Oct. 20, 1970 W. AHRENS ET AL 3,534,943

DENTAL MATERIAL MEASURING APPARATUS

Filed April 15, 1968 2 Sheets-Sheet 1

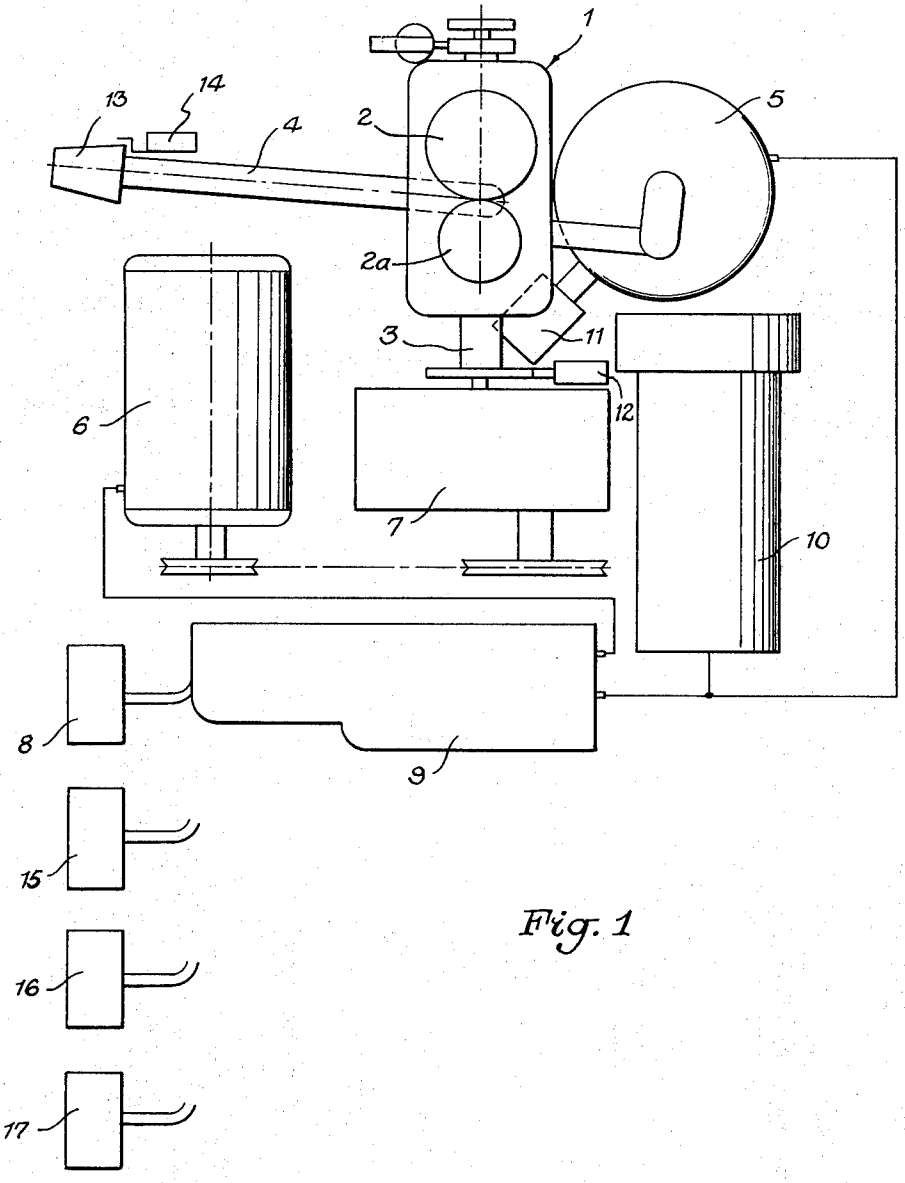

Fig. 1

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Fig. 2

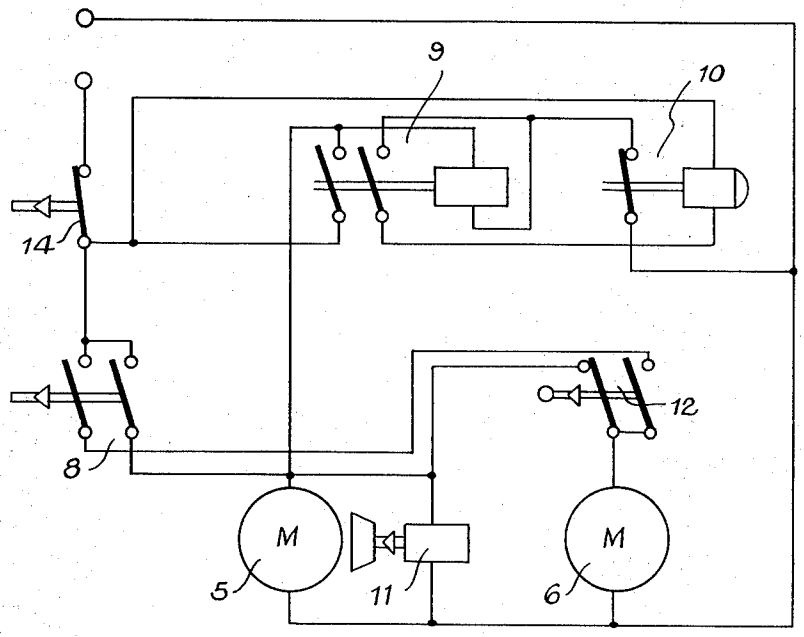
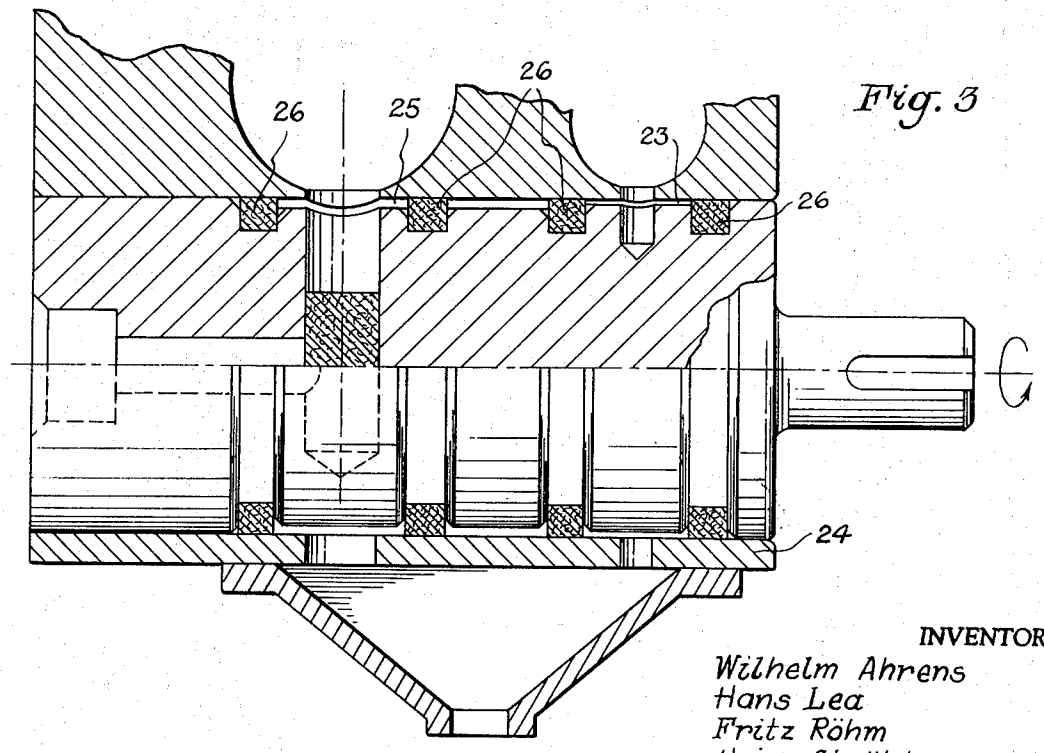


Fig. 3



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DENTAL MATERIAL MEASURING APPARATUS

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U.S. Cl. 259—12 2 Claims

ABSTRACT OF THE DISCLOSURE

The metering cylinder and mixing tube for preparing dental fillings are electrically driven and actuated by push keys. The dental materials can be pre-selected for different portions.

This invention relates to an apparatus for metering and mixing the component parts of materials used for filling teeth.

An apparatus of this sort has two containers for the mercury and amalgam which supply two separate chambers in a metering cylinder. When this cylinder is rotated 180°, both components are dumped into a funnel which ends in a so-called mixing tube. The metering cylinder is turned by means of a manually rotated knob and returned to its neutral position in the same way.

An apparatus of this sort has the disadvantage that a plurality of movements must take place if a multiple of the amount of basic material is necessary in order to make up the entire amount to be metered. Also, the mixing appratus for the mixing tube must be disconnected by a second operation.

In this invention, it has been found that the heretofore used apparatus can be advantageously improved by using various push keys to pre-select the portions to be metered. These push keys can be used to start the metering as well as the mixing, and a special switch is available so that only the mixing can be started, and, for example, cement can be mixed in a special capsule without starting the metering for the amalgam.

