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KNEADING OR MIXING DEVICE

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This invention relates to an apparatus for kneading or mixing substances held in a container. While the apparatus may be used to perform this function in different arts, the device is intended to be particularly useful for dentists in mixing or kneading compositions useful in performing dental work.

The apparatus includes a container preferably in the form of a cylinder or barrel in which the substance to be mixed is placed. A piston is movably mounted in the cylinder to travel to and fro, and this piston head is provided with perforations through which the substance passes as the piston advances. After the kneading operation has been completed, the piston operates to expel the substance from the cylinder or container.

The general object of this invention is to improve the general construction of devices of this kind and particularly to provide simple means for controlling the perforations so that they may remain open when using the piston to knead the substance in the cylinder and so that they can be closed thereafter to facilitate the expulsion of the substance from the cylinder.

One of the objects of the invention is to provide an assembly of parts which can be readily taken apart for cleaning and sterilization. In its construction the device includes a piston rod carrying the piston. One of the objects of the invention is to provide a simple construction for the device which will enable the rod to be constructed of a single piece and to provide means cooperating with the rod so that at will the perforations can be closed or maintained open.

A further object of the invention is to produce a device of this kind in which the piston rod includes an inner rod and an outer tubular rod, and to provide simple means to cooperate with such a rod to enable the perforations to be maintained opened or closed at will.

A further object of the invention is to provide a device of this kind in which simple means for controlling the perforations from the exterior, and for indicating on the exterior of the device, the relation of the perforations, is to say, for indicating whether the perforations are opened or closed.

A further object of the invention is to provide a device of this kind having a single handle for reciprocating the piston.

Further objects of the invention will appear hereinafter.

The invention consists in the novel parts and combination of parts to be described hereinafter, all of which contribute to produce an efficient kneading or mixing device.

A preferred embodiment of the invention is described in the following specification, while the broad scope of the invention is pointed out in the appended claims.

In the drawings:

Fig. 1 is a vertical section through a complete kneading device embodying our invention and illustrating the same with the perforations in their open position;

Fig. 2 is a vertical section taken about on the line 2—2 of Fig. 1 with certain parts broken away, and particularly illustrating the means for holding parts of the piston so that the perforations through the piston will be in a definite relation, that is to say, opened or closed.

Fig. 3 is a horizontal cross section taken on the line 3—3 of Fig. 1 and further illustrating details of the device.

Fig. 4 is a vertical section taken through the upper head of the device and illustrating another embodiment of the invention, in which we employ marks on the piston rod and head of the barrel to indicate the relation of the perforations. In this view the upper portion of the piston rod is broken away and the piston head is illustrated in cross section.

Fig. 5 is a section through the piston rod taken on the line 5—5 of Fig. 4 showing the upper head of the device in plan and illustrating the use of marks on the exterior of this head for enabling the condition of the perforations through the piston to be controlled.

Fig. 6 is a view similar to Fig. 4 but illustrating another embodiment of the invention which dispenses with the use of marks for indicating the condition of the perforations, and which provides means whereby the parts of the piston can be readily controlled to maintain the perforations opened or closed at will.

Fig. 7 is a horizontal section on the line 1—1 of Fig. 6 and looking upwardly;

Fig. 8 is a vertical section taken through a portion of a cylinder or barrel and illustrating another embodiment for the piston which enables the perforations through it to be closed or opened at will.

Fig. 9 is a view similar to Fig. 8 but in this view the section passes through the piston.

Fig. 10 is a horizontal section taken on the line 10—10 of Fig. 9 and further illustrating details of this embodiment of the invention shown in Figs. 8 and 9.

Fig. 11 is a vertical section similar to Fig. 4 but
Illustrating another embodiment of the invention in which the piston is constructed of two relatively movable plates, one of which is movable on the piston rod but maintained in a fixed relation with respect to the barrel or cylinder by guiding means on the cylinder wall.

Fig. 12 is a horizontal cross section on the line 14—14 of Fig. 11 looking upward and illustrating details of the embodiment of this invention.

Fig. 13 is a view similar to Fig. 11 and illustrating another embodiment of the invention in which one of the relatively movable piston plates is maintained yieldingly in different positions on the other plate of the piston. This view particularly illustrates an embodiment of the invention in which the head of the cylinder is utilized to enable the plates of the piston to be shifted relatively to each other as to open or close the perforations through the piston.

Fig. 14 is a horizontal cross section on the line 14—14 of Fig. 13 and further illustrating details of the invention.

