

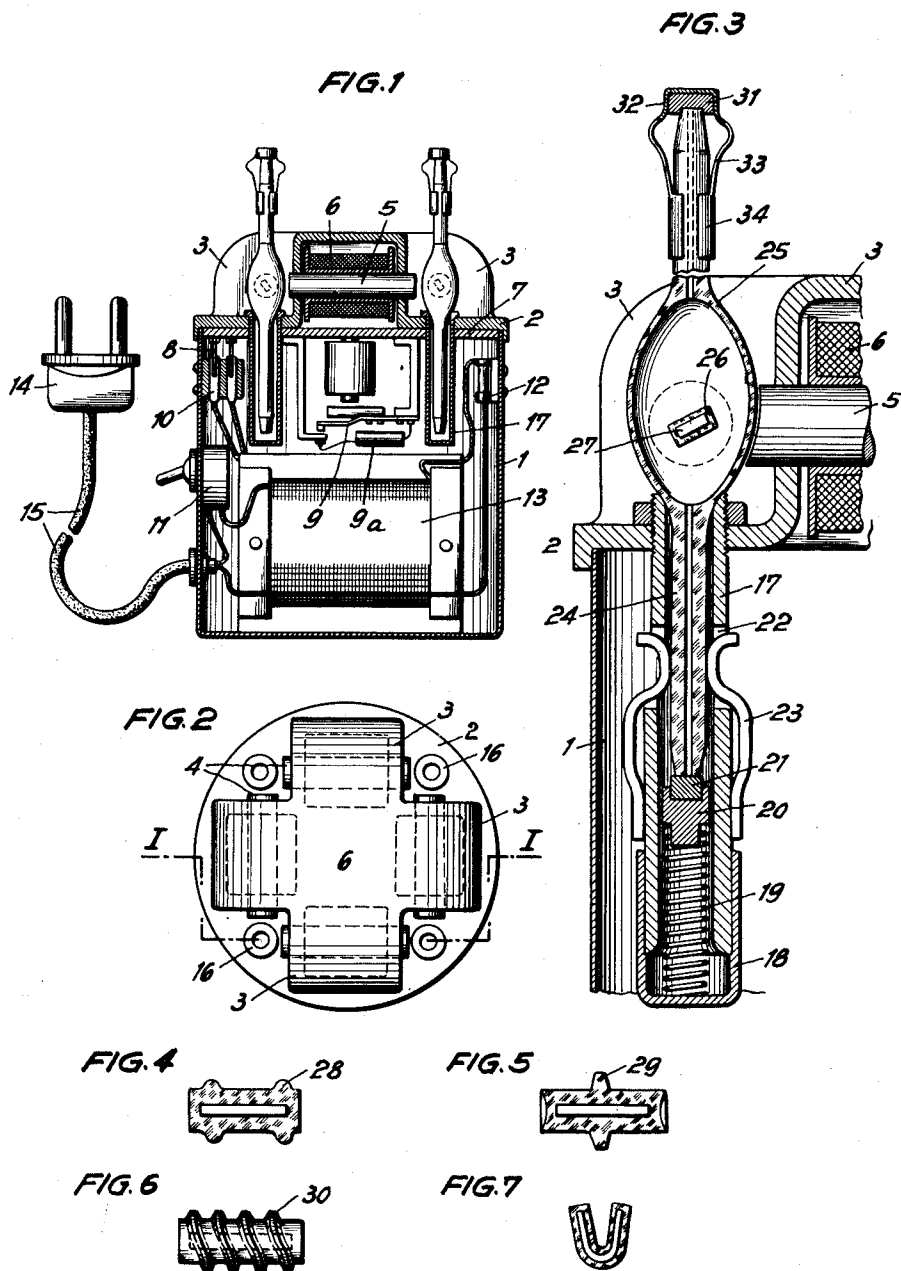
June 9, 1953

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2,641,452

ELECTROMAGNETIC TYPE OF MIXER

Filed July 19, 1950



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UNITED STATES PATENT OFFICE

2,641,452

ELECTROMAGNETIC TYPE OF MIXER

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Application July 19, 1950, Serial No. 174,629

In Germany May 6, 1949

7 Claims. (Cl. 259—1)

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The instant invention concerns a mixing device, in which the mixing takes place in a stationary mixing vessel. This is accomplished, according to the invention, through an electromagnet in whose exciting circuit a periodically working interrupter is connected, the said electromagnet being directed toward an iron core which is loosely and movably enclosed in the mixing vessel. In order to simultaneously be able to mix the contents of several mixing vessels, according to the invention, several electromagnets are provided in one device.

