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R. L. HANSON ET AL

2,748,802

VALVE CONSTRUCTION

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Fig. 1.

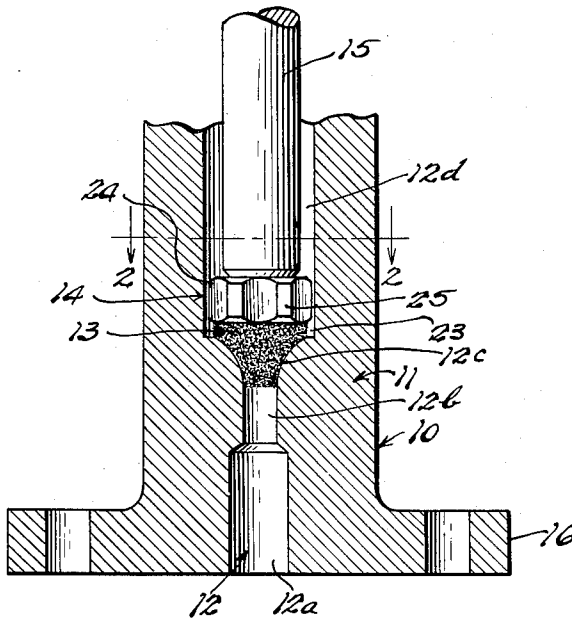


Fig. 3.

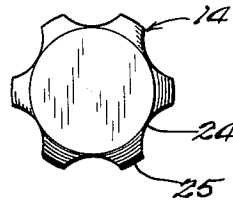


Fig. 4.

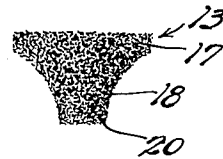


Fig. 2.

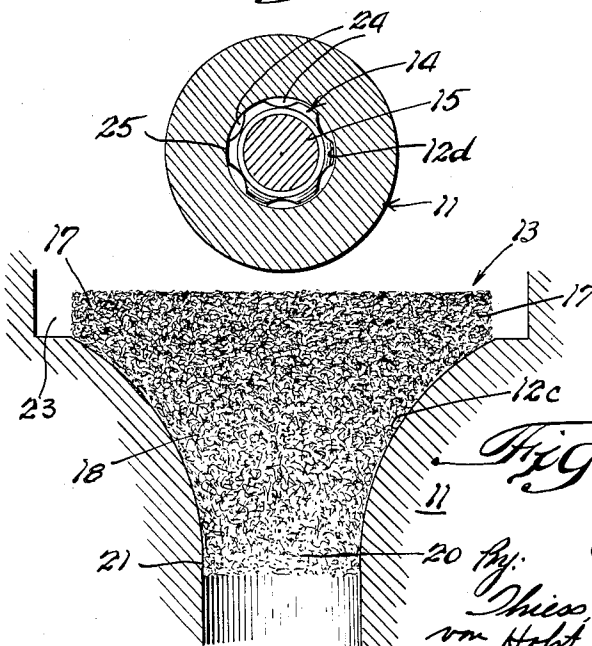


Fig. 5.

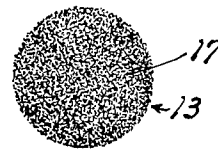


Fig. 6.

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1

2,748,802

VALVE CONSTRUCTION

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3 Claims. (Cl. 138—42)

This invention relates to a homogenizing apparatus and more particularly to improvements in a homogenizing valve construction of the character disclosed in Patent No. 2,304,689, dated December 8, 1942.

For a clear understanding of the principles and operational effects involved in the homogenization of milk and milk products in apparatus employing a valve of this character, reference should be made to the aforementioned patent.

Heretofore, in a valve construction of the type comprising a heterogeneously matted structure of wire having minute interconnected passages therethrough, it has been found that in the treatment of some milk products, such as ice cream mix, there is a tendency for partial obstruction of the minute passages by the less fluid ingredients. In extreme cases of this condition, the high pressure under which the product is delivered to the valve may force a slight compression or lifting of the valve from its seat, so that some portion of the product by-passes the minute interior passages of the valve and flows along its outer surface. In such instance, the by-passing portion of the product is not thoroughly homogenized, in that not all of the butterfat globules in that portion are broken into the smaller particles of fat necessary to effect their stable suspension and dispersion in the homogenized product, as is accomplished by the flow of the product under extreme velocity through the minute interior passages of the valve.

It is one of the objects, therefore, of this invention to provide a valve construction which will effectively eliminate such by-passing of the inner passages of the valve and will prolong the period of its effective use.

It is a further object of this invention to provide a homogenizing valve which is less sensitive to pressure fluctuations of the product being homogenized thereby effecting greater stability in operation of the valve.

