Sept. 1, 1959 K. ÖRNULF DAHL 2,901,967

PRESS FOR BULK MATERIAL

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Fig. 1.

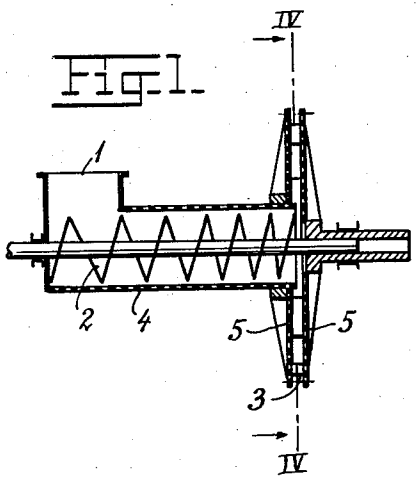


Fig. 2.

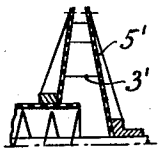


Fig. 3.

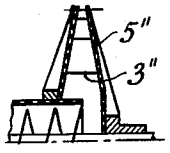


Fig. 4.

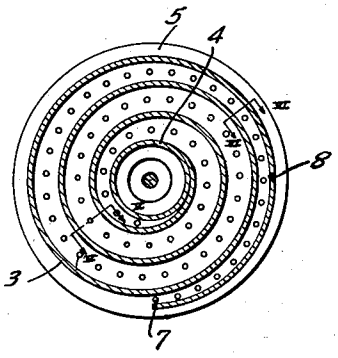


Fig. 5.

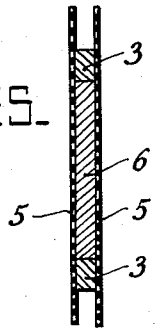
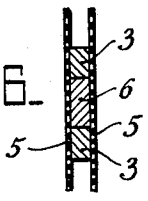


Fig. 6.



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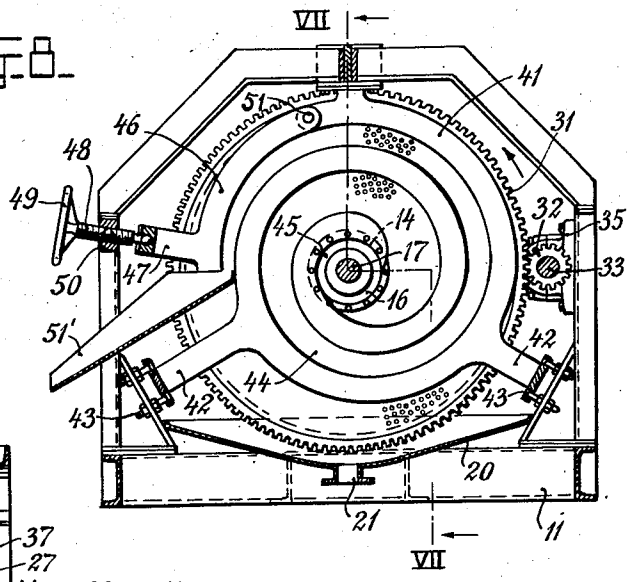
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Fig. 8.



