June 8, 1971 R. WIESENAUER ET AL 3,583,875

STRAINING TUB

Filed Oct. 2, 1968 2 Sheets-Sheet 1

Fig. 1.

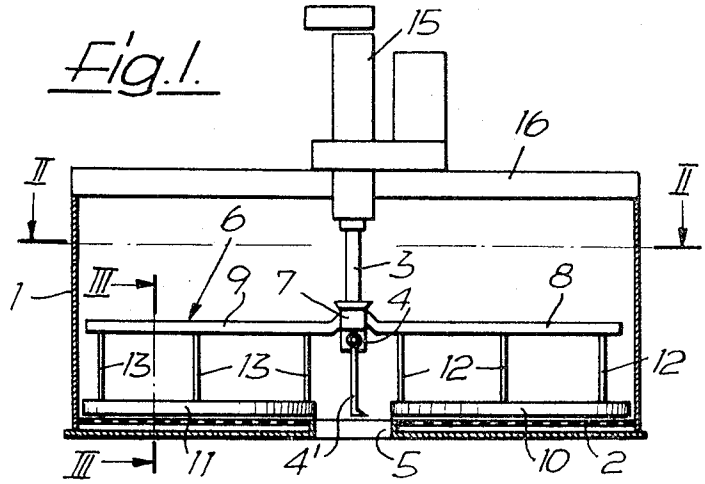


Fig. 2.

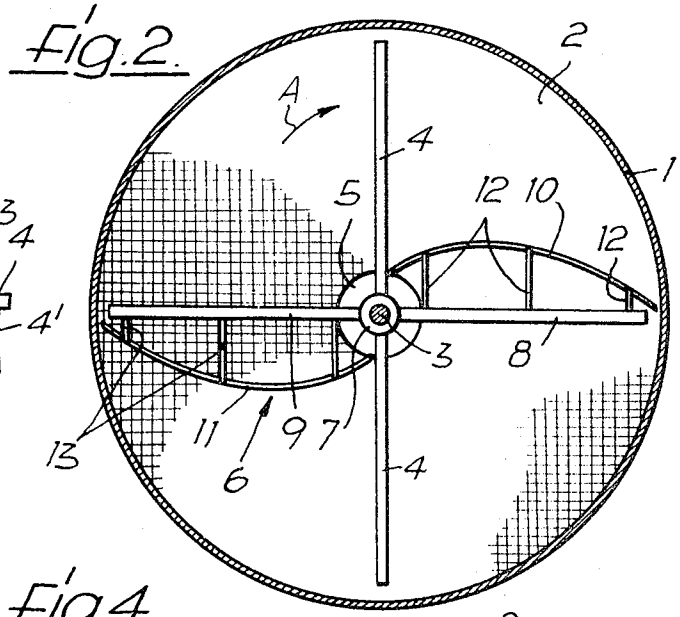


Fig. 3.

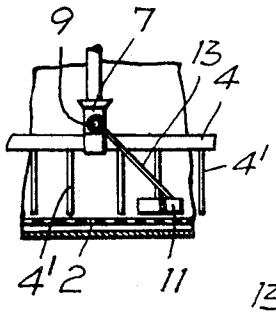
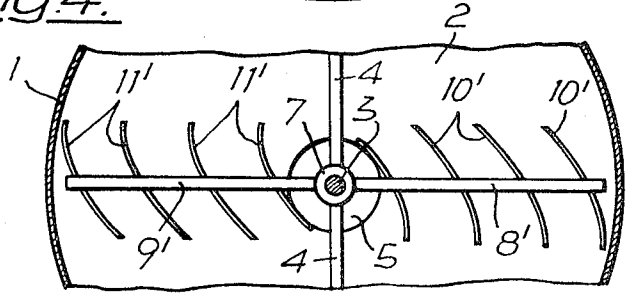


Fig. 4.



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June 8, 1971 R. WIESENAUER ET AL 3,583,875

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Filed Oct. 2, 1968 2 Sheets-Sheet 2

Fig.5.

