July 30, 1957 J. C. TASCIOTTI 2,800,816

WRENCH APPARATUS FOR A HYPODERMIC SYRINGE

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Fig. 1.

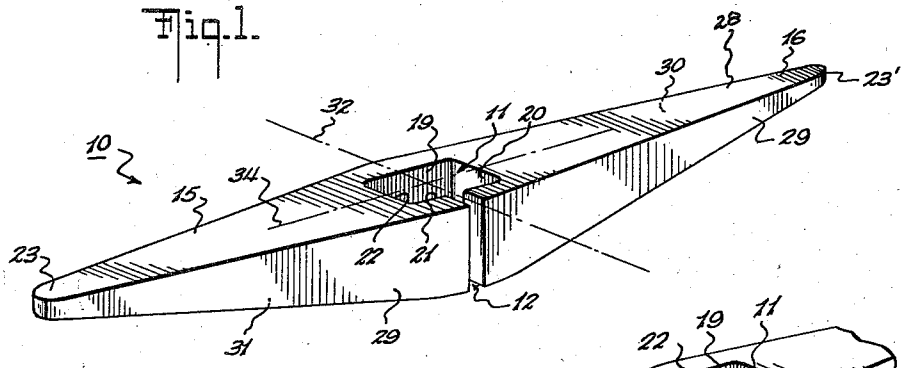


Fig. 3.

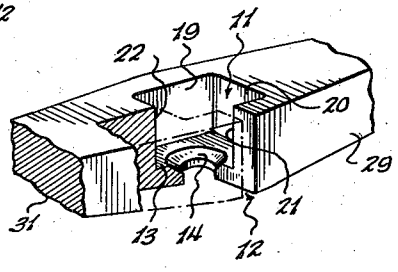


Fig. 2.

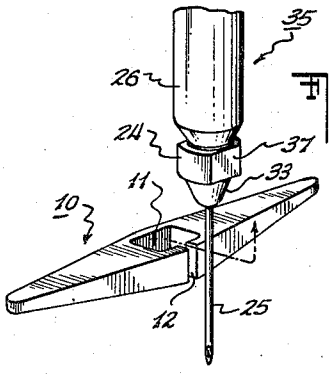


Fig. 5.

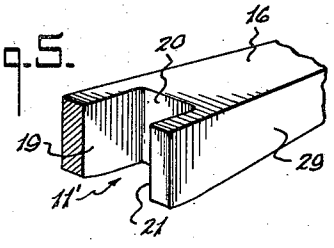


Fig. 4.

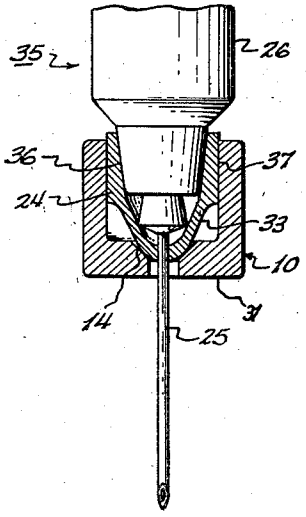
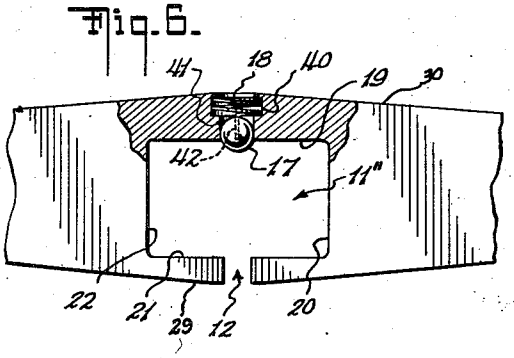


Fig. 6.



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WRENCH APPARATUS FOR A HYPODERMIC SYRINGE

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1 Claim. (Cl. 81—3.34)

The instant invention relates to a wrench designed to facilitate removal of a needle from a hypodermic syringe without injury to the person removing same and, in addition, without damage to the needle or other parts of the syringe.

