

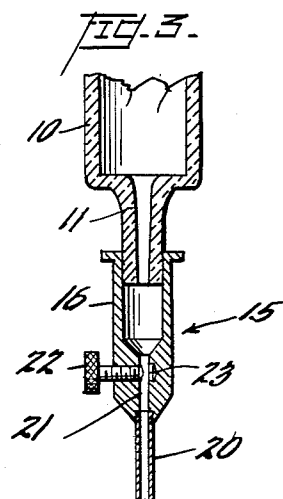
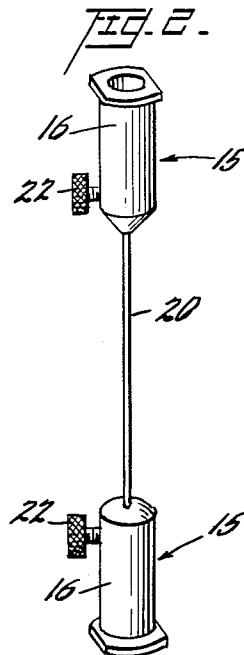
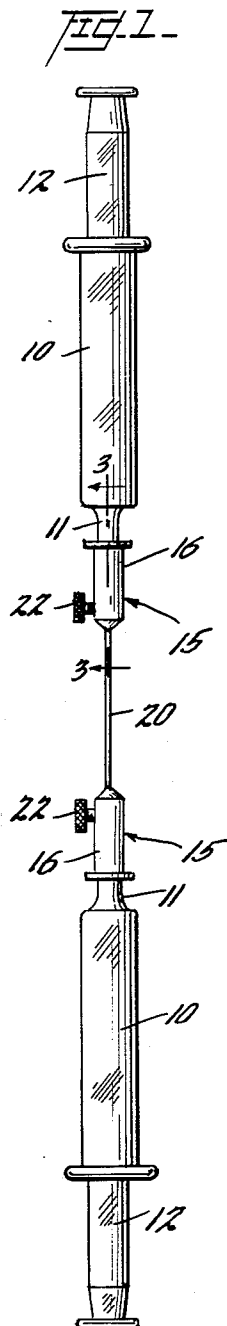
Nov. 28, 1961

E. A. BROWN

3,010,705

EMULSIFIERS

Filed Sept. 26, 1960



INVENTOR

Ethan Allan Brown

BY *Watson, Cole, Grindle & Watson*
ATTORNEYS

1

3,010,705

EMULSIFIERS

Ethan Allan Brown, 75 Bay State Road, Boston 15, Mass.

Filed Sept. 26, 1960, Ser. No. 58,436

7 Claims. (Cl. 259-98)

This invention relates to emulsifiers and more particularly to an apparatus for forming emulsions suitable for use in hypodermic injections.

This application is a continuation-in-part of application Serial No. 805,014, filed April 8, 1959.

It can be shown that stable water-in-oil emulsions in which the aqueous component contains a therapeutic agent or a toxin are much more slowly absorbed by the blood than if the active agent is injected in the form of an aqueous solution, provided the dispersion is sufficiently fine. Thus when a saline solution of a toxin is emulsified in oil with the aid of an emulsifying agent, each globule of the solution is surrounded by oil which must be devoured by the macrophage cells of the blood before the solution becomes available. It is therefore possible, by administering various types of agents in the form of emulsions, to inject at one time a much larger quantity of the agent than would otherwise be permissible, the release of the agent being gradual and extending over a substantial period as the result of the slow and prolonged absorption.

It is therefore the primary object of the invention to provide emulsifying apparatus capable of protecting extremely fine dispersions of immiscible liquids.

It is another object of this invention to provide an apparatus for forming stable emulsions which may be produced by the simple adaption of devices commonly employed in the administering of hypodermic injections, namely, conventional hypodermic syringes and needles.

It is a further object of this invention to provide an emulsifying apparatus which can be adjusted in order to permit variation of the fineness of the dispersion obtained.

With these and other objects in view the preferred practice of the present invention contemplates a needle which is standard excepting that the usual hub for attachment to the nozzle of the pump barrel secured to both ends of the needle rather than to one end only. One or both of the hubs are provided with threaded members positioned transversely to the longitudinal axis of the bore of the hubs and having root diameters greater than the diameter of the hub bores. The threaded members are adapted to completely occlude the bores of the hubs when turned in to their innermost positions. After drawing two immiscible liquids into the barrel of a hypodermic syringe, for instance, an oil and an aqueous solution of a therapeutic agent, and an emulsifier; the loaded syringe is attached to one hub on the above described needle and an empty syringe is attached to the hub at the opposite end of the needle. The threaded member or members are then turned in to partially occlude the bore of the hub. The mixture of liquids may then be pumped back and forth from one syringe to another through the needle, and the turbulence imparted to the fluid in passing through the restricted bore of the hub rapidly effects an extremely fine dispersion of the aqueous and oleaginous components; the resulting emulsion being excellently adapted for injection into human beings or animals with consequent slow absorption of the active agent. The fineness of the dispersion may be controlled by varying the degree of occlusion of the hub bore by the threaded member or members.