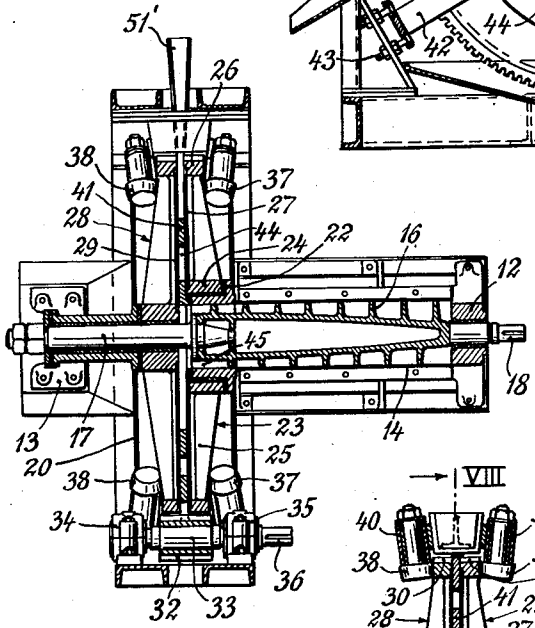
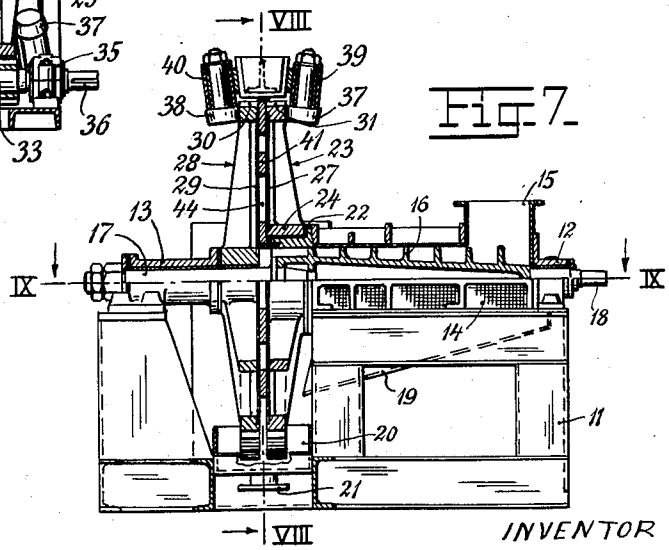


Fig. 9.

Fig. 7.



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PRESS FOR BULK MATERIAL

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Application November 24, 1954, Serial No. 471,005

Claims priority, application Norway November 25, 1953

11 Claims. (Cl. 100—148)

The present invention relates to a continuously operating bulk material press particularly suited for herring oil and fish flour factories, where the raw material is subjected to pressing during the process for separating oil and water.

The predominating practice in the herring oil and fish flour industry is to use continuous screw presses with single or duplex pressing screws. Common to these presses is that they have a horizontal screw or horizontal screws respectively, surrounded by a cage consisting of perforated plates, slotted plates, rods with small mutual spacing or the like. The screws are designed so that the volume of the threads constantly decreases from the feeding end to the outlet end of the press. When the screw rotates the material will be advanced by the press and because of the decreasing thread volume will be subjected to a constantly increasing pressure. Oil and water are thus pressed out through the openings of the press cage, which at the same time exert a guiding action on the press cake, so that it is not entrained in the rotation of the screw.

The press cake is displaced forwards by inclined plane-action throughout the length of the press cage, which for the largest machine types may be up to about 4 meters. Apart from the fact that presses of this design involve high purchase costs, require much space and have a high weight, the press cake is treated in an unfavorable manner for the following reasons:

In order to maintain a reasonable capacity the press cake at the discharge end is kept relatively thick. At the feeding end the condition in this respect is still worse, the core diameter of the screw being here relatively small. These presses only permit oil and water to run off to one side.

The moisture contained in the press cake adjacent the screw core will have to pass through the whole press cake in order to penetrate outwards through the press cage. If this shall be possible it is necessary to rely on the draining capacity of the press cake itself, which is difficult to achieve in a satisfactory manner. Since the press cake slides along the press cage throughout the length of the latter, it is not possible to prevent fine particles of the press cake from being ground off, and penetrating outwards through the openings of the press cage causing the formation of much sludge. Due to the frequent variations in raw material a varying compression ratio is required. Several solutions for this exists, but none can be said to be efficient, since they do not change the pitch of the actual pressing screw threads. In addition, the existing solutions for regulating the pressure ratio between the inlet and outlet openings are difficult and in part impossible to exert during the operation of the press.

Further, since the press cage is stationary, sludge that has been pressed out will easily build up exteriorly on the many reinforcing ribs and bridges of the cage and block the straining surface. The presses therefore require a constant scavenging and cleaning in order to keep the straining faces clean.

