March 3, 1959 C. HABER 2,875,760

INJECTION EQUIPMENT

Filed Oct. 11, 1954 2 Sheets-Sheet 1

Fig. 1.

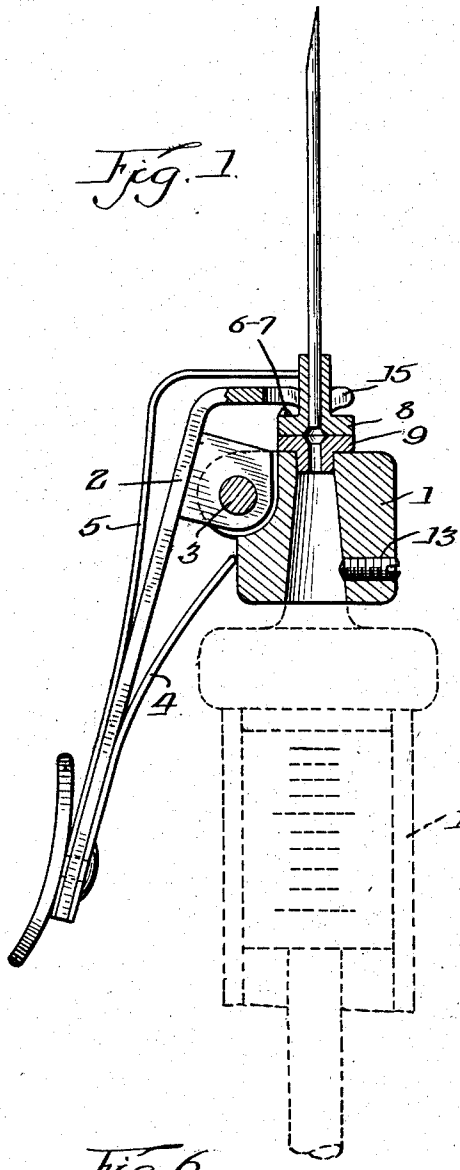


Fig. 2.

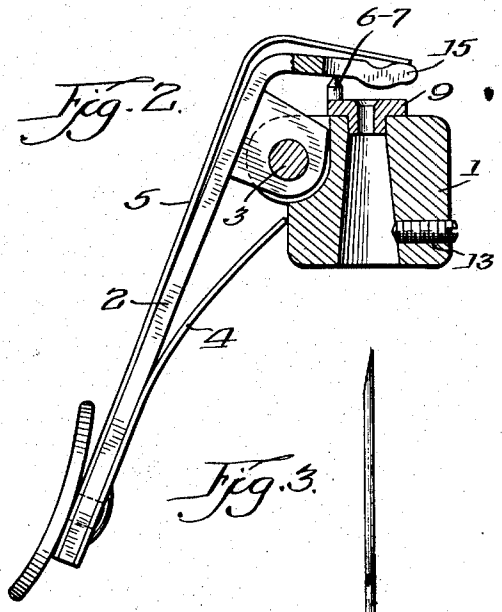


Fig. 3.

Fig. 4

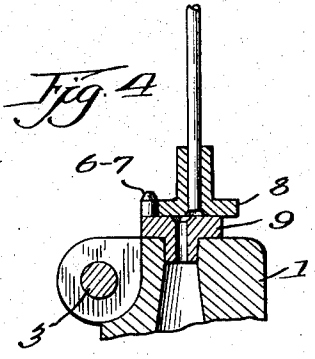


Fig. 5.

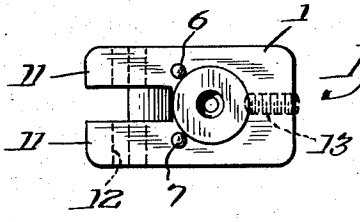
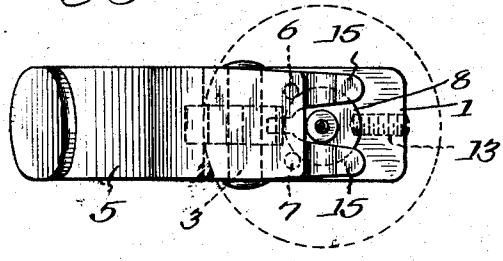


Fig. 6.



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March 3, 1959 C. HABER 2,875,760

INJECTION EQUIPMENT

Filed Oct. 11, 1954 2 Sheets-Sheet 2

Fig. 10.

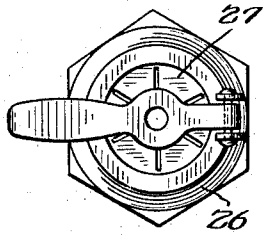


Fig. 7.