Other objects, advantages and novel features of the invention will become apparent upon consideration of

2

the following detailed description, taken in conjunction with the accompanying drawing, wherein:

FIGURE 1 is a view in elevation of two hypodermic syringes connected by a needle having a hub on each end for attachment to the respective nozzles of the syringes.

FIGURE 2 is a perspective view of the needle and hubs before assembly with the syringes, and

FIGURE 3 is a longitudinal sectional view taken on the line 3-3 of FIGURE 1 and illustrating the threaded member utilized to occlude part of the hub bore.

In the following description, reference is made to the embodiment thereof illustrated in the accompanying drawing, and specific language is employed. Nevertheless it will be appreciated that no limitation of the scope of the invention is thereby intended, such further modifications and alterations of the illustrated structure as would normally occur to one skilled in the art being contemplated.

The hypodermic syringes illustrated in FIGURE 1 are entirely conventional, each comprising a barrel 10 having a nozzle 11 at the discharge end thereof, and a plunger 12 fitted within the barrel. The nozzles 11 are tapered slightly toward the discharge outlet, and each nozzle is dimensioned to receive thereon a conventional needle hub 15, the hub being retained on the nozzle by friction. The barrel of each syringe, including the nozzle, and the plunger may be made of glass; the hubs 15 are commonly formed of metal, and their retention on the nozzles may be assured by heating the hubs prior to their application, pressing them tightly on the nozzle, and allowing them to cool, whereby the nozzles are tightly gripped by the hubs. Alternatively, retention of the hubs in assembled relation with the nozzles may be assured by the provision on each nozzle of a locking sleeve having cam surfaces or threads therein which are engaged by the hub flange 16, as in the conventional Luer-Lok type of hub, illustrated in the patent to Dickinson 1,742,497, granted January 7, 1930. It will be appreciated that the detailed structure of the syringes and the hub thus far described form no part of the instant invention and may vary widely from that illustrated.

The hubs 15 are soldered, brazed, welded or otherwise permanently secured to opposite ends of a needle or tube 20; the needle having a bore ranging from about 10 gauge to 15 gauge. The tube 20 need not necessarily be a hypodermic needle as any similar metal tube will suffice. Furthermore, the internal diameter of the needle or tube 20 is not particularly critical in the present invention and any tube may be utilized which will conveniently couple together the hubs 15. It is only necessary that the internal diameter of the needle or tube 20 be no smaller than the diameter of a central bore 21 provided in each of the hubs 15.

Each hub 15 is provided with a threaded member or set screw 22 transversely disposed with respect to the bores 21 and adapted to intersect the bores 21 when turned in. The bores 21 are provided with sockets 23 which serve as seats for the ends of the set screws 22 when the set screws have been turned all the way in. The root diameter of set screws 22 is selected to be somewhat greater than the diameter or gauge of the needle 20 and bores 21. Since the axes of the bores 21 and set screws 22 intersect at right angles when the set screws 22 have been turned down until the inner extremities thereof seat in sockets 23, the bores 21 will be completely occluded by the set screws 22.

In the practice of my invention I first draw the aqueous and oleaginous fluids into one of the syringes 10, preferably using a blunt pointed needle of 13 gauge or larger bore, so that the liquids may readily be drawn in succession into the syringe. The materials which are to be emulsified may, of course, vary widely. By way of

example, I have employed for use in the treatment of hay fever and asthma an aqueous solution of pollen extract, a mineral oil, and a small amount of emulsifier, such as a mannide monooleate, sold under the trade name Arlacel A.

After the first syringe has been charged, the needle used in filling the same is removed and a needle having hubs attached at opposite ends is fitted to the filled syringe and to an empty syringe as shown in FIGURE 1, so that the needle provides a capillary tube connecting the two syringes. The set screws 22 are then turned in to partially occlude the bores 21 to the extent necessary to produce the desired fineness of dispersion. For this purpose it may be desirable to calibrate set screws 22 in order that the desired dispersions may be obtained. The set screws could, for example, be calibrated in microns or any other suitable units. In order to insure accurate control of the fineness of the dispersion obtained it is necessary that the threads on the set screws 22 be made quite fine.

The mixture of fluids is then discharged from one syringe into the other repeatedly by alternate pumping of the syringes. The excessive turbulence imparted to the fluids in passing to and fro through the openings defined by the bores 21 and the inner extremities of the set screws 22 breaks them down rapidly into exceedingly fine particles, thus facilitating the formation of a fine dispersion. The double ended needle and the empty syringe may then be withdrawn, and the loaded syringe supplied with the conventional needle for the purpose of injecting the resulting stable emulsion, with the beneficial effects hereinbefore mentioned.