Finally, it is to be mentioned that it is very important to keep a favorable temperature of the press cake during pressing in order to facilitate separation of the oil. In an effort to obtain this, steam is supplied to the screw cores. In the core wall radial holes are bored, mostly two for each turn of the thread. The steam is admitted into the screw core at the feeding end and the condensate is then supposed to escape through the radial holes of the core. This solution encounters great difficulties and is rather inefficient. For one thing the press cake is heated from one side only (the side engaging the screw core). If the condensate shall leak out from the screw core, the steam pressure in the screw must be higher than the opposed pressure caused by the pressing action. Since the boiler pressure in the factories is usually about 10 to 12 kilograms per square centimeter, the necessary steam pressure is not obtained. Consequently, the pressure of the press cake will dominate, fine particles of the press cake penetrate inwardly through the radial holes and will finally fill up the screw core with sludge and water which cannot be removed at all. In the end the possibility of supplying steam to the screw will be excluded, and the entire heating of the press cake fails.

The present invention makes it possible to overcome these drawbacks. With a view to this a press body is used which has windings extending spirally one outside the other so as to form a passage of spiral shape for the material, whereas the straining member affords lateral confinement of the spiral passage.

Further features of the invention as well as the advantages which can be obtained with the same will be illustrated in the following specification having reference to the drawings.

Fig. 1 is a diagrammatic view in axial section of the press according to one embodiment.

Figures 2 and 3 are partial views in axial section of modified embodiments.

Fig. 4 is a sectional view of the pressing body taken along the line IV—IV in Fig. 1.

Figures 5 and 6 are sectional views at a larger scale of various portions of the spiral passage in an embodiment similar to that of Fig. 1 taken along the line V—V and VI—VI respectively of Fig. 4.

Fig. 7 is a sectional side view at a larger scale and taken along the line VII—VII in Fig. 8, of a press largely similar to the embodiment shown in the Figures 1, 4, 5 and 6, but showing additional constructional details.

Figures 8 and 9 are sectional views taken along the lines VIII—VIII and IX—IX respectively in Fig. 7.

In the Figures 1 to 6 corresponding elements have the same reference numerals.

In the embodiment of Fig. 1 the feeding of the mass which comes down in a hopper **1**, takes place by means of a screw **2** which introduces it into the center of the spiral-shaped pressing body **3**. The screw **2** is surrounded by a straining cage **4** and may have a pitch ratio, that is, it may have the shape of a screw press in order to cause a preliminary straining before the mass enters the pressing spiral **3**. The latter is in the present case assumed to be mounted stationary and made as one single continuous spiral of suitable thickness and covered on both sides by a pair of straining plates **5**, which rotate in mutual synchronism about an axis passing through the center of the spiral and at a velocity suited for passing the mass outwardly through the spiral passage from the center to the periphery, at which the passage has its outlet, indicated at **7** in Fig. 4. The operation of the straining plates can for example be effected from a common shaft having gears in engagement with toothed rims at the periphery of the plates.

The required tapering of the spiral passage from inlet to outlet can be achieved by making the mutual spacing

of the spiral turns decrease gradually outwardly as indicated in Fig. 4, or by making the straining plates 5 conical and inclined towards each other from inlet to outlet as shown in Fig. 2 or 3, or even by using both these measures at a time, whereby a compression of the press cake from all sides can be obtained.

The liquid pressed off, for example water and oil, is discharged through the openings of the straining plates, from which it runs down and can be collected and at the same time any sludge will be thrown off so that the straining plates are kept open and clean.

By using two straining plates as shown the straining from the press cake takes place on two sides, so that the path to be covered by the liquid through the cake is shortened, and in addition it is easily possible to make the cross-sectional shape of the spiral passage high and narrow as indicated in Figs. 5 and 6, in which 6 indicates the press cake near the inlet end and near the outlet end of the spiral respectively.

