June 30, 1936. B. TRUDEL ET AL 2,046,223

HOMOGENIZER

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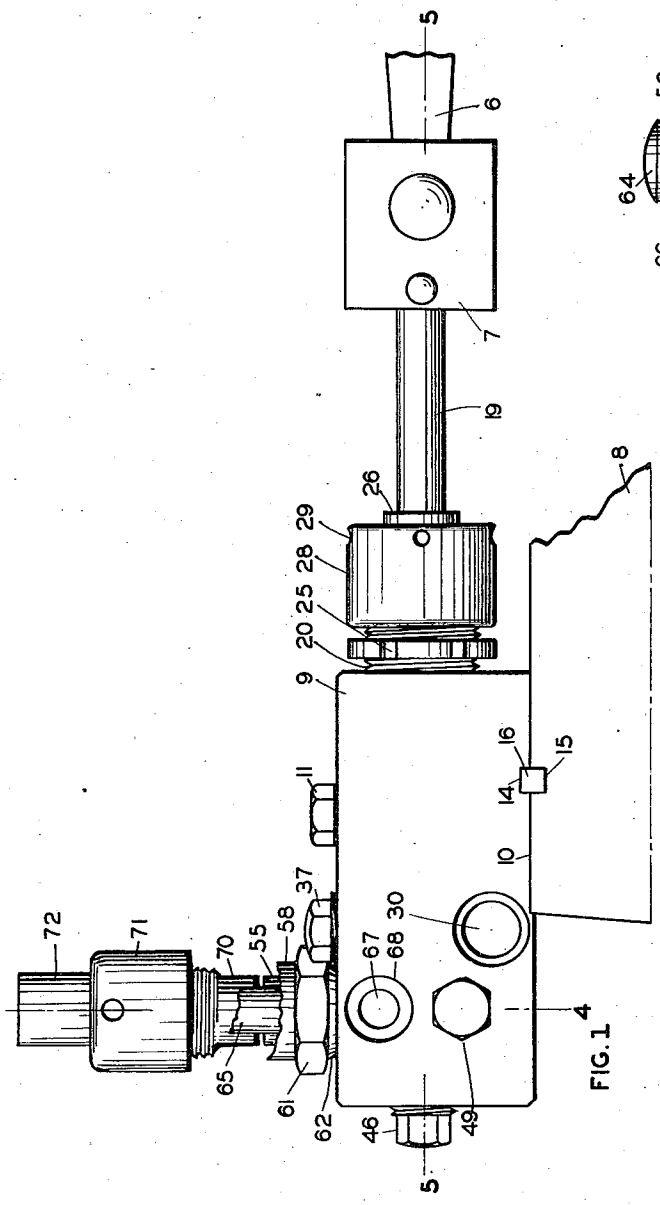


