synthetic resin compound or the like to form a smooth, hard surface thereon. In the completed device a fold or bending line in the paper extends from the upper end of the water bag along one side thereof and toward the nozzle so that the water bag will collapse to a flat condition for folding into a compact package.

Still further objects and advantages will be apparent as the description proceeds with reference to certain preferred embodiments of the invention illustrated in the accompanying drawings, but it is to be understood that the drawings are for the purpose of illustrating the invention and not for the purpose of limiting the invention, as the same is to be limited only by the terms of the appended claims.

In the drawings:
Figure 1 is a plan view of one form of blank from which the syringe may be made;
Figure 2 is a side elevation view of a completed syringe made from the blank shown in Figure 1;
Figure 3 is a fragmentary elevation view showing the first step in forming the device from the blank shown in Figure 1;
Figure 4 is a sectional view taken on the line 4—4 of Figure 3;
Figure 5 is a sectional view taken on the line 5—5 of Figure 3;
Figure 6 is a fragmentary view showing a second step in the manufacturing of the device;
Figure 7 is a sectional view taken on the line 7—7 of Figure 6;
Figure 8 is a sectional view taken on the line 8—8 of Figure 6;
Figure 9 is a fragmentary side elevation view of the partially completed device shown in Figure 6 after a further operation has been performed;
Figure 10 is an enlarged fragmentary side ele-
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venation view showing the final sealing operation; Figure 11 is a front view of the completed device shown in Figure 10;
Figure 12 is a sectional view taken on the line 12—12 of Figure 11;
Figure 13 is a sectional view taken on the line 13—13 of Figure 11;
Figure 14 is a sectional view taken on the line 14—14 of Figure 3;
Figure 15 is a plan view of the completed device shown in Figure 2;
Figure 16 is an elevation view of a modified form of syringe;
Figure 17 is a cross sectional view taken on the line 17—17 of Figure 19;
Figure 18 is a cross sectional view taken on the line 18—18 of Figure 16;
Figure 19 is a fragmentary view of the paper blank used to form the syringe shown in Figure 16;
Figure 20 is a view showing the nozzle and tube portion of the syringe of Figure 16 in a partially completed state;
Figure 21 is a greatly enlarged fragmentary longitudinal sectional view of the nozzle tip; and
Figure 22 is a view showing the syringe of Figure 16 in inverted position for filling and carrying liquid.

Referring now to the drawings, Figure 1 shows one form of blank from which the complete syringe may be formed. The numeral 10 designates the upper portion of the blank which is intended to form the water bag, this part being of substantial width and having a plain edge 11 and an adhesive edge 12. If the blank is cut from heat sealing material, an adhesive coating is not necessary, and in such case the shading on the drawing to indicate adhesive is to be understood to designate merely the areas of the blank which are used to form the necessary seals. The so-called plain edge 11 would then, of course, have the same potential adhesive properties as the so-called adhesive edge 12. In any case, the conventional showing of adhesive is adapted primarily to designate the location of the seams rather than indication the type of seal or limits of the adhesive material.

To make a tapered bottom on the water bag, the upper portion 10 also has an inclined plain edge 13 and an inclined adhesive edge 14, these two edges converging towards a relatively long narrow portion 15 designed to form the connecting tube between the water bag and the nozzle. The portion 15 has a plain edge 16 and an adhesive edge 17, which edges are parallel with each other and also with the previously mentioned edges 11 and 12. The portion 15 may also be tapered if desired. The lower end of the portion 15 is connected with an adhesive portion 18 extending laterrally to a considerable distance and terminating in an uncoated end 19. At the juncture of the portions 15 and 18 in the illustrated embodiment the edge 16 is extended into the portion 15 in the form of a vertical slit or cut 20, and a short horizontal cut 21 is made at right angles to the cut 20 to form a square corner therebetween. The numerals 25 and 21 may be considered to be applied to the corners of the portion 15 which is thereby cut free from the portion 18. It will be observed in Figure 1 that the portion 18 does not extend out at right angles to the vertical edges 16 and 17, but is cut, preferably at an obtuse angle as shown, to make a tapered nozzle tip when rolled.

The nozzle is formed by starting to roll the 70 lateral end portion 19 on a small cylindrical mandrel with the remainder of the adhesive portion 18 rolling up to a thickness of several layers as shown in Figures 3 and 5. The thickness of the material is, of course, considered in the sectional views to more clearly show the form of construction. If a fairly good grade of parchment paper is used, the wall thickness shown in Figure 5 would actually be considerably thinner in relation to the inside diameter of the nozzle, although these proportions are not material and the invention may be practiced with either thick or thin paper, or other sheet or film material. The edge formed on the portion 15 by the cut 20 is designated by the numeral 25a in Figures 3 and 4 and the edge at right angles thereto formed by the cut 21 is designated by the numeral 21a.