According to a further concept of the invention the electromagnets are arranged in a square or polygon and work angularly with their core ends upon the mixing vessels mounted therebetween. According to the invention, the core ends of the electromagnets can be beveled and in this way can be fitted to the shape of the mixing vessels, so that the lines of force may better act upon the iron cores enclosed within the mixing vessels.

According to the invention the exciting circuit can be connected in parallel with that of a magnetic interrupter, so that the resistance in the circuit can be held as low as possible. The operation of the device is effected through alternating current over a transformer or through direct current of suitable voltage.

In order to avoid a damaging action of the iron cores on the mixing fluid, according to the invention, the iron cores are provided with a corrosion resistant coating, as for example, glass or a similar suitable material. In order to improve the mixing action, according to the invention, the iron cores can be formed with their metal plates having elevations, cross ribs, a helical shape, the shape of a horse shoe or can have their ends convex or concave.

According to a further embodiment of the invention, there is a pipe shaped holder between each of the electromagnets, the said holder being fixed to the cover of the device, advantageously including at its bottom a resilient padding of soft material, and having fastened to its sides pressure springs in order to firmly hold the mixing vessel.

According to the invention, the mixing vessels are provided with a cap which is faced with an elastic sealing material and has legs extending in the direction of the cap axis and resiliently acting transversely thereto, the said resilient legs being provided with arched ends. Through this arrangement a firm closure of the mixing vessel is obtained, without resulting in any overpres-

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sure thereon, as would for example be the case where a little rubber cap was used as the closure.

The device according to the invention lends itself especially to the mixing of the contents of blood-pipettes and the like. It makes possible a simple carrying through of the mixing operation, which is exact with respect to time, the simultaneous mixing of several pipettes and the changing of the pipettes without the apparatus being put out of operation.

One example for the carrying out of the invention is illustrated in the drawing, and accordingly

Fig. 1 shows a section through the mixing device, according to the invention, viewed from the side along the line A—B of Fig. 2,

Fig. 2 shows a mixing device according to the invention as viewed from above,

Fig. 3 shows details of the invention on an enlarged scale,

Figs. 4 to 7 show shapes which the enveloped iron cores may take.

The mixing device consists of a round housing 1, which is provided with a cover 2. The cover 2 has four rounded portions 3 each provided with two horizontal openings 4, through which core 5 of the electromagnet extends, the said core 5 being surrounded by the coil 6. Beneath and fixed to the cover 2 is a plate 7 of insulating material, which carries the plug-pins 8 and the magnet interrupter 9 with the interference-preventing device 9a.

On the inner wall of the housing 1 is mounted a plug device 10 which fits the plug-pins 8, the switch 11 and the fuse 12. At the bottom of the housing the transformer 13 is mounted.

The current supply as obtained over the mains-plug 14, the electric wire 15 going on the one side over the switch 11 and, on the other side over the fuse 12 to the primary windings of the transformer 13 and from the secondary windings to the plug device 10. From the plug pins 8 the secondary circuit is connected in parallel with the coil 6 of the electromagnet and with the coils of the magnet interrupter 9.

On the cover 2 in the rounded portions 3 are provided vertical openings 16, in which pipe shaped holders 17 are fixedly mounted. The holders 17 are closed at their lower ends by the caps 18 (Fig. 3). On these caps 18 are supported springs 19 which carry guide pieces 20 with paddings 21 of soft material. On their sides the pipe shaped holders 17 have cutouts 22, in which are meshed pressure springs 23 which are fixed to the outside of the holders.

The pipettes are placed within the holders 17 and are held fast by the springs 23. The enlarged portion 25 of the pipettes contains the iron core 27 which is covered with corrosion resistant material 26 and whose metal plating can be formed with elevations 28 (Fig. 4), with cross ribs 29 (Fig. 5), with helically formed ribs 30 (Fig. 6), or with a horseshoe shape according to Fig. 9, in order to improve the mixing action.

At their upper ends the pipettes can be closed with caps 32 which are faced with an elastic sealing material 31. To these caps are attached legs 33 which extend in a direction of the cap axis and resiliently act transversely thereto and which are provided with arched ends 34 which are located along the upper neck of the pipette.

I claim:

1. Mixing apparatus comprising, in combination, a vessel of non-magnetic material for holding a liquid to be mixed; a mixing member located in said vessel, said mixing member being made of magnetic material; electromagnetic means comprising a solenoid and windings therearound, said solenoid having an end thereof located next to a side wall of said vessel, and said end of said solenoid having a shape corresponding to the shape of said vessel wall; and interrupter means operatively connected to said windings for interrupting current flowing through the same so as to thereby interrupt magnetic forces emanating from said solenoid, whereby said mixing member is moved about in a liquid in said vessel by the interrupted magnetic forces emanated from said solenoid, so that the movement of said mixing member agitates the liquid.