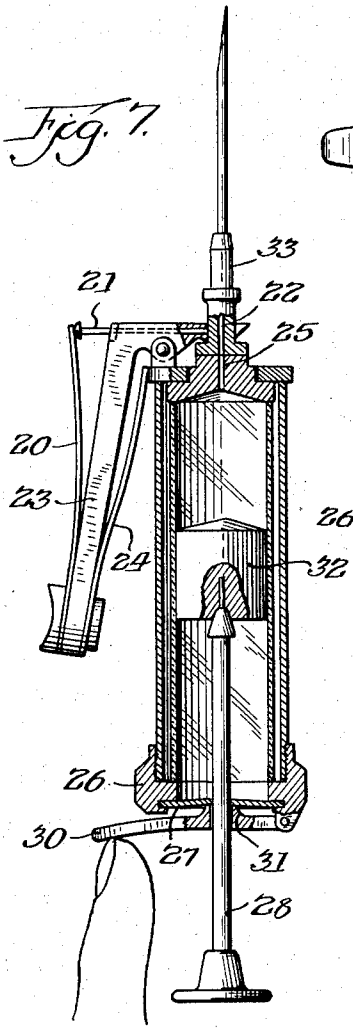


Fig. 9.

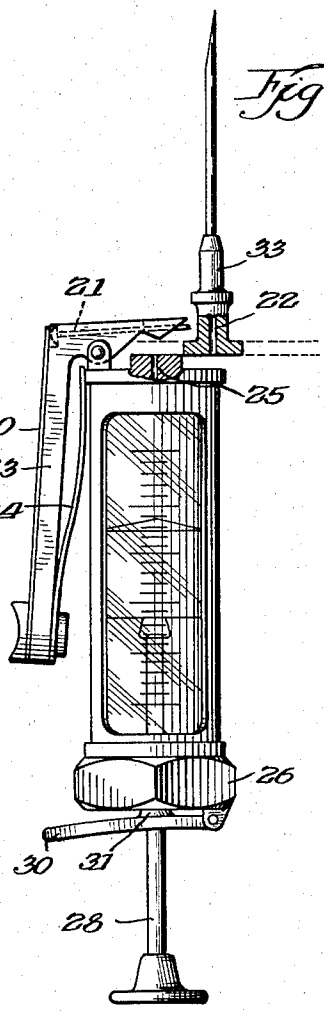


Fig. 11

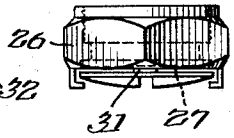


Fig. 12.

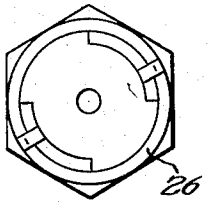


Fig. 13.

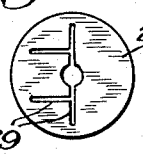


Fig. 15

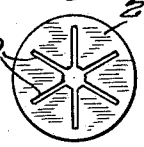


Fig. 16

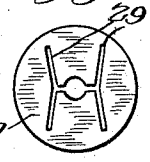


Fig. 14

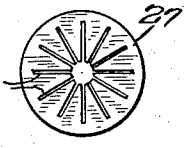
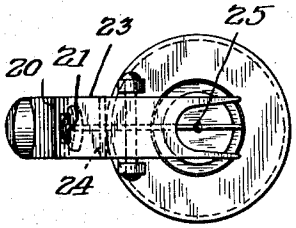


Fig. 8



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United States Patent Office 2,875,760 Patented Mar. 3, 1959

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INJECTION EQUIPMENT

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Application October 11, 1954, Serial No. 461,357

Claims priority, application Germany October 14, 1953

6 Claims. (Cl. 128—215)

This invention relates to injection equipment including a syringe and needles, particularly for use in connection with mass inoculations.

The commonly used conical needle couplings have been found to have serious drawbacks which are particularly apparent in mass inoculations. It has already been suggested to provide the contacting surface of an injection needle with soft metal and to fasten the needle to the mouth of a syringe by means of a cap, but such suggestions do not overcome inherent disadvantages.

The main disadvantages of the cone type of needle resides in the suction which occurs when a needle is removed from the syringe. This suction causes the needle content to move toward the mouth of the syringe and thus to infect the syringe, making the latter unsuitable for further injections. Upon disengagement of the needle, in addition to the suction, capillary attraction, a molecular tension in the bore of the needle, and surface tension on the drop at the tip of the needle occur. When a needle with a soft metal contact surface is taken off, suction occurs likewise, although not as strongly as with a conical coupling, but the capillary attraction, the molecular tension in the needle bore, and the surface tension at the tip of the needle make themselves felt to the same extent.