Fig. 15 is a horizontal cross section taken on the line 15—15 of Fig. 13 and further illustrating details of the piston; and

Fig. 16 is a vertical section taken through a cylinder and illustrating another embodiment of the invention in which the piston head is composed of an imperforate plate and a perforated plate and illustrating a lower head for the cylinder having an extruding orifice formed in the head.

Fig. 17 is a horizontal cross-section on the line 17—17 of Fig. 16.

Fig. 18 is a vertical section showing a portion of the barrel of the device and showing a modified construction for the piston partially in section.

Fig. 19 is a view similar to Fig. 18 and illustrating another embodiment of means for yieldingly holding the piston plates in different rotated or oriented positions with respect to each other.

In the invention as illustrated in Fig. 1, the container is in the form of a barrel 1 having a removable bottom head 2 and removable upper head 3. The bottom head 2 is preferably constructed so that it is quick-acting. For this purpose we prefer to employ a bayonet slot construction, such as illustrated in Fig. 3, that is to say, I provide the end of the barrel with lugs 4 that are received in under-cut slots 5 in the removable head 2. The device includes a piston 6 which includes two relatively movable perforated parts, the perforations of which may be moved in or out of alignment. The piston is preferably formed of two plates 7 and 8, the latter of which is rigidly attached on the end of an inner piston rod 9 and the former of which is rigidly attached on a tubular rod 10. The rods are guided out through the upper head 3 to the exterior of the device and are provided with a handle for enabling the piston to be reciprocated, and also provided with means for holding the inner rod 9 and the outer rod 10 in different rotative positions with respect to each other. By this means perforations 11 in the plate 7 may be made to register with corresponding perforations 12 in the plate 8, and by rotating the plates 7 and 8 to each other the perforations 12 in the plate 8 may be drawn out of line with each other, thereby closing off communication between the upper chamber 13 and the lower chamber 14 of the barrel.

Any suitable means may be employed for rotating the inner and outer piston rods with respect to each other, but, as illustrated in Fig. 1, we provide a handle 15 preferably secured on the end 16 of the inner rod 9, which projects beyond the end of the tubular rod. This handle 15 is preferably constructed of bakelite or similar material and may include two opposite radially projecting arms 17, which form a good grip for the fingers of the hand in grasping the handle. The handle and the outer tube 10 are preferably provided with means for locking them together so that the perforations are either in alignment with each other or out of alignment. In the present instance, we provide the tubular rod with a resilient lever 18, the outer portion of which may be received in a radial socket 19 formed in the lower face of the handle. In addition to this, the lower face of the handle is preferably provided with a stop 20. By pulling down on the head 20 at the outer end of the spring lever 18, it can be dislodged from the socket 19 and rotated around until it strikes the stop 20. In this position of the lever 18 the perforations 11 and 12 will be out of register with each other, which gives the piston the effect of a solid head. After kneading the substance in the cylinder, the lever 18 can be rotated around as indicated and the substance within the cylinder extruded at the lower end of the cylinder, after removing the cap 2.

The handle 15 if constructed of bakelite or similar material, is preferably provided with a ferrule 21 which is cast at its center. The upper extremity of the inner rod 9 is provided with screw threads 22 which enables a thumb screw 23 to be screwed down tight upon the ferrule so as to clamp the handle rigidly on the inner rod. The spring arm 18 is preferably formed on a removable collar 24 which may be secured by a set screw 25.

By constructing the device as described, it will be evident that it can be readily taken apart to enable the separate pieces to be cleaned and sterilized. In doing this, the plate 8 with the inner rod 9 can be withdrawn from the tubular rod.

In the embodiment of the invention illustrated in Figs. 4 and 5, the piston head is composed of an upper plate 26 which is rigidly attached to a piston rod 27. This piston rod is in one piece, that is to say, in this construction we dispensed with any parts resembling piston rods such as the mark 30 in Fig. 1. The plate 25 is countersunk into the upper side of the lower plate 28 which is loosely mounted on the lower end of the piston rod. This lower plate 28 is provided with one or more projections or teeth 29 which extend above the upper face of the upper plate 25. By pulling the rod upwardly so as to bring the piston head against the inner face of the upper head 30, the projections or teeth 29 can be engaged in corresponding sockets 31 formed in the inner face of the head 30. In this way the plate 28 can be held while the rod 27 is rotated to rotate the plate 25 and throw the perforations 32 and 33 out of alignment with each other. In other words, in this embodiment of the invention, we provide the loose plate 28 and the head 30 with interlocking means to enable the plate to be held fixed when this rotation is taking place.