2. Mixing apparatus comprising, in combination, a pipette having opposite elongated ends and having a chamber located between said opposite ends for containing a liquid to be mixed; a mixing member of magnetic material loosely located in said chamber; a solenoid having an end thereof located next to said chamber at an outer side surface portion thereof, said end of said solenoid having a shape corresponding to the shape of said outer surface portion of said chamber; a plurality of windings located about said solenoid; electrical circuit means operatively connected to said windings for conveying current to the same; interrupter means located in said circuit for interrupting the flow of electrical current in said windings, whereby interrupted magnetic forces emanating from said solenoid move said mixing member in said chamber so as to agitate any liquid therein for mixing the same.

3. Mixing apparatus comprising, in combination, a pipette having opposite elongated ends and having a chamber located between said opposite ends for containing a liquid to be mixed; resilient support means operatively connected to one of said ends of said pipette for supporting the same; a mixing member of magnetic material loosely located in said chamber; a solenoid having an end thereof located next to said chamber at an outer side surface portion thereof, said end of said solenoid having a shape corresponding to the shape of said outer surface portion of said chamber; a plurality of windings located about said solenoid; electrical circuit means operatively connected to said windings for conveying current to the same; interrupter means located in said circuit for interrupting the flow of electrical current in said windings, whereby interrupted magnetic forces emanating from said solenoid move said mixing member in said chamber so as to agitate any liquid therein for mixing the same.

4. Mixing apparatus comprising, in combination, a pipette having opposite elongated ends and having a chamber located between said opposite ends for containing a liquid to be mixed; resilient support means operatively connected to one of said ends of said pipette for supporting the same, said resilient support means comprising an elongated tube in which said one elongated end of said pipette is located, said tube being formed with at least one pair of cut-outs in opposite wall portions thereof, resiliently supported pad means mounted in said tube and engaging the extremity of said end of said pipette, and at least one pair of leaf spring members mounted on said tube and respectively extending into said cut-out portions thereof to engage said elongated end of said pipette; a mixing member of magnetic material loosely located in said chamber; a solenoid having an end thereof located next to said chamber at an outer surface portion thereof, said end of said solenoid having a shape corresponding to the shape of said outer surface portion of said chamber; a plurality of windings located about said solenoid, electrical circuit means operatively connected to said windings for conveying current to the same, interrupter means located in said circuit for interrupting the flow of electrical current in said windings, whereby interrupted magnetic forces emanating from said solenoid move said mixing member in said chamber so as to agitate any liquid therein for mixing the same.

5. Mixing apparatus comprising, in combination, a pipette having opposite elongated ends and having a chamber located between said opposite ends for containing a liquid to be mixed; resilient support means operatively connected to one of said ends of said pipette for supporting the same; sealing means mounted on the other of said ends of said pipette; a mixing member of magnetic material loosely located in said chamber; a solenoid having an end thereof located next to said chamber at an outer side surface portion thereof, said end of said solenoid having a shape corresponding to the shape of said outer surface portion of said chamber; a plurality of windings located about said solenoid; electrical circuit means operatively connected to said windings for conveying current to the same; interrupter means located in said circuit for interrupting the flow of electrical current in said windings, whereby interrupted magnetic forces emanating from said solenoid move said mixing member in said chamber so as to agitate any liquid therein for mixing the same.

6. A mixing apparatus comprising, in combination, a pair of vessels for containing liquids to be mixed, said vessels being spaced from each other and being made of a non-magnetic material; magnet means having a pair of opposite ends respectively located next to said vessels so that the magnetic forces emanating from said ends of said magnet communicate with the interior of said vessels; interrupter means operatively connected to said magnet means for interrupting the flow of magnetic forces to the interior of said vessels; and a pair of mixing members loosely mounted in said vessels, respectively, said mixing members being made of a magnetic material so that said mixing members are moved about in liquids in said vessels by said interrupted magnetic forces so as to agitate liquid in said vessels.

7. A mixing apparatus comprising, in combination, a pair of pipettes located in spaced relation with respect to each other, said pipettes each

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having a pair of opposite elongated ends and a chamber located between said ends for holding a liquid to be mixed; a pair of mixing members loosely mounted in said chambers, respectively; a solenoid extending between said chambers and having opposite ends respectively located next to wall portions of said chambers, said ends of said solenoid having shapes which respectively correspond to the shape of said wall portions; a plurality of windings located about said solenoid; electrical circuit means for conveying current to said windings, whereby the interrupted current flowing said windings interrupts the magnetic forces emanating from said ends of said solenoid so as to move said mixing

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members in said chambers and thereby agitate liquid in said chambers to mix the same.

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