FIG. 1

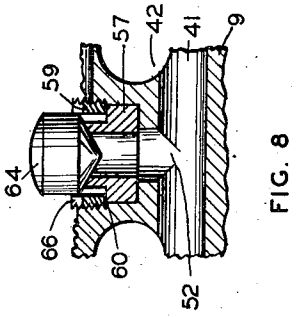


FIG. 8

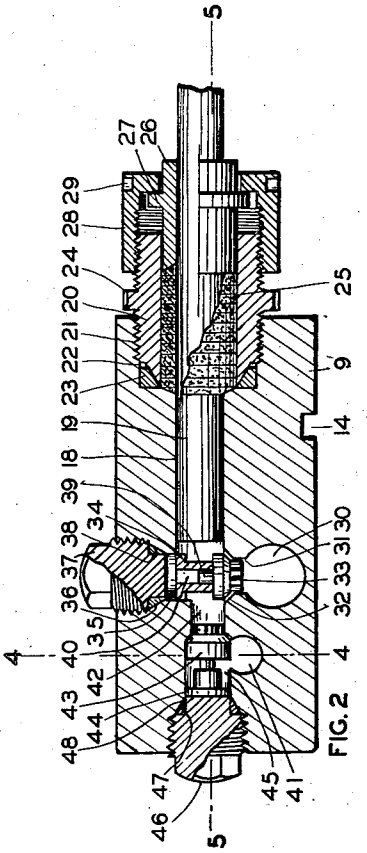


FIG. 2

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HOMOGENIZER

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FIG. 3

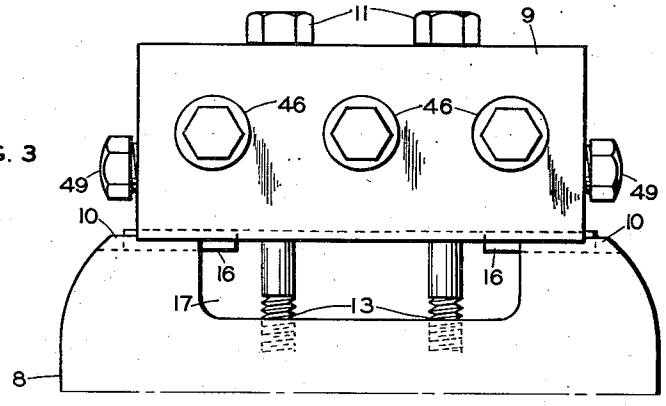


FIG.4

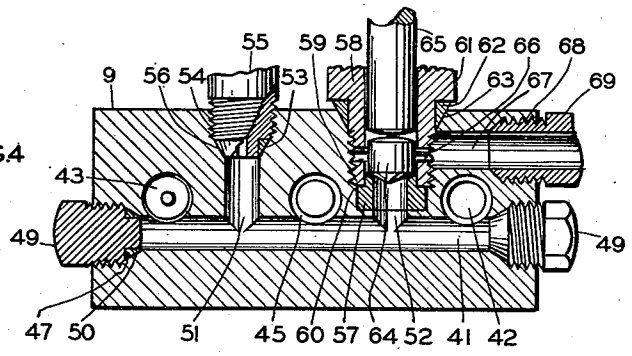
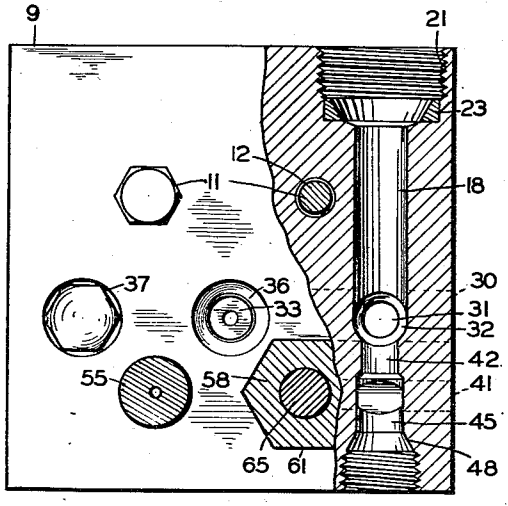


