

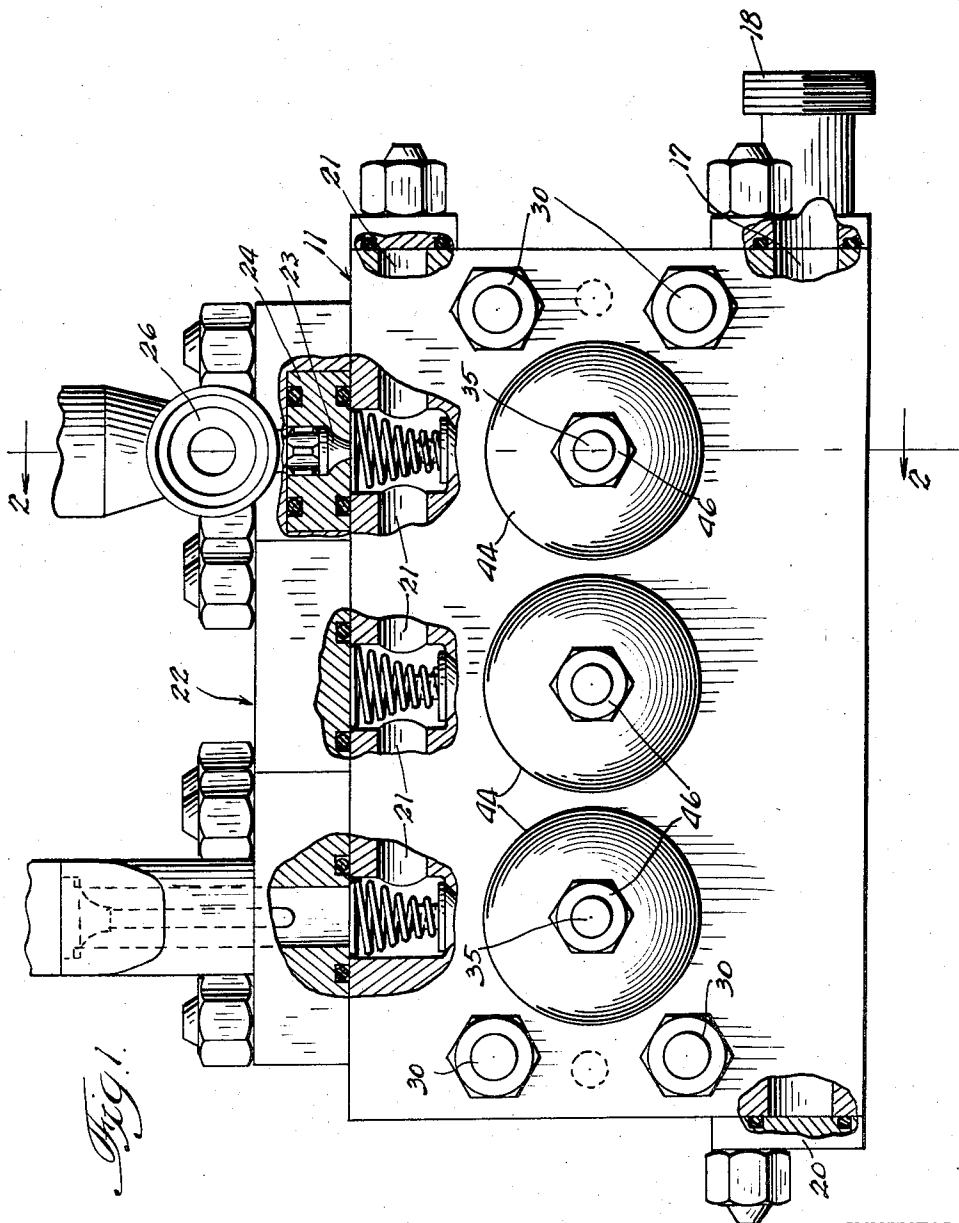
Sept. 1, 1959

A. H. WAKEMAN
HOMOGENIZING APPARATUS

2,901,981

Filed Oct. 7, 1955

3 Sheets-Sheet 1



