April 29, 1952 F. G. CORNELL, JR 2,594,399

APPARATUS FOR TREATING LIQUID DAIRY PRODUCTS

Filed Dec. 12, 1946

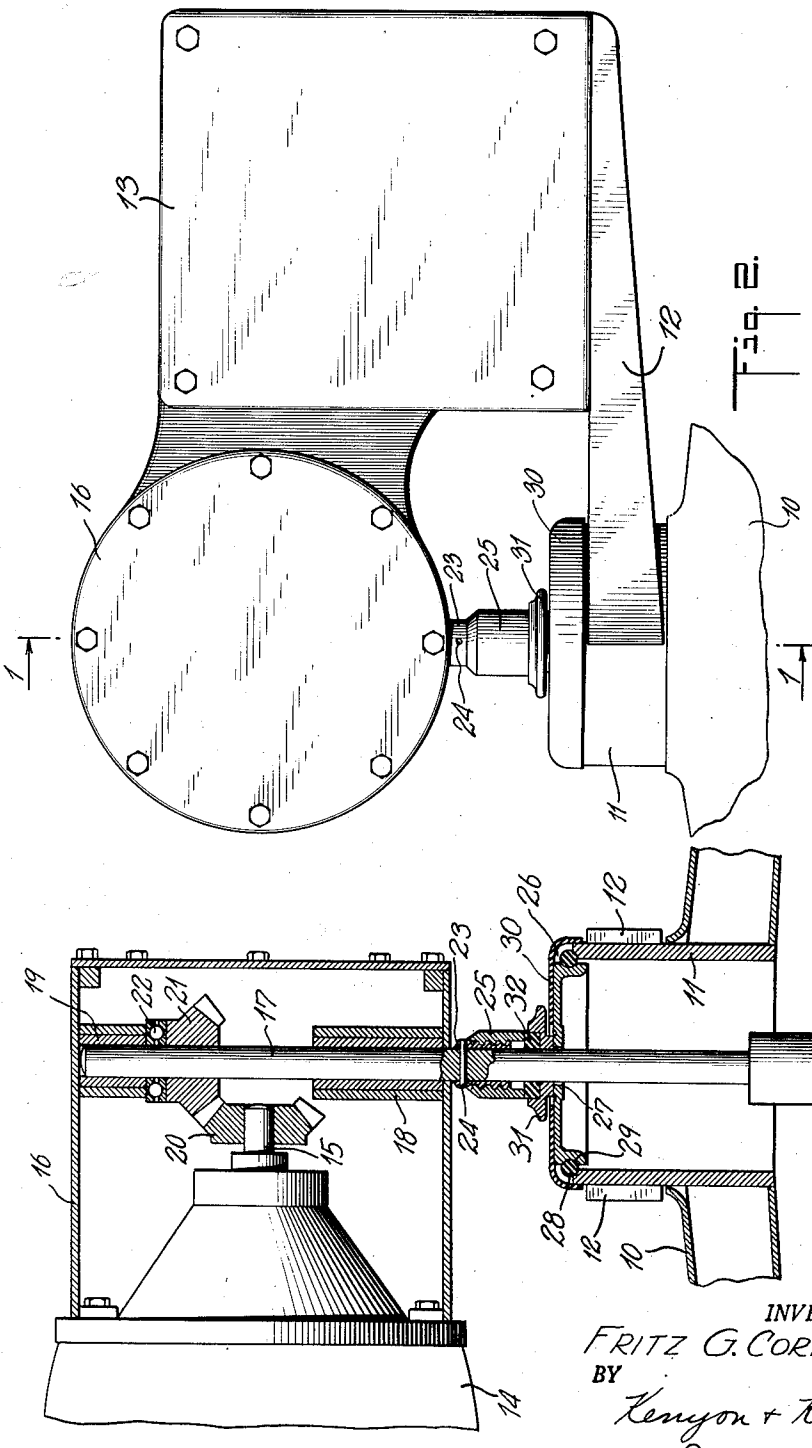


Fig. 1.

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Patented Apr. 29, 1952 2,594,399

UNITED STATES PATENT OFFICE

2,594,399

APPARATUS FOR TREATING LIQUID DAIRY PRODUCTS

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Application December 12, 1946, Serial No. 715,718

5 Claims. (Cl. 259—122)

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This invention relates to apparatus for treating liquid dairy products.