In order to indicate the condition or relation of the perforations on the interior of the cylinder, we provide the side of the rod with a mark 34, and we provide the upper end of the boss of the head 30 with two radial
marks 38 and 36. When the mark 34 is in alignment with mark 35, the operator knows that the perforations 32 and 33 are in alignment. When the mark 34 is in alignment with the mark 35, he knows that the perforations will be closed.

In Figs. 6 and 7 we illustrate another embodiment of the invention in which the piston comprises a plate 37 and a second plate 38. These plates have a correlated construction enabling them to hold themselves in different positions. In one position the perforations will be open and in the other position they will be closed. In order to accomplish this, we prefer to construct plate 38 as a thin plate of resilient material and we provide it with one or more rounded projections 39 on its under side which may be engaged in the upper ends of the perforations 40 of the plate 37. In this position the perforations run parallel with the perforations 40. In this embodiment of the invention we may provide the same means illustrated in Fig. 4 for effecting relative rotation of the plates 37 and 38. In this connection it should be understood that plate 38 is loose on the piston rod 41 but the plate 37 is rigid on this rod. The edge of the spring plate 38 may be provided with one or more teeth or dogs 42 to be received in corresponding sockets 43 on the inner face of the cylinder head. By pulling the piston rod out as far as possible, the dogs or teeth 42 can be engaged in the sockets 43 and the rod 41 can then be rotated. This rotation disengages the rounded projections 39 from the perforations 40 and enables them to be shifted around until they snap into slight depressions or recesses 44 formed in the upper face of the lower plate 37. This holds the perforations of the two plates in register with each other.

In the embodiment of the invention illustrated in Figs. 8 to 10, inclusive, the piston 45 is composed of two rigid plates 46 and 47 which are yieldedly pressed together by a resilient washer or spider 48. In this construction the two plates are relatively movable on the axis of the rod 49, as in the other constructions, but the upper plate 46 is rigidly fixed to the lower end of the rod. The lower plate is rotatable on an internally threaded hub 50 that is attached to the threaded and reduced lower end of the rod. The under side of this hub 50, the spider 48 is attached. This spider has a plurality of radial arms 50a which are resiliently engaged at the ends of these arms against the lower face of the plate 47 and hold it up against the upper plate. One of the plates, for example the lower plate 47, is provided with a radial tongue 51, which is received in a socket-shaped slot 52 in the upper plate 48. This means the relative movement of the plates with respect to each other is limited. In one position the perforations in the two plates will be in alignment with each other. In the other position they will be out of alignment with each other. With this construction, it will be evident that it is merely necessary to rotate the piston rod 49 to the right or to the left in order to hold the perforations opened or closed. In this connection it should be understood that the loose plate 47 of the piston 45 is in alignment with the plate 46 when the barrel is rotated by means of the rod. If desired, the plate 47 can be provided with packing for insuring that it will be sufficiently tight to enable this relative rotary movement or rocking movement to be accomplished.

If desired, the ends of the arms 48a may be received in shallow recesses 53 in the lower face of the plate 47. This prevents any possibility of their shifting their position so as to cover the perforations in the lower plate.

In the embodiment of the invention illustrated in Fig. 11, the piston is composed of an upper plate 54 and a lower plate 55, the former of which is provided with means to enable it to cooperate with the inner face of the wall 56 of the cylinder to hold this plate against rotation. The plate 55 is rigidly secured to the lower end of the piston rod 57. The plate 54 may be provided with a pin 58 which is spring loaded against the wall 56. This means or other means may be provided for enabling the lower plate to have a limited rocking movement on its axis with respect to the upper plate. The upper plate is provided with one or more tongues 59 which run in longitudinal grooves 61 formed in the cylinder wall. With this construction it will be evident that by rotating the rod 57 to the right or to the left the perforations in the plates can be brought into alignment or out of alignment with each other.

In the embodiment of the invention illustrated in Figs. 13 to 15, inclusive, the piston comprises a lower plate 59' and an upper plate 55', the latter of which is of thin resilient metal and preferably constructed so that it can be snapped over the lower end of the piston rod 60' before the lower plate is secured in position by small machine screw 61'. For this purpose the piston rod may be provided with a peripheral groove 62 (see Fig. 15). The plate 55' is formed with an opening 63 of slightly larger diameter than the rod 60' and at diametrically opposite points this opening 63 has inwardly projecting edges 64 which will engage in the groove 62 when the plate 59' is snapped into position.