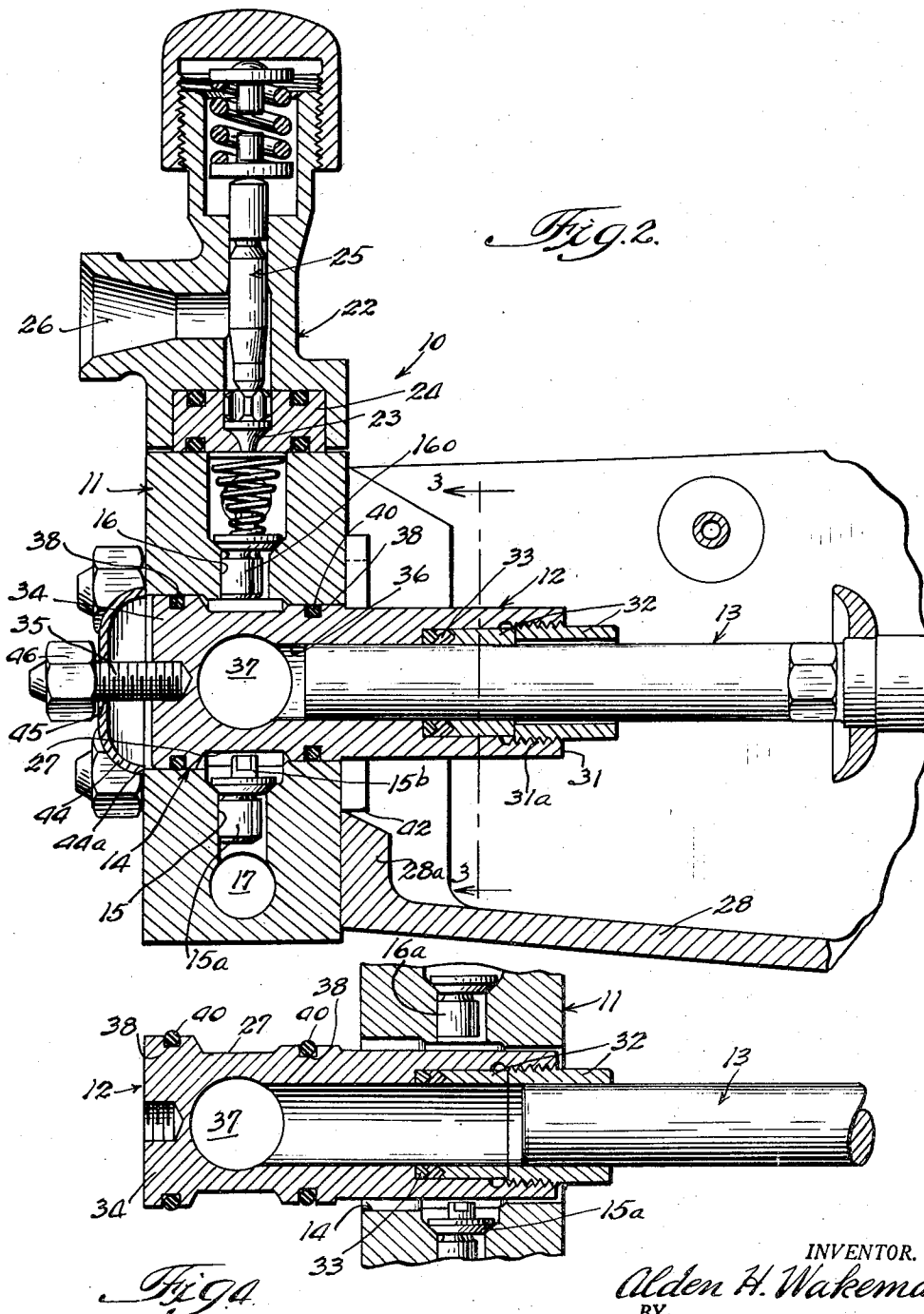
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Fig. 3.

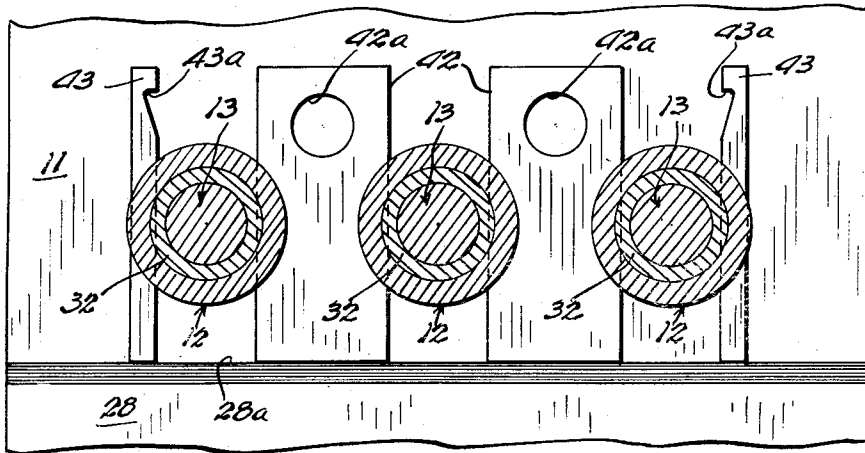


Fig. 5.