The hypodermic syringe commonly in use consists of a fluid-carrying barrel to which a needle-carrying hub is fastened. The hub of one type of syringe is provided with an inner tapered surface designed for press fit connection to a tapered lower end of the barrel. The other end of the hub is provided with a cylindrical opening to receive and hold fast thereto the shank of the needle. After use, the nurse or doctor removes the hub, the needle remaining fastened thereto, and places these elements in a sterilizer. These elements are replaced by a clean hub and its fastened needle when the syringe is to be used again. Ordinarily there is no problem or unusual effort required to apply the clean hub to the barrel of the syringe. The connection is easily made by jamming the hub onto the tapered surface of the syringe. Above all, the connection must be absolutely dependable for safe use of the syringe. Accordingly, the tapered surface of both hub and barrel are specially designed and fabricated to provide a connection which will not disengage during use of the hypodermic syringe.

When the doctor or nurse attempts to disengage the hub from the barrel after use of the syringe, it is the experience of the profession that the strong and dependable press fit provided by the tapered connection is very difficult to disengage. As a matter of fact, and it is common knowledge that, removal of the hub requires a large and strong turning force in attempting to twist it off the syringe. Instances have been reported where the doctor or nurse has suffered injuries as drastic as broken wrists. More frequently, though, the doctor or nurse, in straining to twist off the hub, has either broken the barrel in spite of the fact that it is made of a strong stransparent plastic material, or, upon a sudden and unexpected disengagement during the extreme twisting force being applied. the doctor or nurse has jammed the needle against a desk top or other piece of furniture and caused the needle to be broken, jammed the needle into one's self or sprained a wrist.

The problem of removing the needle-carrying hub is troublesome. Either the barrel or needle is broken in the process or the person removing same injures himself by self-imposed pricks of the needle, or by straining or breaking his wrist. The needle is fragile. Moreover, it offers little, if any, surface to permit one to grip same to exert a large twisting force. In addition to attributing the fast-holding tapered fit as a cause of these undesired results, it is also known that the hub and needle and other components of the syringe do not offer the person attempting to remove the needle any solid or safe surface to grip the component to effect disconnection. Although the hub is usually made of metal, it is very small. Therefore it cannot be gripped. The more fragile needle is less amenable to twisting forces and is of such shape that it

affords no accessible surface to allow a solid and strong grip upon disconnection.

It is, therefore, the principal object of the instant invention to provide a wrench which ensures safe and damage-free removal of the hub and its supported needle from the hypodermic syringe.

It is another object of the instant invention to provide an elongate wrench having a socket into which the hub of the needle is nestled. The transverse arms of the wrench provide handles for twisting off the hub from the syringe. The arms also provide the leverage which makes removal of the hub especially easy. A mere twist of the wrench effects separation. The leverage afforded by the oppositely extending arms transverse to the axis of the syringe eliminates the need for an operator to exert large twisting forces.

It is another object of the invention to provide needle passages in the nature of slots and openings along the side and under faces of the wrench and communicating with the socket. The syringe is nestled in the socket by first passing the needle through the passages while the needle and wrench are relatively transposed so that at all times the needle point is held below the wrench and thus shielded against striking the wrench and also to prevent accidental pricking of the person effecting disconnection.

It is another object of the instant invention to provide a wrench of sufficient leverage to eliminate the extreme forces required to effect separation of the hub from the syringe and thus avoid injuries to the person or damage to the syringe that are accidentally caused by sudden disconnections.

It is a further object of the invention to provide a wrench adaptable to accommodate syringes of different sizes. Syringes and the outer hub dimensions thereof vary to accommodate needles of progressive sizes. Furthermore, syringes of comparable sizes, but made by different manufacturers, are often found to have hub dimensions that differ. Rather than propose a wrench for syringes of each particular size, by the use of spring means, a single wrench may accommodate syringes over a range of progressive sizes. In the illustrated embodiment, a spring-pressed ball is mounted in a wall of the socket and protrudes into the socket. The hub of the syringe nestled in the socket is thus clamped between the ball and a confronting wall of the socket to permit one to twist the hub off the syringe.

Other objects and advantages of the instant invention will become apparent from the following specification and figures of the drawing, in which,

Fig. 1 is a perspective view of a wrench incorporating the improvements of the instant invention;

Fig. 2 is a perspective view on a reduced scale and illustrates the relative positions of the wrench and hypodermic syringe in preparation of wrench engagement of the syringe;

Fig. 3 is a fragmentary perspective view and includes a sectional cutaway to show the details of the wrench socket;

Fig. 4 is a transverse view illustrating the syringe nestled in the wrench socket;

Fig. 5 is a fragmentary perspective view similar to Fig. 3, but showing a wrench socket without a bottom wall and thus representing a modified embodiment; and

Fig. 6 is a sectional cutaway top view of a wrench socket similar to the one shown in Fig. 5 but incorporating spring means.