FIG. 5



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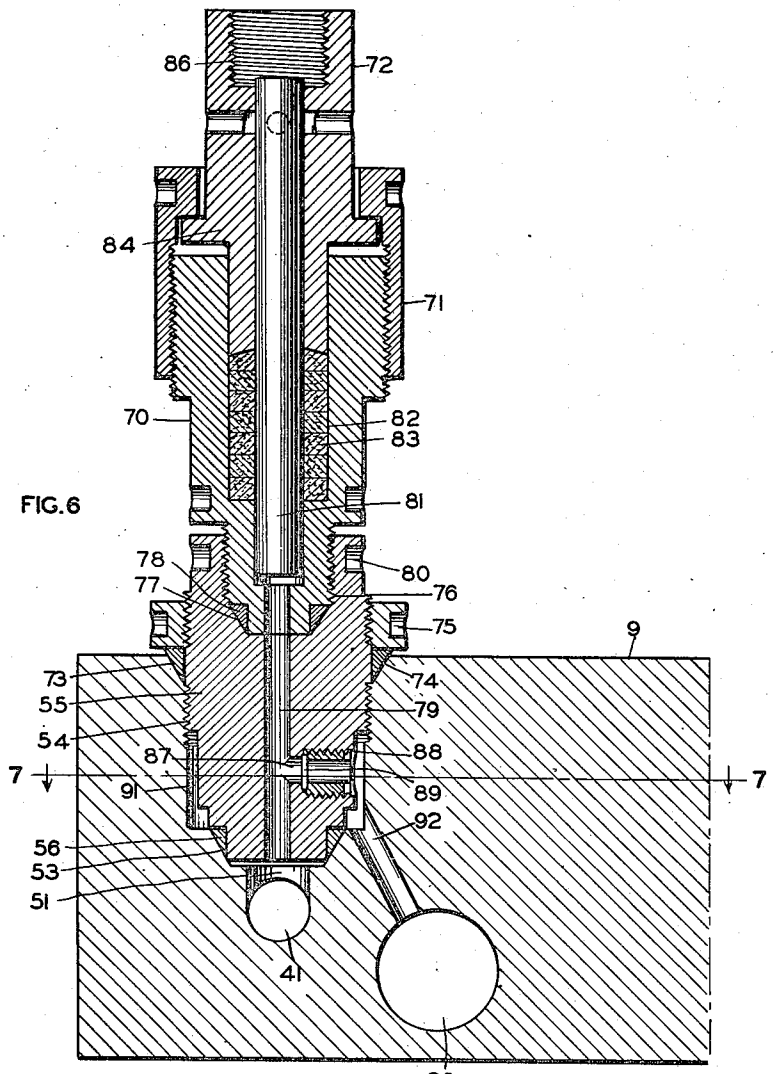
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HOMOGENIZER

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FIG. 6



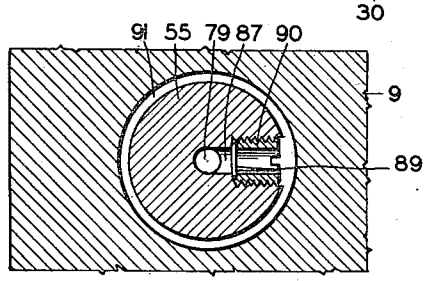


FIG. 7

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UNITED STATES PATENT OFFICE

2,046,223

HOMOGENIZER

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Application December 27, 1934, Serial No. 759,424
In Canada May 29, 1934

3 Claims. (Cl. 99—267)

Our invention relates to improvements in homogenizers such as used for dairy products, though not so limited, as the same may be adapted for homogenizing processes in various industries. The machine is, however, specially adapted to dairies owing to constructional features thereof, resulting in the least number of parts and total accessibility of all internal sections so that the sums may be easily and thoroughly cleaned in order to conform fully to the strictest health regulations affecting the industry.

The objects of the invention are, therefore, to provide a machine of the high pressure type, the pressure on the fluid to be homogenized being derived from reciprocating pistons, the cylinders for which, and all bores, valve chambers, and ducts, are of the continuous type, so that the same may be cleaned by passing a brush or other cleaning element directly through each opening from one end to the other.

Another object is to provide packing means for all glands, plugs, and connections, of absolute sanitary type and which will not interfere with direct cleaning as above-specified.

A further object resides in the provision of a cylinder unit which may readily be removed from the machine for cleaning and sterilizing with the least amount of adjusting and undue labour.

A still further object is to provide a simplified pressure gauging and safety system incorporated in such a manner as to prevent any spilling or waste of the fluid to be homogenized.