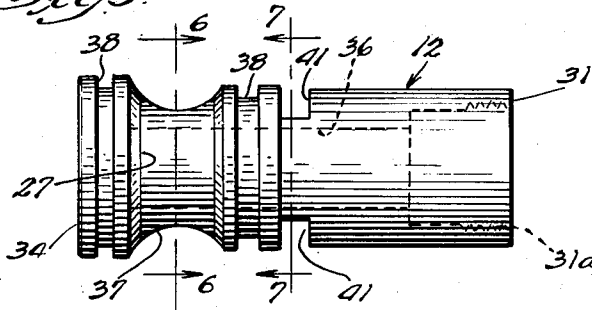


Fig. 6.

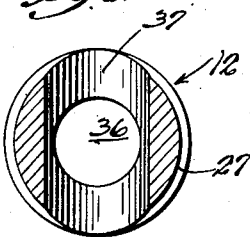
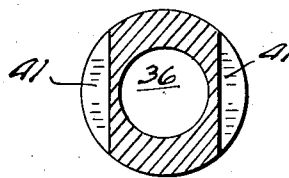


Fig. 7.



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HOMOGENIZING APPARATUS

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6 Claims. (Cl. 103—216)

This invention relates to an homogenizing apparatus, and more particularly to the head block assembly of such apparatus.

Maintenance and cleaning of homogenizing apparatus, utilized in the dairy industry, has always been a time-consuming operation necessitating substantial disassembly of the apparatus to insure proper and thorough cleaning of the various parts thereof. Reassembly of the parts of such assembly normally required skillful handling to insure proper fit therebetween so as to withstand the high internal operating pressures to which the apparatus is normally subjected.

Thus, it is one of the objects of this invention to provide an homogenizing apparatus wherein the head block assembly thereof may be readily disassembled and reassembled when required.

It is a further object of this invention to provide a head block assembly of an homogenizing apparatus wherein proper reassembly of the various component parts of the assembly is assured by reason of the interfitting of certain parts being accomplished only when they are arranged in a predetermined relation.

It is a further object of this invention to provide a head block unit of an homogenizing apparatus which is simple, yet sturdy in construction, and efficient and durable in operation.

Further and additional objects will appear from the description, accompanying drawings, and appended claims.

In accordance with one embodiment of this invention, an homogenizing apparatus is provided comprising a reciprocatory piston, a stationary head unit, and a cylinder section removably mounted on said unit and accommodating an end portion of said piston. The head unit is provided with a bore for accommodating the cylinder section. The bore is disposed in axial alignment with respect to the direction of travel of the piston and is in communication with a pair of relatively spaced inlet and outlet ports formed in the head unit. Disposed within the inlet and outlet ports are valves which are alternately operable upon reciprocatory movement of the piston. The cylinder section is open at one end to accommodate the end portion of the piston and is closed at the other end. Formed in the cylinder section, adjacent the closed end thereof, is a transversely extending port which communicates with the inlet and outlet ports of the head unit. The open end of the cylinder section protrudes from one side of the head unit and is provided with a removable stop which engages said unit side. Protruding from the opposite side of the unit is an elongated stud carried by the cylinder section and extending axially from the closed end thereof. Disposed outside the head unit and accommodating the protruding end of the stud is a washer having a peripheral flange adapted to contact the adjacent side of the unit. Threadably mounted on the protruding end of the stud is a nut which is adapted to urge the washer into contact with the head unit and clamp the latter between the washer and the stop, where-

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by the cylinder section is held in a fixed position within the unit bore.

For a more complete understanding of this invention reference should now be made to the drawings, wherein

Fig. 1 is a fragmentary front elevational view of the improved head block assembly with portions thereof cut away to show the interior construction;

Fig. 2 is a sectional view taken along line 2—2 of Fig. 1;

Fig. 3 is a fragmentary sectional view taken along line 3—3 of Fig. 2;

Fig. 4 is similar to Fig. 3 showing the cylinder section partially disassembled from the head unit;

Fig. 5 is a top plan view of the cylinder section; and

Figs. 6 and 7 are sectional views taken along lines 6—6 and 7—7, respectively, of Fig. 5.