It is a further object of this invention to provide a valve construction which is simple and inexpensive in construction, and is capable of producing proper homogenization of products, the fluidity of which varies over a wide range.

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

In accordance with one embodiment of this invention a valve construction is provided comprising a valve member formed of a homogeneous mass having a plurality of interconnected minute passages formed therein through which a product to be homogenized is forced to flow under pressure, and a retainer for accommodating said valve member. The retainer is provided with a neck portion having a passageway formed therein through which the product to be homogenized is caused to flow in one direction. The mass, forming the valve member, includes a nose portion having the distal end thereof adapted to extend into the retainer passageway and conform substantially to the shape thereof wherein the product flowing through the retainer passageway is likewise caused to

2

pass through the distal end into the interior of the nose portion.

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

Figure 1 is a fragmentary vertical sectional view of a portion of a homogenizing apparatus incorporating the improved valve construction;

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

Fig. 3 is an enlarged top plan view of the compression block which forms a part of the improved homogenizing valve construction;

Fig. 4 is a side elevational view of the improved valve member shown in Fig. 1;

Fig. 5 is a top plan view of the improved valve member shown in Fig. 4; and

Fig. 6 is an enlarged fragmentary vertical sectional view of the improved valve member and a portion of the retainer therefor shown in Fig. 1.

Referring now to the drawings and more particularly to Fig. 1, a homogenizing apparatus 10 is shown which includes a retainer member 11 having a center passageway 12 formed therein through which the product to be homogenized is caused to flow in one direction, a valve member 13 seated within a portion of the passageway 12, a compression block 14 resting on the top of the valve member 13 to effect seating of the latter within the retainer passageway 12, and an adjustable compression stem or bar 15 for applying seating pressure to the valve member.

The retainer 11, in this instance, has an apertured outwardly extending flange 16 formed on the lower side thereof which is adapted to facilitate attaching of the retainer to a pump for the homogenizing apparatus, not shown. The pump is adapted to impart an initial pressure, normally varying from 1,000 pounds to 1,500 pounds, to the product to be homogenized, upon the latter entering the lower end 12a of the passageway 12 of the retainer. It will be noted that retainer passageway 12, in this instance, is reduced in size at 12b before opening into the neck portion 12c of the passageway, the latter portion accommodating valve member 13. The upper portion 12d of the passageway 12 is relatively larger in cross-sectional area than the other portions of the passageway and is adapted to accommodate the compression block 14 and a part of the compression stem 15. The passageway portion 12d, through which the product is discharged subsequent to the butterfat globules having been broken up by valve member 13, communicates with an outlet port, not shown. It is to be understood, of course, that the exterior shape of the retainer is not to be limited to that shown in the drawing but may be varied to accommodate the particular design of the various associated units comprising the homogenizing apparatus.

The valve member 13 is formed of one or more crimped and convolved strands of resilient material, such as high grade spring steel, which is capable of resisting corrosion by the product being homogenized, and likewise will not have a deleterious effect on the product as to the taste and appearance thereof. The strand or strands should preferably range in size from .003 to .015 inch in diameter and should be possessed of sufficient resiliency to withstand the pressure of the flowing product without becoming permanently deformed. The strand or strands of the resilient material are preferably crimped prior to being convolved so as to form a resilient homogeneous mass having a plurality of minute interconnected passages through which the product, to be homogenized, is forced to flow. The homogeneous mass is preformed in a suitable die into a shape which conforms

