Dec. 28, 1954 G. W. MacILWAINE 2,697,978

APPARATUS FOR EXTRACTING LIQUID FROM LIQUID-BEARING MATERIAL

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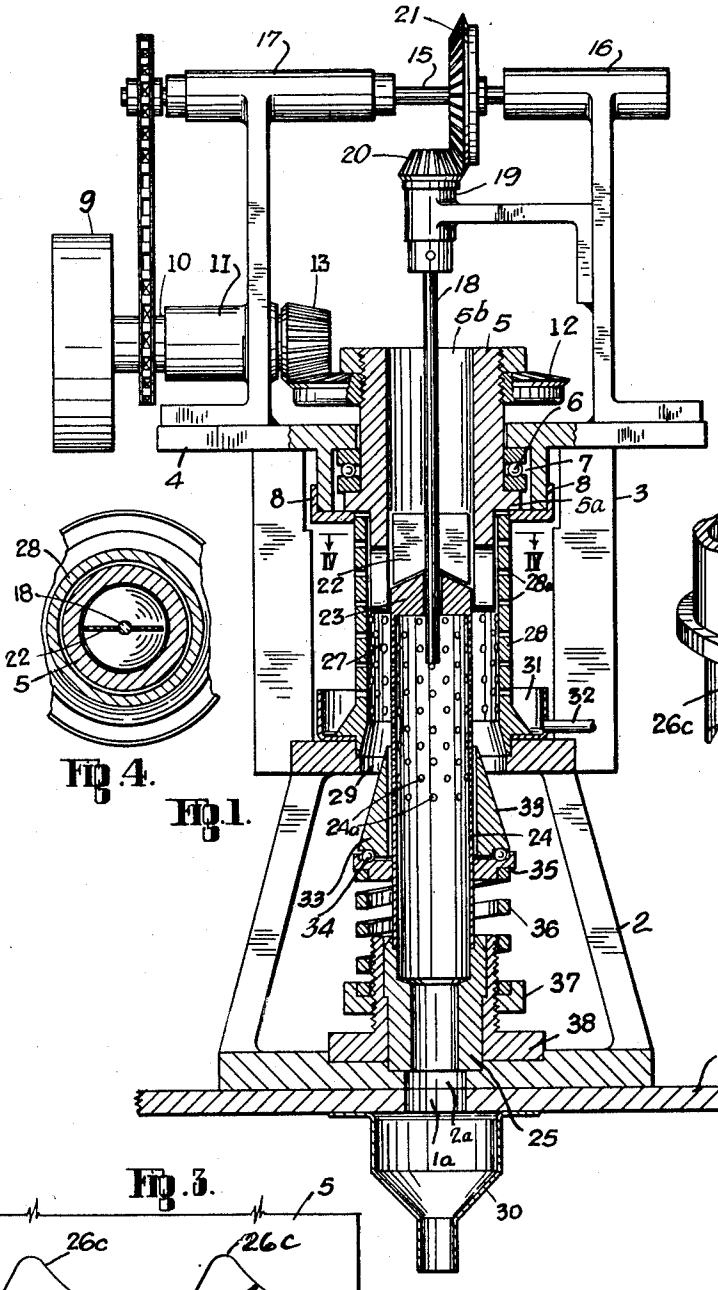


Fig. 1.

Fig. 4.

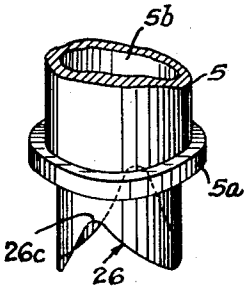


Fig. 2.

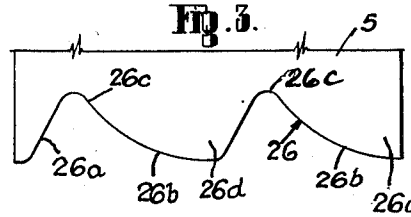


Fig. 3.

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APPARATUS FOR EXTRACTING LIQUID FROM LIQUID-BEARING MATERIAL

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2 Claims. (Cl. 100—107)

This invention relates to an improved apparatus for extracting liquid from liquid bearing material, such as oil from vegetable seeds, of the type in which the material is subjected to pressure in a ported cylinder by means of a rotating worm element displacing the material axially thereof.

Apparatus of this type have usually comprised a ported cylinder and a multi-convolution worm rotating therein, forcing the material axially along the cylinder from the feed end to an outlet opening where the material is ejected, usually in the form of cake suitable for the feeding of animals.

An object of the present invention is to provide a more efficient removal of the liquid content from the oil-bearing seed, dye-containing bark or the like material, and a further object is to reduce the mechanical power necessary for the operating of the machine.

According to the present invention, material to be substantially relieved of its liquid content is fed to the annular space between a pair of coaxial cylinders, one or both of which is or are ported for the escape of liquid, and subject to pressure therein while displaced axially thereof by means of a rotating impeller in the form of a worm sleeve having its end cut away as a single convolution of single or multiple pitch.

The invention will be further described with reference to the accompanying drawings showing one form of construction by way of example.

In the drawings:

Fig. 1 is an elevation of an apparatus, partly in section,

Fig. 2 is a detail view of the impeller,

Fig. 3 is a diagram showing the development of the operative surface of the impeller,

Fig. 4 is a sectional plan view on the line IV—IV of Fig. 1.

The apparatus is supported upon a base **1** by a skeleton framework comprising a skeleton truncated cone member **2** resting upon the base **1** and supporting a skeleton cylindrical member **3**, surrounded by a collar **4**.