The upper face of the spring plate 59 is provided with one or more teeth 65 which may engage in any one of a plurality of corresponding sockets 66 formed on the inner face of the adjacent head 67 of the device. On the under side of the plate 59' one or more teeth 65 are provided, which may be similar to the teeth 65, but these teeth are received in corresponding sockets 69 in the upper face of the plate 55'. These sockets 69 are circumferentially disposed around the upper face of the plate 55' and are spaced so that in one position the perforation in the upper plate and lower plate will be in register with each other, and in the next position they will be out of register with each other. With this construction it will be evident that by rotating the rod 60' through a small angle or the teeth 65 are in the socket 66, the lower plate 59', which is rigid with the rod, can be rotated through a slight angle, and when the teeth 68 snap into the next adjacent socket 69, the perforations in the plates will be out of register.

In Fig. 16 we illustrate a barrel with a lower head 70 having an extruding orifice 71 closed by a removable cap 72, and this view also illustrates another embodiment for the piston in which we employ a single piece piston rod 75, the inner end of which carries rigidly a perforated piston plate 19 and a loose imperforate plate 80. These plates are provided with means for interlocking them by a rotation of the rod. For this purpose, one of these plates, for example the rigid plate 19, carries a hook pin 81, the hooked end of which may be engaged in an undercut slot 82 in the other plate, said slot having an opening 83 at one end large enough to receive the hook end.
of the pin. By pulling the rod 78 out as far as possible, projections 84 can be engaged in recesses 85 in the inner face of the head 89; the piston rod can then be rotated until the hook 5 pin falls into the slot; a further rotation will interlock the piston plates. The imperforate plate 80 can then be advanced by pushing in on the rod. This will extend the substance from the barrel. Evidently when these two plates are not locked together the perforated plate can be reciprocated to knd a substance in the barrel.

The pistons are preferably constructed so that the upper and lower plates engage the wall of the cylinder by means of a circumferential rib or bead 87 (see Fig. 1). In other words, each piston has its body portion of reduced diameter, as indicated at 88. This construction enables the piston to be moved readily through the substance and at the same time insures that the piston will fit sufficiently tight in the barrel.

In the embodiment shown in Fig. 18, the cylinder wall is provided with a longitudinal groove 89 and one of the piston plates, for example the plate 95, is provided with resiliently pressed projections 92 for engaging in this groove. These consist of a ball 91, held in a socket 92 and backed up by a coil spring 93. The other plate 94 is provided with a tongue 95 to run in the groove 89 to hold plate 94 when it is desired to orient the plates to open or close the perforations. The plate 90 is, of course, rigid on the rod and the plate 94 is loose.

In Fig. 19 a construction is illustrated in which one of the plates is provided with a spring pressed ball 95 for engaging in either of two recesses 97 and 98. As illustrated in this view, the plate 95 is rigid with the rod 100.

In the type of the device employing a single shaft piston rod, such as the piston rod 60, a handle would be attached to the rod which may, if desired, be similar to the handle 15 already described.

From the foregoing description, it is evident that in practicing our invention, we construct the piston of two relatively movable plates, and with perforations which may be thrown in or out of register, and we provide means for effecting this from the exterior of the cylinder.

In using the device, the piston is reciprocated by means of the handle 17 with the perforations of the piston plates in registry with each other. This operation forces the substance being kneaded through the perforations so that the substance passes to and fro between the chambers 13 and 14 of the barrel (see Fig. 1). After the substance has been sufficiently kneaded, the device is operated so as to throw the perforations of the piston plates out of registry, after which the lower head or the cap 77 can be removed so as to permit the substance to be forced out of the barrel.

It is understood that the embodiment of the invention described herein is only one of the many embodiments this invention may take, and we do not wish to be limited in the practice of the invention, nor in the claims, to the particular embodiment set forth.

What we claim is:

1. A kneading and mixing apparatus, comprising a combination of a barrel to contain the substance to be kneaded, a piston rod carrying the piston, said piston having a pair of plates with perforations thereon capable of being moved relatively to each other, means associated with the piston plates for yieldingly holding the same in any relative position, means operable from the exterior of the barrel for effecting the rotation of said plate to enable the perforations to be aligned with each other during the kneading operation, and means for forcibly reciprocating the piston while the perforations are in alignment to cause violent flow of the substance to and fro through the perforations.

2. In a kneading and mixing apparatus, the combination of a barrel to contain the substance to be kneaded, a piston guided to and fro in the barrel, a piston rod extending through the head of the barrel and having a handle, said piston

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operating to hold the plates yieldingly with the perforations in or out of register with each other.

6. In a kneading and mixing apparatus, the combination of a barrel to contain the substance to be kneaded, a piston guided to and fro in the barrel and comprising a pair of plates with perforations therethrough, a piston rod rigid with one of said plates and passing through the end of said barrel, a tubular piston rod enveloping the first-named rod and rigid with the other of said plates, means carried by said rods for rotating the same on their axis relative to each other to bring the perforations into or out of register with each other, and means carried by the piston rod for enabling the piston to be forcibly reciprocated to cause the substance to flow violently to and fro through the perforations.