Then, instead of rolling up the edge 16, 23 which would cause the corner 25a, 21a to fit into the corner 25a, 21a, the edge 17 is rolled around to overlie the corner 25a, 21a and unite with the edge 16, 20 as shown in Figures 6 and 7 to form an outstanding flange having a width equal to the width of the indicated adhesive area on the edge 17. When the edges 16 and 17 are thus brought together, the edge 13 is also folded over even with the edge 14 and the edge 11 is folded over even with the edge 12. When the edges 11, 13 and 16 are all united with the respective edges 12, 14 and 17, the portions 10 and 15 form the water bag and tube as shown in Figures 2, 14 and 15. The side walls are shown in somewhat flattened condition as they may be left for packing and shipment, but it is obvious that when the water bag and tube portions are filled with liquid, the sides will round out under the liquid pressure to provide the necessary capacity.

Figure 9 shows a side view of the nozzle portion shown in Figure 6 but with a small adhesive area 25 on the outside of the edge 19 at the end 27. The flange formed by the edges 17 and 20 is then bent over and flattened against the nozzle tube on the vertical and diagonal fold lines 25 and 27, as shown in Figures 10 and 11, in which position it is held by the adhesive areas at 17 and 18. The line 25 designates the upper edge of the adhesive area 25 which becomes a horizontal crease line or transition point between the lower end of the flange 17, 20 which is flattened against the nozzle and the upper part of this flange which is left outstanding. The flattened portion of the flange is shown in Figure 13, and the outstanding portion of the flange is shown in Figure 7. The section shown in Figure 12 is taken in the transition between the line 23 and the plane of the section in Figure 7. These three sections show the device as it appears when completed, while the sectional view in Figure 8 illustrates an uncompleted stage.

If the edges 16 and 17 are united by a lap joint instead of a flange joint, the transition between the nozzle portion 15 and the tube portion 18 is greatly simplified, but then the transition between the tube portion 15 and the water bag portion 19 is more difficult to make leak-tight. Various other lapping and sealing arrangements may be devised to locate the necessary joints and transitions as will occur to persons skilled in the art in the light of the present disclosure. Another form of construction is shown in a second embodiment to be described presently. Still other lapping and sealing arrangements to accomplish the same purpose which fall within the scope of the appended claims are to be included in the
invention as equivalent modifications and variations thereof.

The mandrel upon which the nozzle portion is rolled may be used to provide a rigid backing for the application of heat and pressure, when necessary, for thermostating or thermoplastic sealing materials. The flange joints in the tube and water bag portions may, of course, be pressed against a flat surface. After the various joints have been completed and the mandrel removed from the nozzle, the nozzle is dipped in a synthetic resin or other compound to form a smooth, heat resistant material thereon, over the stepped edges of the spiral rolling of the paper.

If desired, the rolled nozzle may be omitted and a conventional nozzle attached to the tube portion in the usual manner to still obtain the principal advantages of the invention through the use of an inexpensive, readily disposable bag and connecting tube. Conventional nozzles so employed may be disposed of with the bag, or sterilized and re-used on new bags.

Figures 16 to 22 illustrate a syringe embodying the general principles of the invention in a modified form of construction. In this embodiment a single blank 31 of the general shape shown in part in Figure 19 is rolled and folded to form a nozzle 32, tube 33 and water bag 34. The opposite edges of the blank are folded over and united to form the water bag 34 of any desired shape, the sealed joint along the edge of the blank terminating at the point 35 to leave a filler opening 36 at a height which will provide the desired fluid capacity for the water bag. Above the filler opening 36 the edges of the blank are united in a vertical joint 37 and a top horizontal joint 38, the lower portion 39, which joints are extended in the upper corner of the bag to include an area around an eyelet 40 for supporting the bag and its contents. If relatively thin material is used for the blank, suitable reinforcement may be provided around the eyelet 40 to support the necessary weight of water without tearing the material.

The syringe shown in Figure 16 is filled by inverting it and pouring in water through the filler opening 36 substantially to fill the upper part 39 of the bag as shown in Figure 22. The extended seal around the eyelet 40 prevents leakage at this point while the bag is inverted. The blank is preferably proportioned so that the upper portion 39 will hold the same amount of water as the water bag portion 34 and tube 35, whereby, when the bag is inverted, it may be safely filled up almost to the filler opening 36 as shown in Figure 22. This form of construction makes it easy to carry a number of filled syringes without loss of their contents by merely grasping the tubes 33 of all the syringes together in one hand. In this position the syringes may be subjected to considerable jostling without loss of water through the filler openings. When the syringe is to be used, it is merely tipped or rotated in a counterclockwise direction from the position shown in Figure 22 to cause the water in the part 39 to run down into the tube 33 and fill the water bag portion 34 to the approximate level shown in Figure 16, whereupon it may be hung by the eyelet 40 upon a hook provided for the purpose.