Referring now to the drawings, and more particularly to Figs. 1 and 2, an improved head block assembly 10 for an homogenizing apparatus, not shown, of a type used in commercial dairies and the like, is shown which comprises a head unit 11, a plurality of cylinder sections 12 removably mounted within the head unit, and a plurality of reciprocating pistons 13 having the ends thereof accommodated by the cylinder sections 12.

The head unit 11 is provided with a plurality of relatively spaced substantially parallel bores 14 which are adapted to receive the cylinder sections 12. Each bore 14 communicates with an inlet port 15 and an outlet port 16 formed in the head unit; the ports for each bore are disposed perpendicular with respect to the axis of such bore. In this instance, the inlet and outlet ports 15 and 16, respectively, are diametrically opposite one another. All of the inlet ports 15 formed in head unit 11 are interconnected by a transversely extending passageway 17 formed in the lower portion of head unit 11, see Figs. 1 and 2. One end of passageway 17 is provided with a suitable connection 18 for communication with the source of liquid to be subjected to the homogenizing operation. The opposite end of passageway 17 is closed off by a suitable cap 20. Spaced above passageway 17 and disposed parallel therewith is a second passageway 21 which is adapted to interconnect the outlet ports 16 of the bores 14.

Mounted on head unit 11 and in alignment with one outlet port of a bore 14 (the right-hand bore as shown in Fig. 1) is an homogenizing valve housing 22. The housing 22 is provided with an homogenizer valve piece 23 which is formed of porous material and is adapted to cause the liquid passing upwardly through the housing to become homogenized. The valve piece 23 is positioned on a valve seat block 24 which forms a part of the housing 22. Suitable mechanism 25 is disposed within housing 22 for maintaining the valve piece 23 in seated relation on the block 24. A discharge port 26 is formed in the housing 22 above valve piece 23 which leads to the bottle-filling machine, not shown, or any other suitable equipment used in the processing of the dairy product.

The inlet and outlet ports 15 and 16, respectively, for each bore 14 are each provided with a valve 15a and 16a which alternately open ports 15 and 16 upon reciprocatory movement of the piston 13. Valve 15a, disposed within the inlet port 15, is provided with an upwardly extending lug 15b which, when the valve is in an open or unseated position, is caused to contact the base or bottom of a peripheral groove 27 formed in the cylinder section 12. The head unit 11 is secured by bolts 30 or any other suitable means to the housing of the apparatus, not shown, by a bracket 28.

Each cylinder section 12 is provided with an open end 31 which is countersunk to receive packing material 33. The end portion 31a of the countersunk opening is internally threaded to receive a packing gland 32 which

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encompasses the piston 13 and retains the packing material 33 in proper sealing relation with the shank of the piston. The opposite end 34 of section 12, as heretofore mentioned, is closed and has protruding therefrom a stud 35 which is threaded into end 34 and is disposed in axial alignment with respect to the axis of bore 36 formed in section 12. Formed adjacent closed end 34 of section 12 is a transversely extending port 37 which communicates with bore 36 and inlet and outlet ports 15 and 16, respectively, through the peripheral groove 27 heretofore described.

Axially spaced and disposed on opposite sides of groove 27 are a pair of sealing peripheral grooves 38 in which are disposed suitable sealing elements 40, for example, a conventional O ring. Elements 40 effectuate a fluid seal between the head unit 11 and cylinder section 12.

The open end 31 of the section 12 protrudes from one side of the head unit, adjacent the piston 13, and has formed in the periphery thereof a pair of linear keyways 41, see Fig. 5. The keyways, in this instance, are adapted to receive keys 42 or 43. Where, as in this instance, a plurality of cylindrical sections 12 are employed which are disposed in parallel spaced relation with respect to one another, the keyways formed in adjacent cylinder sections 12 are disposed opposite one another so that a single key 42 may serve adjacent cylinder sections and be accommodated by the keyways thereof. In instances, however, where the cylinder section 12 is the end one of the group, a smaller key 43 is provided which is adapted to serve only one cylinder section. The keys 42 and 43, when disposed within the keyways, are adapted to contact a side of the head unit 11 and to have the lower ends thereof rest upon an upwardly extending flange 28a formed on bracket 28 heretofore described. Keys 42 are provided with apertures 42a at the upper ends thereof to facilitate removal of the key from the keyways when disassembly of the head block assembly 10 is desired. Likewise, the upper ends of keys 43 are provided with suitable notches 43a to facilitate removal of the keys from the keyways. While keys and keyways have heretofore been described, it is to be understood, of course, that other suitable means may be provided for functioning as a stop for the cylinder section, and therefore the invention is not limited to the construction.