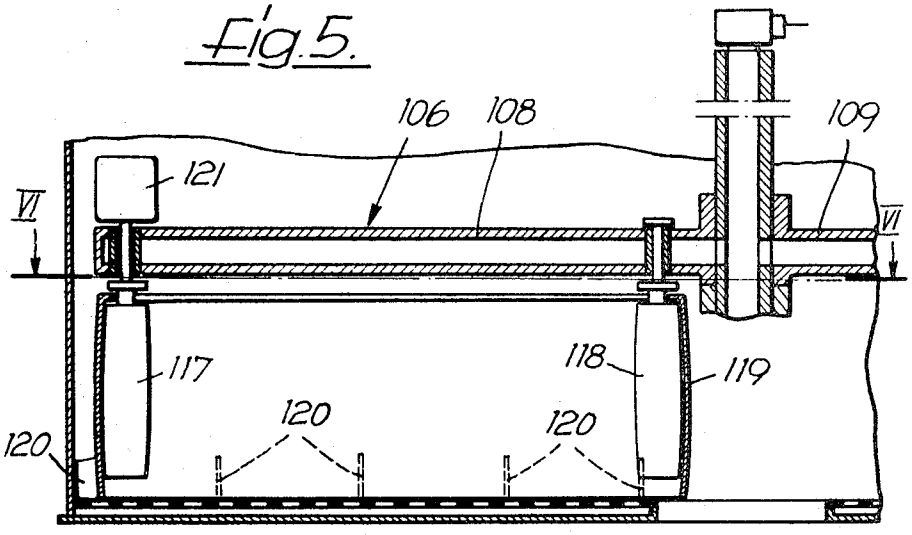


Fig.6.

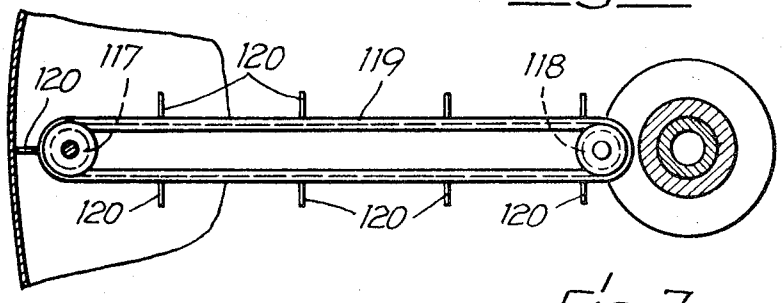
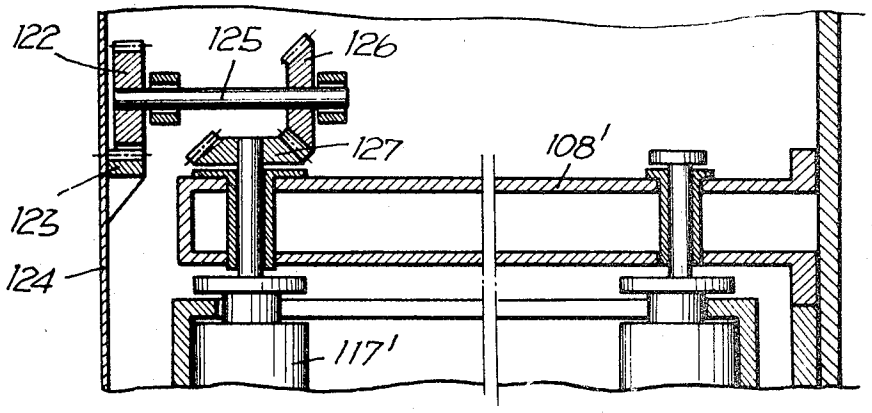


Fig.7.



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STRAINING TUB

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Int. Cl. C12c 7/10
U.S. Cl. 99—278 9 Claims

ABSTRACT OF THE DISCLOSURE

A round straining tub which comprises a tub member including a tub bottom defining a discharge opening. A grain removing device is rotatable about a vertical axis, movable over a bottom and thereby feeding from the grain removing device toward the discharge opening. The discharge opening is disposed at about the center of the tub bottom.

The present invention relates to a straining tub, in general, and to a round straining tub with a grain discharge opening in the tub bottom and a grain releasing apparatus rotatable about a vertical axis, moving over a lower bottom and thereby feeding the grain to the discharge opening, in particular.