Referring now to the figures, a wrench **10** is made of a sturdy body of metal or plastic material, and is preferably cast or molded as an integral unit. The wrench **10** is provided with even or smooth faces; a top face **28**, a front face **29**, a back face **30**, and an under face **31**. The contours of top and under faces **28, 31** are shaped so

that when looking downwardly upon wrench **10** it appears elliptical, that is, gradually curved in shape, with the greatest width at the center. Oppositely extending arms **15** and **16** gradually narrow toward respective ends **23** and **23'**. The arms **15, 16** provide the leverage and serve as handles for grasping the wrench **10** when it is to be turned. Ends **23, 23'** are rounded to afford comfortable handling.

A recessed hub-engaging socket **11** is provided intermediate the arms **15, 16,** and is formed by vertical and preferably flat jaw surfaces **19, 20, 21** and **22** extending from top face **28** to a bottom wall **13** of the socket recess. Adjacent pairs of the jaw surfaces, **19** through **22**, lie along intersecting planes. In the illustrated embodiment of Fig. 1, the plane of each of the surfaces **19** through **22** forms a right angle with either of the adjacent surfaces, and thus provides a four-sided socket, but it would be keeping within the principle of the invention to use other forms of polygonal sockets.

The bottom wall **13** is provided with a beveled opening **14** and a slot **12** that communicates with opening **14** and extends through the front wall formed by the surfaces **21** and **29**. The slot **12** is located, in the preferred embodiment, midway between the surfaces **20** and **22**, and to this extent is centered with respect to the socket **11**. The slot **12** is wide enough to pass the largest-diameter syringe needle expected to be used with any hypodermic syringe for which the wrench **10** is designed.

In the disclosed embodiment, the socket **11** is orientated with respect to a longitudinal axis **34** so that the front and back surfaces **21, 19** are in parallel relationship with respect to the axis **34**, but the socket could be oriented so that the surfaces are angularly displaced with respect to the axis **34** without departing from the invention.

The hub **24** of a syringe **35** is usually provided with a rounded and small-diameter outer end such as **33**. The wider, inner end of the hub is provided with at least two opposite flat surfaces such as **37**. Some hubs are provided with four flat surfaces at the wider end. To provide a rectangular shape for the socket **11** so that it can accommodate hubs that are rectangular in cross section, the length of each of the jaw surfaces **19** and **21** is greater than the length of each of the surfaces **20** and **22**.

Since the jaws of the socket **11** are designed to engage the flat surfaces **37** of hub **24**, the socket **11** must be deep enough to receive the outer end **33** of the hub **24** and at least a portion of each of the flat surfaces **37**. If the socket **11** is too shallow, the flat surfaces **37** would project out from the socket **11**, and wrench engagement would not be possible. Hence the wrench **10** is provided with its greatest vertical dimension, i. e., the distance between the top and under faces **28, 31**, in the region of the socket **11**. For convenience, the socket **11** is located midway between the ends of the arms **15, 16**, and is made sufficiently deep by the truncated, triangular shape of the front and rear surfaces **29** and **30**, as seen in Figures 1, 2 and 3.

The jaws of the wrench **10** are designed to withstand large forces. Accordingly, the thickness of the wall between the front face **29** and the surface **21** and the thickness of the wall between the back face **30** and the surface **19** are sufficient to withstand forces that are to be applied thereto during wrench use. To ensure adequate wall thickness, the wrench **10** is greater in width in the region of the socket **11** than in the region adjacent the ends **23, 23'**. The accommodate this structural requirement, the contours of the faces **28, 31** are gradually curved to form the elliptical-shaped body noted hereinbefore.

The embodiment of Fig. 1 may be modified by the elimination of the bottom wall **13**, as illustrated in a socket **11'** in Fig. 5. This change would require the doctor or nurse to hold the syringe **35** relative to the wrench **10** so that the flat surfaces **37** of the hub **24** are within the socket **11'** during use of the wrench.

The syringe **35** includes a needle **25** fastened thereto by the hub **24**, which in turn is fastened to a fluid-carrying barrel **26** by means of a press-fit tapered surface **36**. It should be noted that the wrench **10** is also usable for syringes employing a threaded connection instead of a press-fit tapered surface to join its hub to its barrel.