To form the syringe from the blank 31, shown in Figure 19, the laterally extending portion 41 is first rolled on a mandrel of the proper size to form the nozzle 32. The lower edge 42 of this portion of the blank is slightly curved, as shown, to form a rounded end 42a on the nozzle tip, and the horizontal length of the portion 41 of the blank is sufficient to provide the desired wall thickness in the nozzle, the size of the water passage through the nozzle, of course, being determined by the size of the mandrel upon which the portion 41 is rolled.

The insertable nozzle portion of the blank 41 terminates at a vertical edge 44 to leave a long, offset, horizontal edge 45 extending from the nozzle portion 41 to the tube forming portion 46 of the blank. The portion of the blank having the horizontal lower edge 45 forms a shank on the nozzle and is designated as numeral 45. The vertical edge 44 is preferably about two inches long and its purpose is to offset the edge 45 to form a perpendicular shoulder 45a on the nozzle, as shown in Figure 20, to serve as a guard to limit the depth of insertion of the nozzle into the patient. The horizontal portion 47 of the blank is extended to sufficient length to build up the desired shoulder height at 45a, depending on the thickness of the material of the blank. The numeral 50 designates a seal area which may be extended upward along the edges of the portions 41, 47 and 46 in the manner shown to hold the material tightly rolled in the nozzle portion of the syringe and to form the necessary marginal joint in the tube and bag portions. It will be apparent that by rolling the portion 41 rather tightly on a mandrel and securing the successive layers together at least in the designated seal area, a sufficiently stiff and serviceable nozzle 32 may be formed. The additional material in the portion 47 of the blank used to form the shoulder 45a makes a still larger and stiffer base or shank 51 on the nozzle where it joins with the tube 33.

The nozzle 32 may be dipped in a suitable coating composition 52 to provide a smooth surface thereon, especially over the curved end 42a where the edge 42 of the paper forms a series of square-corner steps in its successive layers. The coating material 52 is preferably applied to a sufficient thickness to fill in the stepped corners and provide a smooth, rounded contour on the end 42a, as shown in the magnified cross sectional view in Figure 51.

It will be apparent that after the nozzle 32 has been formed and the last part of the horizontal portion 47 is being rolled to complete the nozzle shank 51, the lower end of the tube 33 will be formed concurrently from the blank portion 45. Thus, when the rolling of the shank portion 51 is completed, the seal area 50 on the inside surface of the outer edge of the blank portion 46 will roll over on top of the outer surface at the edge 55 to form a simple lap joint to establish an integral water-tight connection between the lower end of the tube 33 and the nozzle shank 51. A lap joint, however, is not a desired form of joint to follow the reverse curves in the bag portion 34, because the material of the blank cannot readily be folded on a curve. Whereas the lap joint is formed on the shank 51 on a cylindrical surface without any folding of the paper, it is preferred to form this joint on a flat supporting surface with one side of the blank folded over to lie flat on the other side in the manner described in connection with Figures 1 and 2, making it desirable to change to a different type of joint above the nozzle.

The type of joint employed along the straight edges 37 and 38, and also along the reversely curved edge 56, is, therefore, designated as a
flap or flange joint as shown in Figure 17, to distinguish from the lap joint in the tube 33 near the nozzle, as shown in Figure 18. The term flange joint is employed to describe the form of joint shown in Figure 17 because when the sides of the bag are filled out with liquid the edge portions of the two sides of the blank extend in the same direction and are disposed to stand out like a flap in substantially perpendicular relation to the adjacent surface of the container, while in a lap joint, as shown in Figure 18, the opposite edge portions of the blank are oppositely directed and lie in the contour of the container wall when viewed in cross section. It is apparent that the lap joint shown in Figure 18 is most suitable on a cylindrical shape, and that the flange joint shown in Figure 17 is most suitable to follow a curved edge where the bag is to be pressed flat.

Thus, in the sealing operation there must be some kind of a transition between the lap joint on the cylindrical surface of the nozzle shank 51 at the lower end of the tube 33 and the flange joint in the upper part of this tube and along the curved edge 56. If the sealing operation requires a continuous solid backing for pressing the parts together to form the joints, the mandrel on which the nozzle portion is rolled may have an upper end extending from the shank portion 51 gradually flattened in a wedge shape to effect the transition from a cylindrical surface to a flat surface, but the invention is not limited to the use of any particular form of mandrel for this purpose.