Certain methods of treating dairy products, such as milk and cream, require subjection of the product to certain conditions of temperature and vacuum as well as to agitation. One form of apparatus for treating dairy products under the above referred to conditions consists of a vat equipped with heating means and closed by a cover having an air-tight seal with the vat. The cover supports an agitator assembly including a shaft passing through the cover which is provided with a sleeve to receive the shaft. The sleeve is closed by an annular cap forming an air-tight seal therewith and with the shaft passing through the cap.

Heretofore, it has been customary to drive the shaft by a motor mounted on the surface of the cover. It has been found that, with this arrangement, the shaft may be moved out of alinement with the cap due to distortion of the cover due to warpage from the effects of the temperature and vacuum operating conditions within the vat. Such misalinement results in improper functioning of the apparatus. The warpage of the cover is the result of strains set up in it during fabrication, which strains are not uniform. The pull exerted on the cover by vacuum within the vat as well as the expansion of the cover due to temperature rise causes irregular distortion of the cover because of the aforementioned strains. Also, in this type apparatus, pressure may be produced within the vat for discharging the treated liquid dairy product therefrom and the same effect may result.

An object of this invention is an improved shaft operating arrangement and seal for such apparatus where alinement will always be maintained between the shaft and cap and the seal will remain tight both for vacuum and pressure conditions within the vat.

A further object of this invention is a vat seal of such nature that it may be readily taken apart and thoroughly cleaned without requiring dismantling of the shaft and its driving means.

Other objects, novel features and advantages of this invention will be apparent from the following specification and accompanying drawings, wherein:

Fig. 1 is a section taken along line 1—1 of Fig. 2 of an embodiment of the invention; and

Fig. 2 is an elevation of said embodiment.

The cover 10 of a vat of the type disclosed in Cornell Patent No. 2,295,098 is fragmentarily illustrated in Figs. 1 and 2. A cylindrical sleeve 11 extends through the cover 10 and is permanently attached thereto. An arm 12 is carried by the sleeve 11 and supports a frame 13 which in turn supports a motor 14 equipped with a standard built-on speed reducer having an output shaft 15. A housing 16 is attached to one end of the motor unit 14 and a shaft 17 is journalled in bearings 18 and 19 contained in said housing. A beveled gear 20 mounted on the shaft 15 meshes with a beveled gear 21 mounted on the shaft 17. Above the gear 21 is provided a thrust type anti-friction bearing 22. By the arrangement just described, the shaft 17 is supported by the sleeve 11 and remains in axial alinement with the sleeve irrespective of distortion of the container in the area through which the sleeve passes.

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An exteriorly-threaded collar 23 surrounds the shaft 17 below the housing 16 and is fixed to the shaft by a pin 24. A nut 25 surrounds the shaft 17 and is threaded to the collar 23. A cap 26 for the sleeve 11 has a central aperture 27 through which extends the shaft 17 and the exterior diameter of the cap is slightly less than the interior diameter of the sleeve 11 so that it may pass therethrough.

The cap 26 is held in position at the top of the sleeve 11 by a ring 28 of suitable resilient material, such, for example, as rubber which is seated in a groove 29 in the cap 26 and is of sufficient cross-section that its exterior diameter exceeds the interior diameter of the sleeve 11. A splash guard 30 of suitable material overlies the cap 26 and the upper end of the sleeve 11.

A ring 31 surrounds the shaft 17 and rests upon the cap 26. A recess is formed in the upper portion of the ring 31 to receive a gasket 32, the upper surface of which is engaged by the bottom surface of the nut 25. The cap 26 and the ring 31 are provided with co-operating annular surfaces of sufficient smoothness to form a vacuum-tight seal between the cap and ring during relative rotation thereof. Adjustment of the nut 25 on the member 23 compresses the gasket 32 against the ring 31 and around the shaft 17 sufficiently to cause unitary rotation of the shaft and ring and form a vacuum-tight seal between the shaft and ring. An agitator, not shown, is detachably supported from the shaft 17 within the vat by a coupling 33 of the type disclosed in said Cornell patent.

The shaft 17 is maintained in alinement with the sleeve 11 and the annular surfaces of the cap 26 and ring 31 are maintained in sealing relation irrespective of the strains which may be applied to the material constituting the cover by reason of the frame 13 being supported by the sleeve 11. Also, the seal formed at the top of the sleeve 11 is effective for maintaining either sub-atmospheric or superatmospheric pressure in the vat. When a vacuum exists within the vat 10, the cap 26 is urged inwardly to compress the ring 28 by the pressure differential between its top and bottom surface to form a tight seal around the cap rim while the gasket 32 provides a tight seal between the shaft and

the cap. When pressure is applied to the interior of the vat for discharging its contents, a tight seal is maintained against air escape by compression of the ring 28 and the gasket 32 through pressure applied thereto by the nut 25.