Disposed on the opposite side of head unit 11 and accommodating the protruding portion of stud 35 is a cup-like or substantially hemispherical washer 44 which is provided with an opening 45 through which a portion of the stud extends. The diameter or outer peripheral dimension of the portion of the washer adjacent head unit 11 is greater than the largest diameter of bore 14, and thus the peripheral edge 44a of the washer is adapted to contact the adjacent side of the head unit 11. Threadably mounted on the end of the stud projecting through washer opening 45 is a nut 46 which, when drawn up tight on the stud, causes the head unit 11 to be firmly clamped between washer 44 and keys 42 and 43, thereby maintaining the cylinder section 12 in a fixed position within the unit bore 14.

It will be noted, in Fig. 4, that the diameter of the portion of unit bore 14 disposed to the left side of inlet and outlet ports 15 and 16, respectively, is greater than the diameter of the portion of the unit bore disposed to the right side of such ports. Likewise, the peripheral portions of each cylinder section which engage the interior of the unit bore 14 are also of different diameters. Furthermore, the open end portion of each cylinder section 12 projecting, as viewed in Fig. 2, from the head unit 11, is of a still smaller outside diameter, so that removal of the cylinder section from the head unit 11 will be greatly facilitated once the left-hand seal member 40 has become clear of the unit bore in which the cylinder section is disposed.

In removing a cylinder section 12 from the head unit

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the nut 46, threaded onto stud 35, is loosened to permit the keys 42 and 43 to be removed from the keyways. Once the keys are removed, the nut 46 is drawn up tight on the stud against the washer 44 whereupon the cylinder section carrying the stud 35 will be moved to the left with respect to the head unit, as viewed in Fig. 2. In the improved assembly, as shown, the packing 33 and packing gland 32 move with the cylinder section 12 when the latter is withdrawn from the bore. The piston 13 will remain in place and serve as a guide for removing, as well as assembling, the cylinder section with respect to the head unit 11.

It will be noted that the axes of the keyways 41 are disposed at right angles to the axis of the opening 37 formed adjacent the closed end of cylinder section 12 and thus there is no likelihood of the opening 37 being axially aligned with inlet and outlet ports 15 and 16, respectively. Thus, by reason of the relative disposition of the keyways and opening 37, reassembly of the cylinder sections in the unit bores is foolproof.

Thus, it will be seen that an improved homogenizing apparatus has been provided wherein the head block assembly thereof may be readily disassembled and assembled without requiring the talents of a skilled worker. Furthermore, reassembly of portions of the head block assembly is foolproof by reason of the fact that certain component parts of the assembly will only interfit with respect to one another when they are in a predetermined relation.

While a particular embodiment of this invention is shown above, it will be understood, of course, that the invention is not to be limited thereto, since many modifications may be made, and it is contemplated, therefore, by the appended claims, to cover any such modifications as fall within the true spirit and scope of this invention.

I claim:

1. In an homogenizing apparatus, the combination of a reciprocating piston, a stationary head unit spaced from said piston, a cylinder section removably mounted on said head unit and accommodating a portion of said piston, and removable means cooperating with the periphery of said cylinder section and a first exposed surface of said unit adjacent said piston to effect retention of said section in a relatively fixed position on said unit; said unit being provided with an elongated bore having one end thereof opening at said unit first surface and the other end thereof opening at a second exposed surface of said unit, said cylinder section being disposed within said unit bore, the axis of said unit bore being substantially coaxial with the axis of piston movement, said unit also being provided with relatively spaced inlet and outlet ports communicating with said bore, and valves disposed within said inlet and outlet ports and alternately operable to effect opening and closing of said ports upon reciprocation of said piston; said cylinder section being provided with an elongated bore coaxial with said unit bore and open at one end and slidably accommodating a portion of said piston, the opposite end of said section bore communicating with said inlet and outlet ports, said cylinder section including an adjustable portion contacting a portion of said unit second surface circumjacent said unit bore open end and cooperating with said removable means to clamp said unit therebetween whereby said unit and said cylinder section are in a relatively fixed position.