In all known straining tubs of this type, which are used for the separation of the wort from the grain, the discharge opening is provided in the outer edge zone of the bottom adjacent the rim. This position of the discharge opening is suitable insofar as the distance of the grain in the prior known straining tubs is brought about either by means of adjustable knives of a loosening device moving in circular paths about the center of the straining tub, or by a radical grain slat provided on the loosening device, through which the grain is pushed eventually to the outer edge of the lower bottom, where they fall out downwardly from the discharge opening which is closed during the straining process.

The arrangement of the discharge opening in the outer edge zone of the bottom has, however, the great disadvantage that the removal of the grain from the straining tub takes a comparatively long time, because substantially, grain is pushed into the discharge opening only when the grain slat or the knives reach the opening. This is only once the case during each revolution of the loosening device.

In large tubs two discharge openings are provided, and in very large tubs also three or four. Due to the larger grain quantity, however, in these straining tubs, the time period for the removal of the grain is not less than in the small or medium tubs with a single discharge opening. The faster the brew production should be, the less is the time which is available for the removal of the grain from the straining tub. The time period which is required for the process of removal of the grain limits thus the brew production, which is, of course, disturbing.

A shortening of the time period for removal of the grain by increase of the number of the discharge openings in the straining tub is to be excluded, because the expense for the closing mechanism and its drive would be too great.

It is one object of the present invention to provide a straining tub which permits an appreciable shortening of the grain removal time by simple means.

It is another object of the present invention to provide a straining tub of the above-stated type, in which the discharge opening is disposed in the center of the tub bottom.

In such arrangement of the discharge opening, the grain can be pushed out without interruption. The grain fed inwardly from the grain removal device is pushed without retardation into the discharge opening, when it has reached the center of the bottom of the tub. The effect of a central discharge opening is, thus, to be compared with that of a discharge opening having the shape of an annular slot extending along the total outer edge zone of the tub bottom. From this comparison, it can be recognized without any difficulty that the grain removal time is appreciably shorter in the straining tub designed in accordance with the present invention, than that in the prior known devices.

In order not to disturb the emergence of the grain from the discharge opening, it is suitable to provide the grain removal device on a shaft inserted from above into the tub and mounted in an overhung manner.

The grain removal device can be designed in a different manner. In a preferred embodiment, it has at least one carrying arm secured to the drive shaft and extending in radial direction outwardly with a feeding device suspendable in the grain. This feeding device can be formed as a curved grain slat suspended from the carrying arm, in which grain slat each face element of the front side is disposed at an acute angle to its path curve. Suitably the curvature of the front side of the grain slat is chosen such, that a substantially equal feeding speed of all face elements radially inwardly is brought about.

The feeding device can, however, also, by example, be formed by a multi-part grain slat, the parts of which are disposed at a distance from each other and at an acute angle to its direction of movement. The effect of such feeding can be compared with the effect of the obliquely positioned knives, partly used in the known straining tubs for removing of the grain. It is, for this reason, also possible in the straining tub in accordance with the present invention, to feed the grain by means of obliquely positioned knives of the loosening device towards the central discharge opening. In this case, the advantage is brought about relative to the known straining tubs, that the knives for the removal of the grain must all swing in the same direction, which simplifies the drive and the control. In the known straining tubs, however, the outer knives had to swing in the opposite direction to that of the further inside provided knives, in order to feed the grain to the tub edge inwardly up to the discharge opening.

The feeding device can be formed, also, by an endless conveyor belt, which runs over rollers within the range of the inner and othe outer end of the carrying arm, and of which rollers at least one is driven. For the drive of the rollers, for instance, a heat resistant drive motor can be used. For the drive of the conveyor band, a toothed gear meshing a toothed gear rim of the outer frame of the tub, can be provided.

In a preferred embodiment, the carrying arm is arranged between two radial arms of a loosening device, which has a shaft concentrically disposed to the drive shaft.

Since the feeding device is permitted to be suspended in the grain only during the grain removal process, it can be swingably secured, for instance, to the carrying arm. In an advantageous embodiment, the drive shaft of the grain removal device is designed, however, as a hollow shaft axially displaceably mounted on the shaft of the loosening device. The grain removal device can be displaced here upwardly to a point, that the feeding device is not suspended in the grain.