Figure 20 shows one form of transition from the lap joint on the nozzle shank 51 to the flange joint on the upper part of the tube 33. When the nozzle shank has been rolled to the point shown in Figure 20, the under edge 55 of the portion 48 of the blank is folded over and a diagonal crease 55 is formed, beginning at a point 57 some distance from the nozzle and extending down to a point near the shank 51 where the tube 33, of course, cannot be pressed flat but must begin to assume an oval shape in cross section which gradually thickens to a circular shape at the shank. If a flattened mandrel is used, the crease 55 would disappear at the upper end of the mandrel. Thus, when the top edge 56 is rolled upon the shank 51, it forms a lap joint on the shank 51 and also on the lower end of the tube 33 in those portions having oval cross sections. However, where the tube 33 is pressed flat, the seal area 50 on the inside surface adjacent the edge 55 will attach itself both to the outer surface 59, which is folded over by the crease 55, and to a portion 60 of the inside surface which is exposed beyond the edge 55. The width of the seal area on the outer surface 55 will thereby gradually diminish and become zero at the point 57, while the width of the seal area on the inside surface 60 will gradually increase up to the point 57, whereby the seal area 59 will be caused to unite with both surfaces 50 and 60 in the transition. Between the point 57 and the upper end of the seal 58 a simple flange joint will be formed as shown in Figure 17. In this way the tube 33 may have a gradual taper, but it preferably will not enlarge appreciably between the nozzle and the point 57. Above the point 57 the curve 55 may be cut to any shape desired for convenience in handling the necessary quantity of water.

While the seal area 59 is shown on the drawing as an adhesive coating, the shading is employed primarily merely to show the location of the sealed joints and not to constitute a limitation to a specific type of seal. While the material not possessing inherent self-sealing properties is used for the blank, a waterproof adhesive, preferably of the heat sealing type, may be applied to the area 60 along edges of the blank as shown, but when the blank is cut from a material which may be heat sealed, without the addition of any adhesive coating the shaded area 60 merely designates the location of the joints thus formed. Suitable heat sealing materials and the methods of forming heat sealed joints therefrom are well known in the art.

It is also possible to use ordinary inexpensive, low strength, water absorbent paper by coating the paper over its entire area with a thin, tough film of suitable waterproof heat sealing material. The paper may then merely form a backing for the film, which in itself provides the necessary wet strength and heat sealing properties. The joints are formed by applying heat to the approximate areas designated while the edges or parts are held in contact with each other. If heat is applied to the whole nozzle the plastic material contained within it will flow into and impregnate the paper in the nozzle, making a very strong and serviceable nozzle. Also, the plastic film may be applied to the paper to thoroughly impregnate it in the first place, before the blanks are cut or folded, to make a relatively weak and inexpensive paper suitable for the purpose.

The embodiment shown in Figure 16 may also be made without including the nozzle as an integral part of the original blank, without sacrificing the major advantages of the invention. In such a case a conventional nozzle may be attached to the lower end of the tube 33, thereby obviating the transition to a lap joint.

Regardless of the type of nozzle used, the embodiment of Figure 16 provides a disposable syringe bag which is inexpensive to manufacture and which may be completely folded in a flat package. The upper portion 33 of the bag provides convenient measuring and carrying container for the water before the bag is turned upright for use. A number of the filled bags may easily be carried by their tubes 33 without spilling the contents away from the openings in the filter, or pinching devices on the nozzle when being used. After use, the whole device may be disposed of, thereby relieving hospital and clinic facilities of a considerable amount of washing and sterilizing.

Having now described my invention and in what manner the same may be used, what I claim as new and desire to protect by Letters Patent:

1. A water bag syringe comprising a sheet of flexible material folded on its longitudinal center line and sealed at its overlapped edges to form an integral water bag and connecting tube, and having a tubular nozzle formed on the end of said connecting tube by a rolled portion of said sheet.

2. A water bag syringe comprising a piece of material precut to a shape corresponding with the contour of the finished syringe, and folded and sealed to form a water bag and connecting tube, a nozzle on said connecting tube formed from a strip of the same piece of material extending laterally from the portion thereof from which the connecting tube is formed, the outer edge of said nozzle forming strip being cut at an angle to the connecting tube portion of slightly greater than 90 degrees, so that when said strip is rolled to form the nozzle, the outer edge is wound in a spiral to form a tapered tip for said
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nozzle; and a coating on said tip to form a smooth contour over said spirally wound edges.

SAMUEL L. DIACK.

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