The path which the mass has to cover with respect to the straining plates is only equal to half the diameter of the spiral since the mass rotates with the straining plates and thus will be considerably shorter with respect to the path covered by the mass through the press passage than is the case in a screw press. At the same time it is easily possible to adapt the rotational velocity of the straining plates so that the same pressing time is obtained as in a screw press for the same length of the press passage.

For regulating the decrease of the cross section and hence the resistance in the spiral passage an end portion of the spiral wall may be pivoted for movement in a plane normal to the axis, about an axis indicated by 8 in Fig. 4, assuming of course, that the straining plates are plane and parallel in the portions concerned. An example of such pivoted end portion is shown more in detail in Figs. 7 to 9 inclusive. In this manner it is possible to regulate the pressing action within a wide range according to the consistency of the material.

To explain the structure of Fig. 1 in more detail, reference is made to the Figures 7 to 9, in which 11 designates a machine frame on which there are mounted bearings 12 and 13 and a screw press cage or screen 14 aligned on a horizontal axis. The cage 14 has a feeding hopper 15 and surrounds a feeding and pressing screw 16 journalled at its front end in the bearing 12 and attached at its rear end to a shaft 17 journalled in the bearing 13. The screw 16 has an axial extension 18 projecting outside the bearing 12, for connection to a suitable rotational driving device, not shown. Underneath the screen or cage 14 a collecting chute 19 for liquid matter is mounted, which has a rearwardly sloping bottom and terminates above a collecting pool 20 provided with an outlet 21.

The rear end of the screw 16 is confined within a flanged annular supporting member 22 mounted on the frame 11. On the member 22 there is mounted a rotatable spider member 23 comprising a hub 24, radial arms 25 and a rim 26 carrying a perforated plate 27 extending in a vertical plane at right angles to the axis of the screw 16.

Another spider member 28 largely similar to the member 23 but having a smaller axial opening, is rotatably mounted on the shaft 17 and carries a perforated plate 29 parallel to and facing the plate 27. The rims of the spider members 23 and 28 are formed with aligned gearing rims 30 and 31 respectively, meshing with a common driving gear 32 on a shaft 33 journalled in bearings 34 and 35 on the frame 11 and having an extension 36 for connection to a rotational driving means, not shown.

A plurality of rollers 37 and 38 journalled in bearings 39 and 40 on the frame 11 are provided for taking up axial spacing thrust on the rims of the spiders 23 and 28 respectively, whereas axial thrust on the hubs is taken up by the member 22 and the bearing 13, respectively.

The perforated plates 27 and 29 on the spiders 23 and 28 are in slideable engagement with and spaced from each other by a stationary steel member 41 having radial extensions 42 attached to the frame 1 by adjustable screw bolts 43. The member 41 is of spiral shape and provides a spiral passage extending anti-clockwise as viewed in Fig. 8, from a circular central opening 45 flush with the inner face of the annular member 22 to adjacent the periphery of the plates 27 and 29.

On the outer extremity of the member 41 there is pivoted, as at 51, an arcuate member 46 providing an outer wall for an extension of the spiral passage and having adjacent its free extremity an outward extension 47, which outside the periphery of the spiders is pivotally supported by an adjusting screw 48. The screw 48 carries a manipulating wheel 49 and is in threaded engagement with a nut 50 pivoted in the frame 11. As will be seen from Fig. 8, the outer extremity of the spiral passage is facing downwardly and underneath its outlet end there extends a sloping chute 51' attached to the member 41.

It will be understood that in operation the conveying and pressing screw 16 is rotated in appropriate direction for feeding matter to be treated from the hopper 15 to the central space 45 of the spiral member 41, and the spiders 23 and 28 with the plates 27 and 29 are rotated anti-clockwise, as viewed in Fig. 8, by the gear 32 so as to feed the solid matter to the discharge chute 51. Liquid matter pressed off by the screw press 14, 16 is conveyed by the chute 19 to the pool 20 which also collects liquid pressed off from the spiral passage 44 through the plates 27, 29, and the combined liquids are discharged through the outlet 21.