Other objects as well as many advantages of the machine will become apparent in the following description of the preferred embodiment of the invention, as shown in the drawings accompanying herewith, in which:

Fig. 1 is a side elevation of the parts of the homogenizing machine which are falling within the features of this invention;

Fig. 2 is a vertical, sectional elevation of the cylinder block in the plane of the axis of one cylinder;

Fig. 3 is an end view of the homogenizing block with portion of the machine standard;

Fig. 4 is a cross-section of the block taken on line 4—4 of Figs. 1 and 2;

Fig. 5 is a top view of the block with portion of same broken away showing ducts, valve seats, and packing means in a plane denoted by line 5—5 of Figs. 1 and 2;

Fig. 6 is an enlarged cross-sectional elevation of the combined pressure gauge and safety valve, together with portion of the block and showing a modification in the mode of packing the same to the block;

Fig. 7 is a cross-section of the same taken on line 7—7 of Fig. 6; and;

Fig. 8 is an enlarged view of the homogenized valve and seat, as shown in Fig. 4.

Similar and/or corresponding parts, in all the figures, are denoted by like numerals.

The machine generally consists of a suitable base, having mounted thereon a shaft to which a source of power is attached, and provided with cranks or cams in the required number so as to actuate a series of connecting rods having cross-heads and guides therefor from which the pistons depend. However, as the subject matter of the invention presently described is limited to those parts of the machine actually performing the homogenization, the parts of the machine heretofor mentioned are not shown in the drawings with the exception of part of a connecting rod 6, cross-head 7, and portion of the base 8.

The homogenizing portion of the machine consists in a block 9 of metal having great strength and of preferably rectangular cross and longitudinal sections. It is held to the base by resting on its top between guideways 10 running parallel with the axis of the pistons and securely held thereon by means of machine screws 11, there being two in the present illustration, which pass through perforations 12 in the block and which are threaded in the base as at 13.

In order to secure the block against any tendency of slipping on the base, keyways 14 in the block, and 15 in the base, are provided with keys 16 locking the two together.

For obvious reasons, explained later in this description, the block may be slipped off the machine in a longitudinal direction by removing the keys 16 and bolts 11. This may be accomplished by driving the keys towards the centre of the machine when they will drop in pit 17 provided in the base.

Directly in line with each cross-head is a bore 18 reaching substantially half-way in the block and in which pistons 19 reciprocate. It will be noted that there are three bores in the present machine adapted to receive three pistons intended to be operated by three cams or cranks, located 120 degrees apart so that the displacement caused by the reciprocating pistons will be balanced and therefore continuous.

The packing of the pistons in the block consists in an adapter 20 threaded in an enlargement of the bores, as shown at 21, and terminating in a taper 22, which rests against a ta-

pered ring 23 squarely seated in the block. The adapter is provided with a flange 24 having slots 25 so as to receive a key for either tightening or loosening the same. The bore of the adapter is sufficiently large over the diameter of the piston so as to allow suitable packing 25 between the two. The packing is pressed tightly into the nipple by means of a sleeve 26, slidably fitted over the piston and provided with a flange 27. Pressure is applied to sleeve 26 by means of a gland 28 threaded on the adapter, as shown, its head resting against flange 27. The gland is provided with means such as perforations 29 adapted to receive a tightening tool.

Admission of the fluid to be homogenized, so as to distribute the same to the three bores 18 forming cylinders for pistons 19, is by means of a transversal duct 30 extending through the block and provided with enlarged threaded portions towards the two sides of the block so as to receive proper connections with the fluid supply. A passage comprising a vertical opening 31 having the upper part tapered as at 32, to provide a valve seat, lying over duct 30 in line with each cylinder. A valve comprising a valve proper 33 and a circular valve guide 34 rests on the above-mentioned seat. A bore 35 leads the upper part of guide 34 extending vertically in the block above the valve seat. A portion of said bore 35 is tapered as at 36 and then enlarged to receive a plug 37 provided with a conical metal ring 38 squarely seated around the reduced portion of the plug, as shown. The valve proper and its guide 34 are interjoined by a small central pin 39 on the valve, slidingly fitted in hole 40 of the valve guide.