Although the present invention has been described as utilizing a set screw in each of the hubs 15, it is, of course, obvious that only one set screw need be provided. It is, however, advantageous to utilize a set screw in each of the hubs 15 since this arrangement provides two points of turbulence for the fluids during each pass from one syringe to the other. Also, it may be desirable in some instances to utilize a needle 20 having a relatively small bore (for example, 16 gauge to 22 gauge) to create still more turbulence in the moving fluids and thus hasten the completion of the emulsifying process.

It will be appreciated that the cost of production of the device may be kept low by using conventional parts manufactured in large quantity, such as conventional hubs and needles, the only added expenses being those incident to the securing of the second hub to the needle and the tapping of the hubs to accommodate the set screws.

What is claimed is:

1. An emulsifier comprising a pair of hypodermic syringes, a hub fitted to the nozzle of each syringe, each of said hubs being provided with a central bore coaxial with said nozzles, a tube interconnecting said hubs and coaxial with said bores to provide a continuous uninterrupted fluid passageway of uniform cross-section between said syringes, and adjustable means for partially occluding at least one of said central bores.

2. An emulsifier as defined in claim 1 wherein said adjustable means is a threaded member disposed in a threaded aperture transverse to the axis of said central bore.

3. A device for use in forming emulsions for hypodermic injection comprising a pair of hypodermic syringes, a hypodermic needle, a hub secured to each end of said needle, each hub being provided with a central bore coaxial with said needle, each hub being fitted to the nozzle of one of said syringes to provide a continuous uninterrupted fluid passageway of uniform cross-section between said syringes, and adjustable means for partially occluding the central bore of at least one

of said hubs, whereby two immiscible liquids drawn into one of said syringes prior to fitting same to its hub may be pumped repeatedly from one to the other of said syringes through said needle and said partially occluded bore to form an emulsion of the liquids.

4. A device for use in forming emulsions for hypodermic injection comprising a pair of hypodermic syringes, a hypodermic needle of about 10 to 15 gauge, a hub secured to each end of said needle, each hub being provided with a central bore coaxial with said needle, each hub being fitted to the nozzle of one of said syringes to provide a continuous uninterrupted fluid passageway of uniform cross-section between said syringes, and at least one set screw disposed in a threaded aperture transverse to one of said central bores for partially occluding said bore whereby an aqueous medium, an oil, and an emulsifier drawn into one of said syringes prior to fitting the same to its hub may be pumped repeatedly from each of said syringes into the other of said syringes through said needle and said partially occluded bore to emulsify the aqueous and oleaginous components.

5. A device for use in forming emulsions for hypodermic injection, comprising a pair of hypodermic syringes, a hypodermic needle of about 16 gauge to about 22 gauge, and a hub secured to each end of said needle, each hub being fitted to the nozzle of one of said syringes to provide a continuous uninterrupted fluid passageway of uniform cross-section between said syringes, whereby two immiscible liquids drawn into one of said syringes prior to fitting the same to its hub may be pumped repeatedly from one to the other of said syringes through said needle to form an emulsion of the liquids.

6. A device for use in forming emulsions for hypodermic injection, comprising a pair of hypodermic syringes, a capillary tube of about 16 gauge to about 22 gauge, and a hub secured to each end of said tube, each hub being fitted to the nozzle of one of said syringes to provide a continuous uninterrupted fluid passageway of uniform cross-section between said syringes, whereby an aqueous medium, an oil, and an emulsifier drawn into one of said syringes prior to fitting the same to its hub may be pumped repeatedly from each of said syringes into the other of said syringes through said tube to emulsify the aqueous and oleaginous components.

7. A device for use in forming emulsions for hypodermic injection, comprising a pair of hypodermic syringes, a hypodermic needle, and a hub secured to each end of said needle, each hub being fitted to the nozzle of one of said syringes to provide a continuous uninterrupted fluid passageway of uniform cross-section between said syringes, whereby an aqueous medium, an oil, and an emulsifier drawn into one of said syringes prior to fitting the same to its hub may be pumped repeatedly into the other of said syringes through said needle and repeatedly returned to the first of said syringes through said needle to emulsify the aqueous and oleaginous components.

References Cited in the file of this patent

UNITED STATES PATENTS

2,026,604	Alfreds	Jan. 7, 1936
2,124,580	Lavine	July 26, 1938
2,158,593	Scrimgeour	May 16, 1939
2,172,661	Krauss	Sept. 12, 1939
2,410,546	McCabe	Nov. 5, 1946
2,477,598	Hain	Aug. 2, 1949
2,726,656	Lockhart	Dec. 13, 1955