The disengagement of the conus or of other couplings of known construction requires not only undue time but also the use of both hands, with or without auxiliary instruments, to displace the syringe upon opening the coupling. Such displacement may also cause displacement of the contents of the needle. Extensive investigations have revealed that with needle couplings of known design, infection of the syringe cannot be safely avoided.

The main object of the invention is to provide improved injection equipment which overcomes the above indicated disadvantages.

This object is realized by the provision of injection equipment including a device adapted to withdraw, hold, and eject a needle. In accordance with the invention, these operations may be performed by one hand.

In accordance with another object and feature of the invention, the needle is removed from the syringe, after the inoculation, by sliding it off laterally.

The various objects and features of the invention will appear from the description which will be rendered below with reference to the accompanying drawings showing embodiments to give examples. In the drawings,

Fig. 1 is a part sectional view taken through a device, according to the invention, for withdrawing, holding and ejecting injection needles;

Fig. 2 is a view similar to Fig. 1, but with the needle removed;

Fig. 3 represents a flanged needle of the present invention, with the flange portion shown in section, indicating that the needle extends to the base of the flange;

Fig. 4 is a longitudinal part sectional view through the needle and the mouth of a syringe, illustrating an intermediate position of the needle while sliding off the mouth of the syringe;

Fig. 5 is a plan view of the device of Fig. 1, with the lever of Fig. 1 removed, but showing locating pins;

Fig. 6 is a view similar to Fig. 5, the lever being shown;

Fig. 7 is a part sectional view through an injection syringe with needle, an ejection pin being pushed back, and an ejection spring in set condition;

Fig. 8 is a plan view of the syringe of Feb. 7 but without needle;

Fig. 9 is explanatory of the ejection of the needle from its seat on the syringe;

Fig. 10 is a plan view of a piston rod brake with release lever;

Fig. 11 is a side view of the closure of the syringe comprising a cam disc which constitutes a modified means for the release of the piston rod brake;

Fig. 12 is a plan view of the cam disc; and

Figs. 13 to 16 show several modifications of the resilient disc or membrane.

Referring to the drawings, and first to Figs. 1 to 6, the device for withdrawing, holding, and ejecting needles, as shown in Fig. 1, comprises a tubular metal member **1** which by means of a set screw **13** is secured to an injection syringe **14**, but which may as well form part of the syringe mouth. The metal member **1** is provided with two extensions **11** (Fig. 5) with bores **12** formed therein which receive a pin **3** on which the angularly shaped lever **2** pivots. A spring **4** is fastened at one end to the lower part of the lever **2**, the other end of the spring pressing against the metal member **1**. An ejection spring **5** which is bent approximately at the same angle as the pressure lever **2** is mounted on top of the lever. Stop and locating pins **6** and **7** ensure perfect alignment of the needle flange **8** and the mouthpiece **9** of the syringe and, as shown in Fig. 2, are of sufficient length to prevent the pressure lever from resting on the mouthpiece **9** when no needle is attached to the mouth.

The inoculation syringe of the invention is operated as follows:

For the withdrawal of a needle according to Fig. 3, from a needle magazine or holder (not shown), in which a plurality of needles may be held in horizontal position, the lever **2** is operated or depressed, and the forked ends **15** of the lever (see Fig. 6) are slipped over the flange of the needle. The lever **2** is thereupon released and the needle is pulled out from the holder by means of the forked lever ends, using a single hand. The two locating pins **6** and **7** cause exact superposition of the needle flange **8** and the syringe mouthpiece **9** so that the bores of the syringe and the needle will be coaxial. As the needle is attached to the syringe, the ejection spring **5** is simultaneously set to the position in which it is shown in Fig. 1. The pressure of the spring **4** attempts to rotate the lever **2** clockwise, thereby causing the ends **15** to exert axial pressure on the flange **8** of the needle and thus holding the needle in place. Such pressure overcomes the lateral pressure exerted by the ejection spring **5**, such spring therefore remaining in its set position. After the injection, the lever **2** is somewhat depressed, thereby rotating counterclockwise and releasing the axial pressure exerted on the flange of the needle. The preset ejection spring **5** now can exert its force laterally against the needle base to effect instantaneous sliding off of the needle from the syringe mouth **9**. The bores in the needle and the syringe are sealed off during the sliding off of the needle, preventing any displacement of liquid in the needle bore.