With these and other objects in view which will become apparent in the following detailed description, the present invention, which is shown by example only, will be

clearly understood in connection with the accompanying drawings, in which:

FIG. 1 is an axial section of a first embodiment of the straining tub, designed in accordance with the present invention;

FIG. 2 is a section along the lines II—II of FIG. 1;

FIG. 3 is a section along the lines III—III of FIG. 1;

FIG. 4 is a fragmentary section similar to that shown in FIG. 2 of another embodiment of the present invention;

FIG. 5 is a fragmentary longitudinal section of a third embodiment of the straining tub;

FIG. 6 is a section along the lines VI—VI of FIG. 5; and

FIG. 7 is a fragmentary axial section of a variation of the embodiment disclosed in FIG. 5.

Referring now to the drawings, and in particular to FIGS. 1–3, into a circular cylindrical straining tub **1** having a bottom **2** extends from above a shaft **3**, mounted in an overhung manner and concentrically to the straining tub **1**, at the lower end of which shaft **3** is secured a loosening device. The loosening device comprises two carriers **4** securtd to the shaft **3** for joint rotation therewith, disposed horizontally and extending diametrically in outward direction, as well as loosening knives **4'**, which are secured on the carriers **4** spaced apart from each other, and point to the bottom **2**.

The bottom **2** is equipped with a central opening which coincides with the corresponding opening in the bottom of the straining tub. Both openings form jointly the discharge opening **5**. By means of a closing device (not shown), the discharge opening **5** can be closed up.

A hub **7** of a grain removing device, identified as a unit by the numeral **6**, is mounted axially displaceably, but non-rotatably, on the shaft **3**. As shown in particular in FIG. 2, two carrying arms **8** and **9** are secured to the hub **7**, which carrying arms **8** and **9** extend at equal height and in diametrical directions radially outwardly up to the neighbourhood of the periphery of the straining tub **1** and are disposed perpendicularly to the carriers **4**.

At a distance below the carrying arms **8** and **9** are arranged two curved grain slats **10** and **11**, respectively, which are disposed in a plane parallel to the plane of the bottom **2** and connected by means of obliquely disposed rods **12** and **13**, respectively, with the corresponding carrying arms. The inclined position of the rods **12** and **13**, respectively, is chosen such, as shown in FIG. 3, that the upper end runs ahead of the lower end, in the direction of rotation indicated by the arrow A. The equally formed grain slats **10** and **11** extend from the periphery of the straining tub **1** up to the edge of the discharge opening **5** and are curved such, that upon recognition of the different speeds of the individual sections, all sections produce a substantially equal feed speed radially inwardly.

A drive device **15**, by which the shaft **3** can be driven, as well as the hub **7** and the shaft **3**, can be moved in axial direction, is disposed at an upper cover **16** of the straining tub **1**.

The operation of the present device is as follows:

While the separation of the wort from the grain and the washing out of the extract remaining in the grain by means of oversprinkling water, the grain removal device **6** is lifted out of the grain and runs idle with the loosening device **4**, **4'**. When thereafter the grain must be removed from the straining tub **1**, the grain removing device **6** is lowered, so that the grain slats **10** and **11** are suspended in the grain. Due to their curvature, they feed continuously the grain to the discharge opening **5**. Since the grain can enter the discharge opening **5** independently from the momentary position of the grain slats **10** and **11**, when they have reached the inner end of the grain slats, the grain is pushed out continuously from the discharge opening, so that the straining tub **1** is emptied in a comparatively short time period.

Referring now again to the drawings, and in particular to the embodiment disclosed in FIG. 4, instead of the two one-part grain slats **10** and **11**, multi-part grain slats are provided. The individual parts **10'** and **11'**, which are secured spaced apart from each other on the carrying arms **8'** and **9'**, respectively, stand at an acute angle to their moving path, and feed, therefore, the grain radially inwardly. Their width is chosen such, that the rear edge of the one part is disposed about within the path of the front edge of the inwardly following next part. By this arrangement, it is brought about that the grain is fed inwardly so far by each part, that it is gripped by the next adjacent part and is delivered by the latter again to the next part. This process repeats itself until the grain reaches the discharge opening. The remaining structure is in this embodiment the same as that in FIGS. 1–3.