After disconnection of the agitator from the shaft 17, the seal between the shaft 17 and the sleeve 11 may be dismantled by screwing the nut 25 upwardly far enough to permit the ring 28 to be pried out of the groove 29 and drawn down through the sleeve. Thereafter, the cap 26, splash guard 30, ring 31, gasket 32 and nut member 25 may be passed down along the shaft and through the sleeve. After the parts have been cleaned, they may be assembled by procedure reverse to the demounting procedure.

It is to be understood that various modifications may be made in the device above described, without in any way departing from the spirit of the invention as defined in the appended claims.

I claim:

1. In combination with a closed container, a sleeve supported by and extending through a portion of said container, a rotatable shaft extending through said sleeve, a first member of less cross-section than said sleeve surrounding said shaft and capable of movement through said sleeve, a sealing member in contacting relation with said first member and said sleeve and of sufficient cross-section that its exterior diameter exceeds the interior diameter of said sleeve, a second member surrounding said shaft and engaging said first member, said two members having smooth contacting annular surfaces constituting a vacuum and pressure tight seal, a gasket surrounding said shaft and engaging said second member, an externally threaded collar fixed to the shaft, and a nut threaded on the collar for compressing said gasket against said second member.

2. In combination with a closed container, a motor, a sleeve supported by and extending through a portion of said container, a rotatable shaft extending through said sleeve, a first member of less cross-section than said sleeve surrounding said shaft and capable of movement through said sleeve, a sealing member in contacting relation with said first member and said sleeve and of sufficient cross-section that its exterior diameter exceeds the interior diameter of said sleeve, a second member surrounding said shaft and engaging said first member, said two members having smooth contacting annular surfaces constituting a vacuum and pressure tight seal, a threaded member fixed to said shaft, a nut member surrounding said shaft and screwed onto said threaded member, a gasket interposed between said nut member and said second member, and means carried by said sleeve constituting a sole support for said shaft and said motor, and a fixed coupling between said shaft and said motor whereby said shaft and sleeve are maintained in alinement with said surfaces in sealing relation and said coupling is always free of distorting stresses irrespective of distortion of the container in the area through which said sleeve and shaft pass.

3. In combination with a closed container, a sleeve supported by and extending through a portion of said container, a rotatable shaft extending through said sleeve, a first member in vacuum and pressure tight relation to said sleeve and having an aperture through which said shaft extends, a second member surrounding

said shaft and engaging said member, said two members having smooth contacting annular surfaces constituting a vacuum and pressure tight seal, a gasket surrounding said shaft and engaging said second member, an externally threaded collar surrounding the shaft, means fixing the collar to the shaft and a nut threaded on the collar for engaging and for compressing said gasket against said second member.

4. In combination with a closed container, a motor, a sleeve supported by and extending through a portion of said container, a rotatable shaft extending through said sleeve, a first member in vacuum and pressure tight relation to said sleeve and having an aperture through which said shaft extends, a second member surrounding said shaft and engaging said first member, said two members having smooth contacting annular surfaces constituting a vacuum and pressure tight seal, a gasket surrounding said shaft and engaging said second member, adjustable means carried by said shaft for compressing said gasket against said second member, means carried by said sleeve constituting a sole support for said shaft, and a fixed coupling between said shaft and said motor whereby said shaft and sleeve are maintained in alinement with said surfaces in sealing relation and said coupling is always free of distorting stresses irrespective of distortion of the container in the area through which said sleeve and shaft pass.

5. In combination with a closed container, a motor, a sleeve supported by and extending through a portion of said container, a rotatable shaft extending through said sleeve, a first member of less cross-section than said sleeve surrounding said shaft and capable of movement through said sleeve, a sealing member in contacting relation with said first member and said sleeve and of greater overall dimensions than said sleeve, a second member surrounding said shaft and engaging said first member, said two members having smooth contacting annular surfaces constituting a vacuum and pressure tight seal, a gasket surrounding said shaft and engaging said second member, adjustable means carried by said shaft for compressing said gasket against said second member, means carried by said sleeve constituting a sole support for said shaft, and a fixed coupling between said shaft and said motor whereby said shaft and sleeve are maintained in alinement with said surfaces in sealing relation and said coupling is always free of distorting stresses irrespective of distortion of the container in the area through which said sleeve and shaft pass.

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