The connection of the needle with the syringe mouth, according to the invention, makes suction impossible. Due to the very high speed of the ejection movement, molecular tensions as well as the surface tension of the drop which usually hangs from the needle tip are without

effect. The mouth of the syringe remains sterile even with an unlimited number of needle changes. An infection of the syringe is, therefore, impossible.

By withdrawing a needle from a sterilizer magazine, holding several needles, without touching the needles, and by transferring the needles from the magazine to the syringe mouth directly and horizontally, time is saved, particularly in mass inoculations, and greater safety is gained inasmuch as any contact of the needle with other objects is positively avoided.

Referring now to Figs. 7 and 16, the inoculation syringe **5** is equipped with an ejection device for the needle, comprising a leaf spring **20** and a striking pin **21**. The needle is provided with a flanged extension **33** having a bore **22** for alignment with the bore **25** formed in the syringe mouth. The extension such as **33** prevents contact of the skin with the syringe mouth and may also serve for holding the needle in the sterilizer magazine. When the needle **22** is put in place on the syringe, the neck of the needle flange pushes the striking pin back, and the pressure lever **23** presses the flange of the needle by the pressure of a spring **24** onto the syringe mouth. When the lever **23** is after injection slightly depressed, rotating counterclockwise, the axial pressure on the needle is released, permitting the leaf spring **20** to return to its original position and carrying the striking pin **21** along, which in turn slides the needle across and off the syringe mouth.

The bottom closure of the syringe is formed by a cap nut **26**, which comprises a resilient disc or membrane **27** serving as a brake on the piston rod **28**. The rod **28** has a diameter slightly larger than the aperture in the membrane **27**. The membrane is provided with radial slots **29**, shown in Figs. 13–16. Adjacent to the resilient disc **27** is a member, for instance, a lever **30** proviled with a hub **31** for the release of the brake action when the piston **32** is to be moved back. The hub **31** of the lever **30** is pressed against the disc **27** and pries the sections of the resilient disc or membrane away from the piston rod.

It will be appreciated from the foregoing description that the construction and operation of the injection equipment presents the many advantages briefly outlined before.

Changes may be made within the scope and spirit of the appended claims.

I claim:

1. Injection equipment comprising a syringe having a mouthpiece, and a device for withdrawing an injection needle from a needle magazine and to put and hold such needle in working engagement with said mouthpiece and to thereafter release said needle and eject it from engagement with said mouthpiece, said device comprising an angular generally L-shaped lever having the short leg thereof forked for gripping a needle for withdrawal thereof from a magazine, means for pivotally disposing said lever on the syringe, a first spring carried by said lever

and exerting a force thereon which attempts to rotate it clockwise, thereby causing said short forked end thereof to exert axial pressure on said withdrawn needle, pressing such needle into working engagement with said syringe mouth, and second spring means carried by said lever, said second spring means exerting a force on said needle in lateral direction which is inoperative during the working engagement of said needle with said syringe mouth, angular displacement of said L-shaped lever against the force of said first spring releasing the axial pressure exerted by said forked end on said needle and allowing said second spring to exert its force laterally against said needle to release such needle and eject it from engagement with said syringe mouth.

2. A structure and cooperation of parts according to claim 1, wherein said mouthpiece forms a plane end surface extending perpendicularly to the axis of the syringe, said needle being provided with a bottom flange forming a similar plane surface for engagement with said end surface of said mouthpiece in working position of said needle.

3. A structure and cooperation of parts according to claim 2, comprising pins carried by said mouthpiece for defining the working position of said needle flange in engagement with said mouthpiece.

4. A structure and cooperation of parts according to claim 2, comprising a cylindrical extension projecting from said needle flange in the direction of the needle point.

5. A structure and cooperation of parts according to claim 1, comprising a striking pin cooperatively disposed with respect to the short leg of said L-shaped lever, the outer end of said striking pin being in engagement with said second spring and laterally inwardly biased thereby in the direction of the needle in its operating engagement with said mouthpiece.

6. A structure and cooperation of parts according to claim 1, comprising a piston slidably disposed in said syringe, a piston rod for moving said piston, and brake means for said piston rod comprising a membrane-like resilient disc, said piston rod extending through a hole formed in said disc the diameter of which is slightly smaller than the diameter of said piston rod, slots being formed in said disc extending from the hole formed therein, whereby said piston rod is held in actuated position with the piston advanced within said syringe in the direction of said mouthpiece, and means for exerting pressure on said slotted disc to release said piston rod for return of said piston away from said mouthpiece.

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