Referring now to the embodiments disclosed in FIGS. 5–7, these embodiments are distinguished from the embodiments disclosed in FIGS. 1–3 merely by a different design of the grain removal device, for which reason the other parts are no more repeated.

As shown in FIG. 5, the grain removing device, generally identified by the numeral **106**, has at each carrying arm **108** and **109** a feeding device. Since both feeding devices are equally designed, one only is shown in the drawing and described. The feeding device has two rollers **117** and **118** which are rotatably mounted with a vertical axis at the outer and inner end, respectively, of the carrying arm **108**. On the rollers **117** and **118** is arranged, in this embodiment, an endless conveyor band **119** with scrapers **120**. It is to be understood that, instead of a band, also a chain or the like can be used. The feeding device is driven by a heat resistant driving motor **121**, which is arranged on the arm **108** and which drives the roller **117**. The direction of rotation of the motor is chosen such, that the conveyor belt **119** runs at its front side from the outside towards the inside.

Instead of a drive of the conveyor band by means of a motor, as shown in FIG. 7, the drive can also take place by means of a toothed gear **122**, which meshes a toothed wheel rim **123**, when the carrying arm **108'** rotates, which toothed wheel rim **123** is provided at the inner wall of the frame **124**. The toothed gear **122** drives a bevelled gear **126** by means of a shaft **125**, which bevelled gear **126** meshes another bevelled gear **127** mounted on the shaft of the roller **117'**.

We claim:

1. A round straining tub comprising

a tub member including a tub bottom defining a discharge opening,

a grain removing device rotatable about a vertical axis, movable over a lowering bottom and thereby feeding from said grain removing device toward said discharge opening,

said discharge opening being disposed at about the center of said tub bottom,

said grain removing device comprising at least one carrying arm secured to a drive shaft and extending outwardly in radial direction and said carrying arm extending outwardly in radial direction and having a conveying device immersable in said grain,

said conveying device comprises a curved grain slat suspended from said carrying arm, and

each face element of the front side of said grain slat defining an acute angle to the curve of its path.

2. The tub, as set forth in claim **1**, wherein said grain slat has a curvature providing substantially equal feeding speed of all face elements radially inwardly.

3. The tub, as set forth in claim **1**, wherein said conveying device comprises a multi-part grain slat, the parts of which are spaced apart from each other and are arranged at an acute angle to their direction of movement.

4. The tub, as set forth in claim **3**, wherein said parts of said multi-part grain slat are oriented such that the rear edge of one of said parts is disposed about within

the path of the front edge of the next adjacent inward part.

5. A round straining tub comprising

a tub member including a tub bottom defining a discharge opening,

a grain removing device rotatable about a vertical axis, movable over a lowering bottom and thereby feeding from said grain removing device toward said discharge opening,

said discharge opening being disposed at about the center of said tub bottom,

said grain removing device comprises at least one carrying arm secured to a drive shaft and extending outwardly in radial direction and said carrying arm extending outwardly in radial direction and having a conveying device immersable in said grain.

said conveying device comprises an endless conveyor band,

said carrying arm having rollers within the range of its inner and outer end,

said endless conveyor band surrounding said rollers and adapted to run about said rollers, and

means for driving at least one of said rollers.

6. The tub, as set forth in claim 5, wherein said driving means comprises an electric motor secured to said carrying arm.

7. The tub, as set forth in claim 5, wherein said driving means comprises a toothed gear meshing a toothed rim secured to the periphery of said hub.

8. A round straining tub comprising

a tub member including a tub bottom defining a discharge opening,

a grain removing device rotatable about a vertical axis, movable over a lowering bottom and thereby feeding from said grain removing device toward said discharge opening,

said discharge opening being disposed at about the center of said tub bottom,

said grain removing device comprises at least one carrying arm secured to a drive shaft and extending outwardly in radial direction and said carrying arm extending outwardly in radial direction and having a conveying device immersable in said grain.

a loosening device having two radial arms, and wherein said carrying arm is disposed between said radial arms, and

said loosening device has a shaft disposed concentrically to said drive shaft.

9. The tub, as set forth in claim 8, wherein said drive shaft comprises a hub secured to and non-rotatably but axially immovably disposed on said shaft of said loosening device.

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ROBERT W. JENKINS, Primary Examiner