The press is capable of considerable modification and such changes thereto as come within the scope of the appended claims are deemed to be a part of the invention.

I claim:

1. A press for bulk material comprising a pressing body provided with spiral turns defining a stationary single spiral-shaped passage extending over more than 360° and converging from an inlet end to an outlet end, a rotatable liquid-penetrable straining member arranged for forming a lateral confinement for said passage and means for causing rotation of said straining member in a direction for causing a movement of bulk material within said passageway in the direction of convergence of the latter.

2. A press for bulk material comprising a stationary pressing body including a spiral-shaped wall extending over more than 360 degrees and defining a tapering passage for said material between opposite side faces of said body, and a straining structure forming a lateral confinement for said passage and including liquid-penetrable portions on either side of said body in slidable engagement with the lateral faces thereof and rotatable about an axis of the spiral formed by said wall, and in the direction of taper of said passage.

3. A press for bulk material comprising a stationary pressing body provided with spiral turns defining a spiral-shaped passage extending over more than 360 degrees and converging outwardly from an inlet end to an outlet end, means for feeding bulk material into the inlet end of said passage, a liquid-penetrable straining member forming a lateral confinement for said passage on either side thereof and rotatable in a direction for causing outward movement of bulk material within said passage, adjustable means being pivoted on said body adjacent one end of said passage for movement in a plane normal to the axis of rotation of said straining structure for regulating the compression area of the outlet end of said body, and said straining structure having parallel plane portions on opposite sides of said adjustable member.

4. A press for bulk material comprising a stationary pressing body provided with spiral turns defining a spiral-

shaped passage converging from an inlet end to an outlet end, a liquid-penetrable straining member forming a lateral confinement for said passage and rotatable in a direction for causing movement of bulk material within said passage from said inlet end to said outlet end, adjustable means being pivoted on said body adjacent one end of said passage for movement in a plane normal to the axis of rotation of said straining structure for regulating the compression area of the outlet end of said body, and said straining structure having parallel plane portions on opposite sides of said adjustable member.

5. A press for bulk material as claimed in claim 4, in which said adjustable means is located adjacent the outer end of said passage.

6. A press for bulk material as claimed in claim 4, in which said adjustable means is mounted adjacent the outlet end of said passage, and in which said straining structure is arranged for rotation in a direction for causing outward movement of the material within said passage, and said passage has its inlet end adjacent the center and its outlet end adjacent the periphery of said pressing body.

7. A press for bulk material comprising a stationary pressing body provided with spiral turns defining a single spiral-shaped passage extending over more than 360 degrees and converging outwards from an inlet end to an outlet end, a rotatable liquid-penetrable straining member arranged for forming a lateral confinement for said passage and means for causing rotation of said straining member in a direction for causing an outward movement of bulk material within said passage.

8. A press for bulk material as claimed in claim 1, in which said pressing body and said straining structure

are mounted for relative rotation about a substantially horizontal axis.

9. A press for bulk material comprising a stationary pressing body formed with spiral turns defining a spiral-shaped passage converging in its radial cross-sectional dimension from an inlet end to an outlet end, a liquid-penetrable straining member forming lateral confinement for said passage and rotatable in a given direction for causing movement of bulk material within said passage from said inlet end to said outlet end.

10. A press for bulk material comprising a pressing body largely extending in a plane and including a spiral-shaped wall extending over more than 360 degrees and defining a tapering passage for said material, a straining structure forming a lateral confinement for said passage and rotatable relative to said body about an axis substantially normal to said plane and centrally of the spiral formed by said wall, and in the direction of taper of said passage.

11. A press for bulk material as claimed in claim 10, in which said passage is open on both sides and said straining structure includes liquid-penetrable portions on either side of said body in slidable engagement with the lateral faces thereof.

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