The means by which the objects of the invention are obtained are described more fully with reference to the accompanying drawings in which:

FIG. 1 is a schematic plan view of the apparatus;

FIG. 2 is a circuit diagram for the apparatus; and

FIG. 3 is a partial cross-sectional view through the metering means.

As shown in FIG. 1, the apparatus **1** has containers **2** and **2***a* for holding the mercury and amalgam. Metering cylinder **3** is beneath the containers. The materials are dumped from the metering cylinder into a mixing tube **4** which is swung by motor **5**. The metering cylinder **3** is turned by means of motor **6** and reduction gear **7**. The cylinder has a peripheral speed of 30 mm. per second. The mixing motor is started by a push key **8** joined to a remote control switch **9** and a time relay **10** which sets the period necessary for mixing the materials. The apparatus is operated by pushing the key **8** whereby the mixing motor **5** and metering motor **6** are started simultaneously. The stopped or neutral position of the metering cylinder is controlled by the cam operated terminal

switch **12**. Also, a magnetic brake **11** is joined to the mixing motor **5** so that at the end of the mixing process, the mixing tube can be immediately returned to its initial position. A mixing capsule **13** is threaded on the end of the mixing tube **4**. When capsule **13** is screwed or unscrewed from the mixing tube, it actuates a control switch **14** in the main electrical circuit for the apparatus.

FIG. 2 shows the operation of the main electrical circuit. When the capsule **13** is tightly screwed to the tube **4** as indicated in FIG. 1, the main electric circuit is closed by the intermittent switch **14**. The remote control switch **9** is then closed by pushing key **8**. The closed remote control switch is held by time relay **10**. Brake magnet **11** is lifted by being connected to the remote control switch **9**, and at the same time, mixing motor **5** is started. Also, metering motor **6** is started by the closing of switch **12**. A cam on the shaft of metering motor **6** will open switch **12** after each rotation and turn off metering motor **6**. After the pre-determined mixing time is over, time relay **10** opens the main electric circuit by opening switch **9** so that the mixing motor **5** is turned off and magnet **11** used to return the tube **4** to its initial position.

In this invention, in addition to key **8**, other keys **15**, **16** and **17** mounted in the apparatus housing are connected to the control mechanism for the mixing and/or metering motors.

When key **8** is pushed, the operation described above starts and after the metering cylinder is rotated 360°, the metering is stopped. When key **15** is pushed, there is obtained by way of a summation member that the metering process 2X runs its course. This is done by means of an impulse-type control mechanism or an electrical summation. The terminal switch in this case is only effective when it is opened by an impulse after one revolution. When key **16** is pushed, then the same process is accomplished after three revolutions and the terminal switch opened after the three revolutions. The terminal switch acts, for the summation, as an impulse sender.

The time periods for mixing are variable from zero to sixty seconds and they can be separattely pre-selected for each metering process by means of the time relay. This latter can be mechanical, and/or a combined structure. When the key **17** is pushed, only the mixing mechanism is actuated while the metering mechanism remains stopped.

FIG. 3 shows the detailed construction of the metering structure.

In order to make sure that the metering cylinder can be turned satisfactorily, the cylinder is constructed so that the diameters of the individual segments for the amalgam and mercury are different. The incremental differences in diameter are beween $^{2}/_{100}$ and $^{6}/_{100}$ mm. The space or clearance **23** adjacent the mercury area is very small so that mercury cannot get into the space between the cylinder and the guide sleeve **24**. This clearance **23** is less than the diameter of the smallest particle of mercury. Slot **25** in the chamber below the amalgam container is relatively wide, for example, $^{6}/_{100}$ mm. so that even when a small amount of the hard material enters the space the cylinder will not become stuck within the guide sleeve. An additional seal against the escape of mercury and/or amalgam into the space between the cylinder and the sleeve is accomplished by means of felt rings **26**.

Have now described the means by which the objects of the invention are obtained, we claim:

1. A metering and mixing apparatus for preparing dental fillings and the like comprising mixing means, dental material holding containers, material metering means joined to said containers to measure and deliver to said mixing means the necessary amounts of the materials to be mixed, first electric motor means drivingly connected to said metering means, said mixing means including a removable mixing capsule operatively positioned on said mixing means to receive said materials to be mixed, second electric motor means drivingly connected to said mixing means, an electric circuit for actuating said first and second motor means, said electric circuit including a switch positioned to be closed by placing said mixing capsule on said mixing means and to be opened by removal of said mixing capsule from said mixing means for preventing said mixing apparatus from being inadvertently operated without said mixing capsule being in place.

2. The apparatus of claim 1, including adjustable time switches in said electric circuit to determine the times of operation of said motors.

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