2. In an homogenizing apparatus, the combination of a reciprocating piston, a stationary head unit spaced from said piston, an elongated cylinder section removably mounted on said head unit and accommodating a portion of said piston, said cylinder section being provided with an elongated peripheral pocket formed in an exposed portion of said section adjacent said piston, said pocket being disposed substantially transversely to the axis of said section, and removable means cooperating with said cylinder section pocket and a first exposed sur-

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face of said unit adjacent said piston to prevent relative movement of said section with respect to said unit in a direction away from said piston; said unit being provided with an elongated bore having one end thereof opening at said unit first surface and the other end thereof opening at a second exposed surface of said unit, said cylinder section being disposed within said unit bore, said unit also being provided with relatively spaced inlet and outlet ports communicating with said bore, and valves disposed within said inlet and outlet ports and alternately operable to effect opening and closing of said ports upon reciprocation of said piston; said cylinder section having the periphery thereof cooperating with the surface of said unit bore to form a passageway communicating with said inlet and outlet ports, axially spaced seal pieces encompassing said section periphery and disposed on opposite sides of said passageway and cooperating with said unit bore surface to form a fluid seal therebetween, said cylinder section being provided with an elongated bore coaxial with said unit bore and having one end thereof slidably accommodating an end portion of said piston, the opposite end of said section bore communicating with said passageway, said cylinder section including an adjustable portion abutting the portion of said unit second surface circumjacent said unit bore open end and cooperating with said removable means to effect clamping of said unit therebetween whereby said unit and said cylinder section are in a relatively fixed position.

3. The apparatus defined in claim 2 wherein the passageway-forming peripheral portion of said cylinder section is contacted by the valve disposed within the inlet port in said head unit, when said valve is in open position, and limits the opening of said valve.

4. In an homogenizing apparatus, the combination of a reciprocating piston, a stationary head unit spaced from said piston and provided with an open end bore aligned with said piston, a cylinder section removably mounted within said unit bore and slidably accommodating a portion of said piston, and removable means cooperating with a portion of said section projecting from a first surface of said unit adjacent said piston and with said unit first surface to prevent movement of said section relative to said unit in a direction away from said piston, relatively spaced inlet and outlet ports disposed intermediate the ends of said bore and in communication therewith, valves disposed within said inlet and outlet ports and alternately operable to effect opening and closing of said ports upon reciprocation of said piston, and a shoulder formed on the interior surface of said bore intermediate the end of said bore adjacent said piston and said ports; said cylinder section having the periphery of the portion thereof disposed within said unit bore cooperating with the interior surface of said bore to form an annular passageway communicating with said inlet and outlet ports, said cylinder section being provided with an elongated bore coaxially disposed with respect to said unit bore, one end of said section bore slidably accommodating an end portion of said piston, sealing means carried by said cylinder section adjacent said one end and in encompassing relation with the accommodated piston end portion, said

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sealing means being passable through said unit bore, the other end of said section bore communicating with said annular passageway, said section including an adjustable portion abutting a second surface of said unit opposite said first surface and circumjacent said unit bore, and cooperating with said removable means to clamp said unit therebetween whereby said unit and said cylinder section are in a relatively fixed position.

5. The apparatus defined in claim 4 wherein the adjustable resilient portion includes an elongated axially aligned protruding stud, a hollow substantially hemispherical member provided with an opening through which the distal end of said stud extends, the diameter of said member being greater than the diameter of the adjacent open end of the unit bore, and a nut piece threadably mounted on the distal end of said stud and cooperating with said member to effect clamping of the latter between the unit and said nut piece.

6. In an homogenizing apparatus, the combination of a pair of relatively spaced reciprocating pistons, a stationary head unit spaced from said pistons, a pair of cylinder sections, one for each piston, removably mounted on said unit, and removable means cooperating with each of said cylinder sections and said unit to effect retention of said sections in relatively fixed positions on said unit; said unit being provided with a pair of relatively spaced substantially parallel elongated bores, each bore axially aligned with the direction of travel of a piston and being provided with relatively spaced inlet and outlet ports communicating therewith and valves disposed within said ports and alternately operable to effect opening and closing of said ports upon reciprocation of the piston aligned with said bore; each cylinder section having the periphery thereof cooperating with the interior surface of the unit bore in which said section is accommodated to form a passageway communicating with the inlet and outlet ports of said unit bore and being provided with an elongated bore coaxial with the unit bore in which said section is disposed, one end of said section bore slidably accommodating an end portion of an aligned piston, said one end of said section bore carrying adjustable sealing means encompassing said accommodated piston end portion to effect a fluid seal therebetween, the other end of said section bore communicating with said passageway; portions of said cylinder sections protruding from said unit bores and having segments thereof slidably accommodating said removable means.

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