A second duct 41, transversely of the block, is intended to receive the fluid under pressure from the cylinders, through passages 42 in line with each cylinder and closed by check valve 43. These valves are of the same type as already described, the valve guide in the latter case being shown at 44, parallel to the cylinder being enlarged towards the edge of the block and there threaded to receive plugs 46, having its squarely seated conical packing ring 47 fitting on tapered portion 48 of the block. Duct 41 is closed at both sides of the block by means of plugs 49 threaded in the block, as shown, and also having a squarely seated packing ring 47 resting against the tapered portion 50 of the base.

The check valves with central pins, in conjunction with the reciprocating guides, forms an efficient leak-proof combination. The horizontal sets are constructed with guides on both sides thereof, as shown in the drawings.

Directly over duct 41 and connecting therewith are vertical ducts 51 and 52. Duct 51 tapers at 53 enlarging its bore which is threaded as at 54 to receive the pressure gauge and safety valve unit later described herein. Above duct 52 is located the homogenizing valve, and to receive the same, the bore is enlarged sufficiently for the installation of the hollow valve seat 57, which is preferably made of very hard steel or hard ferrous compounds such as stellite, directly underneath a sleeve 58 of which is an extension of the homogenizing valve body, omitted from the drawings as not being part of this invention, strictly speaking.

Sleeve 58 is threaded in the block, as shown, and has a separate lower ring 59 resting on shoulder 60 of the valve seat 57, there being a space between the ring and the seat as shown in Fig. 8. The extension of sleeve 58 is enlarged at 61 where it is preferably faced to receive a key to tighten the same. Squarely seated under the enlargement is a conical metal ring 62 fitting in the tapered portion of 63 of the block. Above valve seat 57, located in the bore of extension 58, is the valve member 64, also of hard metal, tapered underneath, as shown to properly seat on 57, and curved on top thereof to abut on the lower end of pressure rod 65. Ring 59 is provided with notches 66 to receive a tool for tightening same.

Passage for fluid from valve 64 is by means of the space between the upper and lower part of extension 59, to a duct 67, provided with a threaded portion 68 to receive connection 69 through which the homogenized fluid is ejected from the machine. It is understood, however, that without departing from this invention, the fluid may be led from the first homogenizing valve to a second stage of the same nature, if desired.

The pressure gauge and safety valve unit, shown in detail in Figures 6 and 7 consists of a body portion 55 threaded in the block at 54 and provided at the lower end with a squarely seated tapered packing ring 56 closing on tapered portion 53.

It will be seen here that portion 55 of this unit is seated at the top of the block in preference to the showing in Figures 4 and 5, where it is shown principally for location. The seating consists in a metal packing ring 73 having a straight internal wall fitting closely to a correspondingly straight wall on portion 55, the external wall of the ring being tapered to seat on tapered seat 74 in the block and pressed thereon by a ring 75 threaded on portion 55, as shown.

Portion 55 has a bore 76 at its upper part, threaded to receive second portion 70 adapted to screw therein and provided at its lower end with a squarely seated tapered packing ring 77 resting on a corresponding tapered seat 78 in the block. A central vertical bore 79 through portion 55 and the lower part of portion 70 is enlarged at 80 to receive a plunger 81 and further enlarged at 82 to receive packing 83 and a compression gland 84, adapted to be pressed down by a sleeve 71, as shown. Gland 84 is bored to allow the passing of piston 81 and enlarged at its top and there threaded as at 86 to receive the gauge indicating element (not shown).

The lower end of portion 55 has a cross duct 87 leading from bore 79 to an enlarged threaded bore 88, in which is installed a blow-off disc 89, held in place by a threaded hollow sleeve 90, as shown. It will be seen in the drawing that there is a space all around between the lower end of portion 55 and the bore in the block at that point forming a continuous passage 91. From this passage a duct 92 in the block leads to the main inlet duct 30, as shown.