After using the syringe **35**, the doctor or nurse removes the hub **24** (needle **25** is still mounted thereto) and replaces these parts with a sterilized hub **24** and attached needle **25**. Needle **25** is not removed from hub **24**, but remains fixed thereto, and both are placed into the sterilizer after use.

In use, the wrench **10** is held so that the slot **12** is alongside and parallel to the needle **25**, as illustrated in Fig. 2. Syringe **35** and the wrench **10** are then moved relatively to one another (see the arrowheaded dot-and-dash line in Fig. 2 that indicates this path of relative movement) so that the needle **25** passes through the vertical and horizontal portions of the slot **12** and into the opening **14** in the bottom wall **13**. The pointed end of needle **25** is maintained beyond the under surface **31** at all times. Thus the point of needle **25** cannot strike any part of the wrench **10**, and damage to the point is thereby avoided.

After needle **25** is lined up with the opening **14**, hub **24** is moved into the socket **11** until its outer end rests against the bevel of the opening **14**, as illustrated in Fig. 4. The flat faces **37** of hub **24** are now engaged by the jaws of the socket **11**, and the wrench **10** is ready to be turned about the axis of barrel **26** to effect separation of hub **24**.

Since the sockets **11** or **11'** are usually made only slightly larger than the dimensions of hub **24** of the syringe for which the wrench is to be used, syringes of various sizes will require correspondingly sized sockets, which may be provided by a set of wrenches of graduated-size sockets. However, by providing a spring-pressed means in one wall of a wrench socket, a single wrench may be used for syringes of various sizes. In one embodiment of a spring-pressed means which is illustrated in a socket **11''** in Fig. 6, a spring **18** is mounted in a drilled hole **40** in the wall between the rear face **30** and the jaw face **19**. The axis of the hole **40** is parallel to an axis **32** (see Fig. 1). The face **30** is peened at the opening of the hole **40** to keep the spring **18** in place. The hole **40** does not extend through to the surface **19**, but terminates at a shoulder formed by a coaxial, smaller hole **41** drilled through the jaw face **19**, the shoulder acting as an abutment for the inner end of the spring **18**. The drilled hole **41** provides a recess to receive a ball **17**, which is secured to an axially extending inner end **42** of the spring **18** so as to normally lie partly in the hole **41** and partly in the socket **11''**.

Whenever a syringe hub is inserted in the socket **11'**, the ball **17** will be cammed into the hole **41** a distance which depends on the size of the hub, and the spring **18** will be correspondingly compressed. Thus, hub **24** will be clamped between the ball **17** and the opposite jaw face **21** of the socket **11''**, and hubs of various sizes may be firmly clamped by the action of the spring **18**.

It will be understood that the spring **18** and the ball **17** may be replaced by equivalent but different spring structures to provide the same services. It is not necessary that the spring-pressed ball **17** be mounted in the wall opposite the slot **12**. However, it is preferable that it be mounted in one of the jaw-forming walls other than the wall containing the slot **12**. Furthermore, it would be preferable when the spring-pressed ball **17** is used to eliminate the bottom wall **13** so that the clamped hub **24** may be withdrawn through the lower face **31** after the hub has been disconnected from the barrel **26**.

It is intended that the foregoing embodiments be treated as illustrative examples of my invention and not in any limited sense.

What is claimed is:

A wrench for disengaging a needle-carrying hub of a

hypodermic syringe comprising, a longitudinal body having upper, lower and side faces and oppositely extending arms, said arms providing gripping means for rotating said wrench, said upper face having a socket-forming recess intermediate said arms to provide jaw faces extending inwardly from said top face, adjacent ones of said jaw faces lying in planes intersecting at right angles, a bottom wall terminating said socket-forming recess, one of said side faces having a vertical slot extending between said upper and lower faces of said body and communicating with said socket, said bottom wall having a beveled opening and a through slot extending from said opening in alignment with and communicating with said vertical slot, whereby a syringe-supported needle may be passed through said slots and aligned with said beveled opening

so that a needle-carrying hub will rest in said socket and against said bottom wall with such needle protruding through said opening whereupon relative rotation between said wrench and a manually-held syringe will disengage such needle-carrying hub.

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