An impeller **5** in the form of a cylindrical sleeve, having a ridge **5***a* supporting a ball race **6** disposed within an annular space **7** defined by the collar **4** and an inverted collar **8**, is rotatable from a driving wheel **9** on a shaft **10** mounted in a bearing **11** supported by collar **4**, by means of bevel gearing **12, 13**. By means of chain and sprocket drive **14**, connecting shaft **10** with a shaft **15**, mounted in bearings **16** and **17** supported on collar **4**, driving wheel **9** also rotates a shaft **18** mounted at its outer end in a bearing **19** and driven from shaft **15** through bevel gearing **20, 21**.

Shaft **18**, extending through the interior cylindrical chamber **5***b* of impeller **5**, is provided with stirrer blades **22** and is mounted at its lower end in a bearing **23**, which also acts as closure means for the upper end of an inner cylinder **24**, supported by collar **25** on the base of cone member **2**. Shaft **18** and blades **22** together comprise a rotary agitator and it will be appreciated that rotation of driving wheel **9** causes impeller **5** and shaft **18** to rotate in opposite directions.

The lower end of impeller **5** is cut away as a convolution of double pitch **26** to produce leading edges **26***a*, trailing edges **26***b*, recesses **26***c* and projecting tongues **26***d*.

Liquid bearing material fed by suitable means, such as a chute (not shown), into cylindrical chamber **5***b* is pressed by rotating blades **22** assisted by gravity into a

confined space above bearing **23** formed by recesses **26***c* of rotating impeller **5**, by which, under the combined action of gravitational attraction and pressure exerted by trailing edges **26***b*, the material is forced through an annular space **27** between a pair of coaxial cylinders, comprising inner cylinder **24** and an outer cylinder **28** supported on cone member **2**, being discharged via an annular outlet **29**.

The pressure exerted on the liquid bearing material in the above manner causes the liquid content to exude from annular space **27** through perforations **24***a* and **28***a* in cylinders **24** and **28** respectively. Liquid passing through perforations **24***a* flows down the inside of cylinder **24** and collar **25** and through apertures **2***a*, **1***a* in cone member **2** and base **1** respectively to a withdrawal conduit **30**. Similarly, liquid passing through perforations **28***a* collects in an annular gutter **31** and is withdrawn through a conduit **32**.

The area of outlet **29** may be varied by means of an adjustable conical obturating plug **33**, seated on a ball race **34** supported on an annular disc **35**, loaded by means of a spring **36** in contact with a nut **37** in threaded engagement with a sleeve **38** surrounding collar **25**. Adjustment of nut **37** controls the average pressure developed on the material in annular space **27**, while the spring loading of plug **33** tends to compensate for variations of pressure on the material.

Amongst the advantages resulting from use of the apparatus according to the invention are the following:

(*a*) Whereas the orthodox type of expeller employs the Archimedian screw principle to a greater or less degree for the conveyance of the material through the machine for oil-freeing purposes, and this Archimedian screw is surrounded by a porous unit through which oil percolation is possible, the present apparatus employs a novel type impeller of cylindrical form having a single convolution which can be made to induce material to travel under pressure between the outer and inner perforated units, thus the wear and tear on this impeller is taken over its length, and not its thickness, as is the case with the Archimedian screw threads.

(*b*) When, as in the preferred embodiment of the invention, the impeller is disposed between two cylindrical perforated units there are provided two exits for the displaced miscella, resulting in the contained oil in the mass having only to travel half the distance through the compressed mass undergoing squeezing in order to find an exit. By this expedient, lower pressure can be employed.

(*c*) Frictional heat generated with the apparatus is minimized on account of the fact that the impeller only impinges on the material at the time of initial entry and packing.

Whilst the apparatus has been described for use in connection with extracting liquid from liquid bearing material it is to be understood that it may be employed for the extraction of fats which are normally solids but liquid under the conditions of extraction.

I claim:

1. An apparatus for extracting liquid from liquid bearing material, including in combination a pair of coaxial cylinders, at least one of which is ported for the escape of liquid, an upper portion of the inner cylinder extending into the confines of a lower portion of the outer cylinder to form an annular space defined by the overlap between said inner and outer cylinders, said annular space terminating at its lower end in an annular outlet, closure means for the upper end of the inner cylinder, and an impeller in the form of a cylindrical sleeve, extending into the confines of an upper portion of the outer cylinder and having its lower end terminating adjacent said closure means and above and adjacent the upper end of said annular space, said sleeve having its lower end cut away as a single convolution of a pitch effective to provide communication between the inside of said sleeve above said closure means and the annular space as herein before defined.

2. An apparatus for extracting liquid from liquid bearing material, including in combination a pair of coaxial cylinders, at least one of which is ported for the escape of liquid, an upper portion of the inner cylinder extend-

ing into the confines of a lower portion of the outer cylinder to form an annular space defined by the overlap between said inner and outer cylinders, said annular space terminating at its lower end in an annular outlet, closure means for the upper end of the inner cylinder, an impeller in the form of a cylindrical sleeve, having an external diameter substantially equal to the internal diameter of the outer cylinder, extending into the confines of an upper portion of the outer cylinder and having its lower end terminating adjacent said closure means and above and adjacent the upper end of said annular space, said sleeve having its lower end cut away as a single convolution of a pitch effective to provide communication between the inside of said sleeve above said closure means and the annular space as herein before defined, means to rotate said impeller, a stirrer disposed immediately above said closure means, and means for regulating the pressure resistance to axial displacement of material within the annular space between said coaxial cylinders.

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