It will be noticed that every duct, passage, or opening, in the machine, where fluid will have access, runs completely through the block so that when the connections, plugs, or other accessories are removed all ducts may be flushed or brushed from one end to the other. It will be seen also that all plugs, glands, and connections, leading to said ducts, are either provided with a conical sanitary packing ring fitting in a tapered portion of the block, or else machined to fit in a sanitary tapered packing ring seated in the block. In either case it presents a tapered plane surface joint at every connection, so that in brushing and flushing the apparatus no dirt, sediment, or any matter may remain therein. Another feature of great importance in this construction lies

in the fact that the packing ring forming a seat at the end of the plugs, etc., the fluid will not come in contact with the threads at any time during the process of homogenization.

The packing rings, whether the female rings in the block or the male rings on the components, are made of a comparatively softer metal than the block or components themselves. This will result in a leak-proof fit, will permit the harder tapered portion to make its proper setting in or around the ring, and also will allow the ring to be extended tightly in place when fastened in the block, and to be contracted tightly when mounted on the plugs, glands, or other accessories. It may be said here, that although the packing rings are preferably mounted at the end of the plugs and connections, there is no limitation to this as they may be effectively mounted so as to fit in the outside surface of the block as at **63** in Fig. 4 and **74** in Fig. 6, or in any other suitable place or manner.

Again drawing attention to the sanitary features of this machine, it may be said that, after the machine has completed the homogenization process, its cleaning may be readily attended to by removal of the block itself. This is accomplished by disconnecting fluid leads thereto and unscrewing the three sleeves **28** holding the piston packing. The keys **15** may then be pushed until they fall in pit **17**, when the block may be pulled rearwardly as a unit from the machine. After removing all the plugs already described, the block may be flushed either with water at high pressure or with brushes which can be passed through all the cylinders, ducts, valve chambers, etc., it being remembered that the nature of the packings will allow the lock to be sterilized with steam without any injury to them. When the block is so removed from the machine and stripped of its component elements, all ducts, cylinders, valve chambers, will be free and accessible, as the cutaway portion in Fig. 5 clearly illustrates.

In operation, connection is made from the supply of milk or other fluid by connection with the intake duct **30** and on setting the machine in operation the fluid will be drawn in the cylinders by way of valves **33** on withdrawal of the pistons and forced by way of valves **43** to the receiving duct **41**. From that point the fluid will flow up in duct **52** where due to its pressure it will raise plunger **64** which is adjusted to required pressure thereby homogenizing the fluid which will find its way out of the machine through duct **67** and led therefrom by connections, part of which is shown at **69**. The existing pressure in duct **41** will follow bore **79** in the gauge unit and cause plunger **81** to operate its indicating element. Should the pressure, through any cause, rise beyond the safe limit for the machine, relief will be offered by the blowing off of disc **89** allowing the free return of the fluid through passage **91** and duct **92** to the supply duct **30**, guarding against spilling and loss of any fluid.

We claim:

1. In a homogenizer including a cylinder block and fluid pressure imparting piston cooperating therewith, fluid inlet and outlet ducts in said block and a homogenizing valve body, a bore in said block over and connecting with said outlet duct, a homogenizing valve seat in the lower part of said bore, a ring threaded in said bore over said seat, the upper part of said bore threaded to receive the homogenizing valve body, the space between said body and said ring forming an exit for said fluid, a delivery duct in said block leading to said space, and seating means consisting in a ring of comparatively soft metal around said body resting on a tapered seat on said block.

2. In a homogenizer including a cylinder block and fluid pressure imparting pistons cooperating therewith, fluid inlet and outlet ducts in said block and a homogenizing valve body, a bore in said block over and connecting with said outlet duct, a homogenizing valve seat in the lower part of said bore, a ring threaded in said bore over said seat, the upper part of said bore threaded to receive the homogenizing valve body, the space between said body and said ring forming an exit for said fluid, and a delivery duct in said block leading to said space.

3. In a homogenizer including a cylinder block, pistons reciprocating therein, inlet and outlet ducts in conjunction with said pistons and said block, a safety valve comprising an element mounted in said block over said outlet duct, a bore in said block leading from the inlet of said valve to said outlet duct, a portion of said element being reduced to provide space therearound in said block having connection with the outlet of said valve, and a duct leading from said space to said inlet duct.

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