to the shape of the neck portion 12c of the retainer passageway 12. The term "homogeneous mass" is intended to cover a mass which is formed from a strand or strands of resilient material which is of substantially uniform characteristics throughout and does not refer to the disposition of the material after being compressed into the valve member. As noted in Fig. 6, the valve member 13, in this instance, includes a head portion 17, which is annular or disk-shape in form, and a nose portion 18 which is integral with the head portion 17 and protrudes in one direction therefrom. The nose portion 18 has a trumpet shape outer periphery, which, in this instance, conforms in shape to the neck portion 12c of the retainer. The shape of the nose portion 18 of the valve member 13 and the neck portion 12c of the retainer passageway 12 may be considered akin to the peripheral shape of a solid which is generated by a nonrectilinear line spaced from and rotated about the center line of the head portion 17 as an axis. The distal or outer end 20 of the nose portion 18 of the valve member 13, as seen in Fig. 6, is blunt and projects into the restricted entrance 22 of the retainer neck portion 12c and conforms substantially to the cross-sectional shape of the entrance. By reason of the conformity of the distal end 20 with that of the entrance 22, the product, while flowing upwardly through passageway 12, is required to pass into and through the minute interconnected passages, pockets, or interstices formed in the distal end 20, as well as the remainder of the nose portion 18. The porosity of valve member 13 decreases progressively from the distal end 20 to the head portion 17, see Fig. 6, so that, as the product travels up through the progressively increasing cross area of valve member 13, the velocity of the flowing product will be substantially maintained. Furthermore, due to the differential in the porosity of the valve member, the larger passages or interstices formed in distal end 20 effect initially a greater shearing or breaking up of the butterfat globules than the smaller passages and interstices formed in the remainder of the valve member. The solid compression block 14 rests on and completely overlies the upper surface of the head end portion 17 of valve member 13, so that none of the product will flow upwardly out from the upper surface of the head portion 17. As the product approaches the upper or head end portion 17 of the valve member, it is diverted outwardly toward the upper periphery of the valve contacting the upper neck portion 12c of the retainer passageway 12. The diverted product then flows radially outward from within the upper portion of the valve 13 into an annular cavity 23, formed between the periphery of the passageway portion 12d and the annular periphery of head portion 17 of the valve member 13, and thence through lateral flutes or grooves 24 formed in compression block 14 into passageway portion 12d. The extent to which the distal end 20 of the nose portion 18 of valve member 13 projects into the restrictive entrance 22 of passageway neck portion 12c is such that the distal end of the valve member will always remain disposed in tight peripheral contact therewith when the valve is assembled. If, however, extreme pressure should develop within the homogenizing apparatus which would tend to move the valve member 13 upwardly relative to the retainer, a part of the distal end 20 will still remain within the restrictive entrance 21 and thereby insure that the product, while flowing through the homogenizing apparatus, will be required to pass therethrough. It is to be understood, of course, that any appreciable relative upward movement of the valve member 13 with respect to the retainer, occurs under only unusual conditions where extremely high pressures develop.

The compression block 14, as seen in Figs. 1 and 3, which rests on top of the head portion 17 of the valve member 13, when the valve is in assembled relation, is formed preferably of high grade steel which is not adversely affected by the product being homogenized. The

block 14 has the periphery thereof provided with a plurality of symmetrically arranged grooves or flutes 24 which permit the product to pass from annular cavity 23 into passageway portion 12d. The radially extending lands 25, disposed intermediate the grooves or flutes 24, are adapted to slidably engage the interior surface of passageway portion 12d.

The upper end of stem 15, not shown, is adapted to be threaded into the upper end of retainer 11, and terminates in a handle disposed outside the retainer for facilitating turning of the stem and applying seating pressure to the valve member 13. The diameter of stem 15 is considerably less than the interior diameter of passageway portion 12d, thereby permitting the product freely to flow through the space around the stem.

Thus, it will be seen that an improved valve construction for a homogenizing apparatus has been devised which effectively and efficiently accomplishes the homogenization of all of the product subjected to treatment. Furthermore, the improved valve construction is simple and compact in construction and is inexpensive to produce.

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.

We claim:

1. In a homogenizing apparatus for a dairy product, or the like, the combination of a valve member composed of a strand of resilient material convolved to produce a homogeneous mass of a substantially trumpet-shaped configuration and having a plurality of interconnected minute passages formed therein through which such a product flows under pressure and is homogenized with but a minimum of protein destabilization of such product, and a retainer of substantially the same trumpet-shaped configuration as said valve member and in which said valve member is forcibly seated, said retainer having the smaller end thereof terminating in a passageway through which such product passes in one direction prior to contacting said valve member; said valve member having a nose portion at the smaller end thereof projecting into said passageway and yieldably engaging the interior surface thereof, whereby substantially the whole cross-sectional area of the protruding nose portion of said valve member is penetrated by the product flowing through said passageway.

2. The homogenizing apparatus recited in claim 1 wherein the porosity of said valve member decreases progressively from said protruding nose portion to the opposite end of said valve member.

3. In a homogenizing apparatus for a dairy product, or the like, the combination of a replaceable valve member composed of a fibrous homogeneous mass of a substantially trumpet-shaped configuration having a plurality of interconnected minute passages formed therein through which a product flows under pressure and is homogenized with but a minimum of protein destabilization of such product, and a retainer for accommodating said valve member and being of substantially the same trumpet-shaped configuration as the latter, the smaller end portion of said retainer communicating with a centrally disposed passageway through which the product to be homogenized passes in one direction prior to contacting said valve member; said valve member including an annular head portion of substantially low porosity protruding beyond the larger end portion of the retainer and downstream of the direction of flow of the product and a nose portion of substantially high porosity, said nose portion being aligned with the center line of said head portion and projecting into said passageway and resiliently contacting the surface of the latter whereby the product flowing through said passageway penetrates the whole of said nose portion; the porosity of said valve

5

member becoming progressively less from said nose portion to said head portion whereby the direction of flow of the product through said valve member upon approaching said head portion of said valve member is deflected toward the periphery of said valve member and substantially normal to the center line of said head portion.

5

6

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