7. In a kneading and mixing apparatus, the combination of a barrel to contain the substance to be kneaded, a piston guided to and fro in the barrel and comprising a pair of plates with a plurality of perforations therethrough, a piston rod rigid with one of said plates and passing through the end of said barrel, a tubular piston rod enveloping the first-named rod and rigid with the other of said plates, means fixed on one of said rods, and means fixed on the other of said rods, said last-named means having a correlated construction enabling the same to hold the plates in a definite position, thereby enabling the perforations to be maintained closed or open at will.

8. In a kneading and mixing apparatus, the combination of a barrel to contain the substance to be kneaded, a piston guided to and fro in the barrel and comprising a pair of plates with a plurality of perforations therethrough, a piston rod rigid with one of said plates and passing through the end of said barrel, a tubular piston rod enveloping the first-named rod and rigid with the other of said plates, a handle rigidly secured to the inner rod, and means fixed on the tubular rod for enabling the same to be rotated relatively to the inner rod to maintain the perforations opened or closed.

9. In a kneading and mixing apparatus, the combination of a barrel to contain the substance to be kneaded, a piston guided to and fro in the barrel and comprising a pair of plates with a plurality of perforations therethrough, a piston rod rigid with one of said plates and passing through the end of said barrel, a tubular piston rod enveloping the first-named rod and rigid with the other of said plates, a handle rigidly secured to the inner rod, and means fixed on the tubular rod for enabling the same to be rotated relatively to the inner rod to maintain the perforations opened or closed, said last-named means and said handle having interlocking means for maintaining the perforations in a definite relation to each other.

10. In a kneading and mixing apparatus, the combination of a barrel to contain the substance to be kneaded, a piston guided to and fro in the barrel and comprising a pair of plates with a plurality of perforations therethrough, a piston rod rigid with one of said plates and passing through the end of said barrel, a tubular piston rod enveloping the first-named rod and rigid with the other of said plates, said inner rod projecting beyond the end of the tubular rod, a handle rigidly secured to the end of the inner rod beyond the tubular rod, a lever carried by the tubular rod adjacent the handle and enabling the tubular rod to be rotated relative to the inner rod to control the relative position of the perforations.

11. In a kneading and mixing apparatus, the combination of a barrel to contain the substance to be kneaded, a piston guided to and fro in the barrel and comprising a pair of plates with a plurality of perforations therethrough, a piston rod rigid with one of said plates and passing through the end of said barrel, a tubular piston rod enveloping the first-named rod and rigid with the other of said plates, said inner rod projecting beyond the end of the tubular rod, a handle rigidly secured to the end of the inner rod beyond the tubular rod, a lever carried by the tubular rod adjacent the handle and enabling the tubular rod to be rotated relative to the inner rod to control the relative position of the perforations, and correlated interlocking means between the lever and the handle for compacting the perforations in or out of register with each other.

12. In a kneading and mixing apparatus, the combination of a barrel to contain the substance to be kneaded, a head on the barrel, a piston guided to and fro in the barrel and comprising a pair of plates with perforations therethrough, a piston rod rigid with one of said plates, the other of said plates mounted for rocking movement on the axis of the rod, a head on the barrel, said head and the loose plate having correlated interlocking means for enabling the loose plate to be held against rotation while the rod and the other plate are rotated to bring the perforations into or out of alignment with each other.

13. In a kneading and mixing device, the combination of a cylinder, a piston rod movable therein, a piston plate rigidly mounted on the end of said rod, a second piston plate loosely mounted on the rod adjacent the first-named plate, said plates having perforations which may register together, and yielding means carried by one of said plates for engaging the other plate, the said other plate having means for engaging the yielding means to enable said plates to be held in different oriented positions with respect to each other.

14. In a kneading and mixing apparatus, the combination of a barrel, a tubular piston rod guided through the same, an inner rod mounted within the tubular rod, a handle carried by one of said rods for reciprocating the same, a piston plate carried by the inner rod within the barrel, a piston plate carried by the tubular rod within the barrel lying adjacent to the first-named piston plate, said piston plates having a plurality of perforations therethrough which may align, means for effecting a relative rotation of the inner rod and the tubular rod to maintain the perforations at will in register or out of register with each other, and means on the rods for forcibly reciprocating the piston plates to cause violent movement of the substance to and fro through the perforations when in alignment.

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