

Sept. 16, 1969

A. HAFLIGER
FEED CUBE PRESS WITH ECCENTRICITY ADJUSTING
AND CLAMPING MEANS

3,467,031

Filed March 21, 1967

2 Sheets-Sheet 1

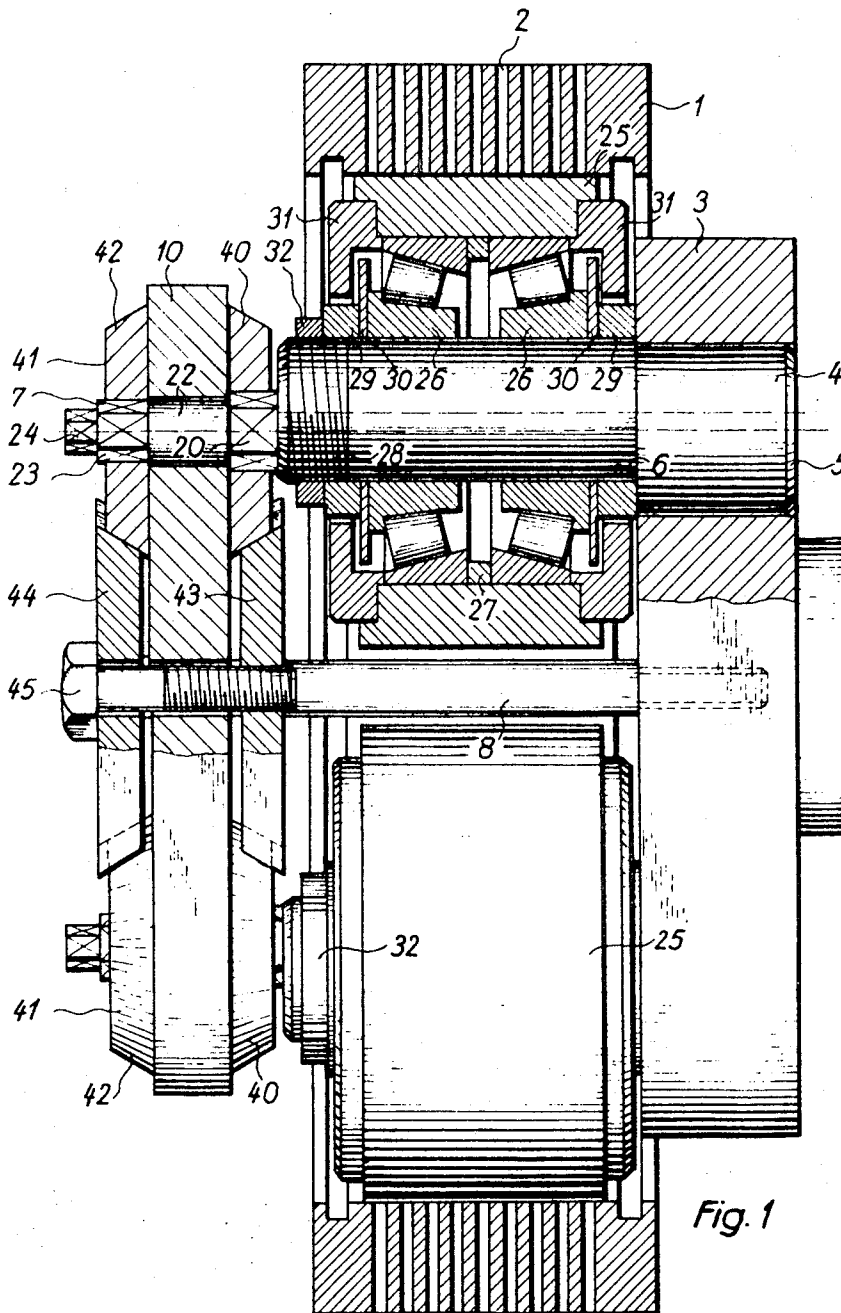


Fig. 1

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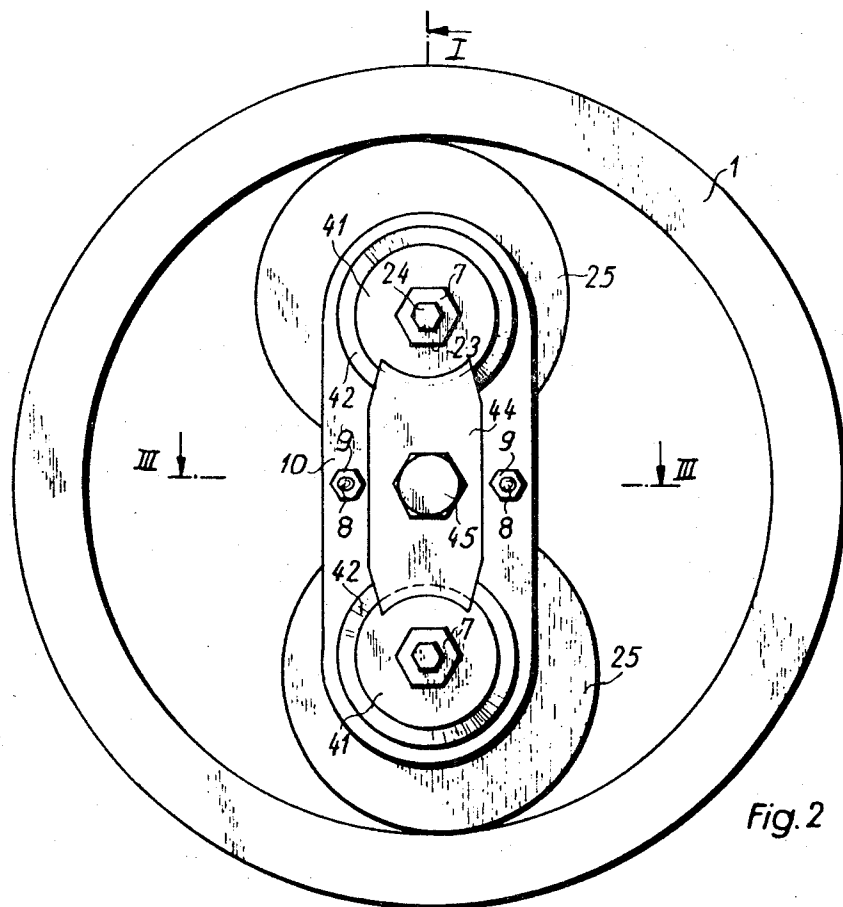


Fig. 2

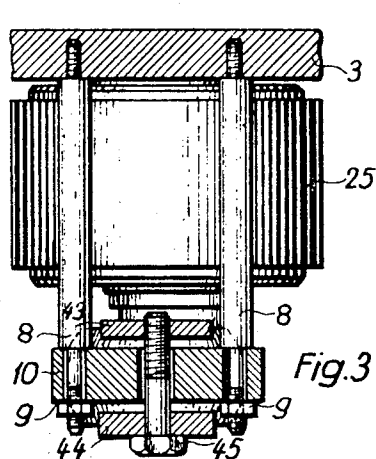


Fig. 3

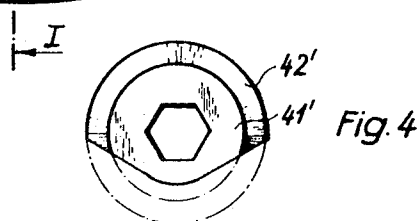


Fig. 4

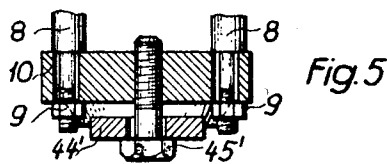


Fig. 5

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3,467,031

FEED CUBE PRESS WITH ECCENTRICITY ADJUSTING AND CLAMPING MEANS

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4,206/66

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11 Claims

ABSTRACT OF THE DISCLOSURE

A feed cube press, of the type arranged to compress and extrude rectangular cross section strips of cattle feed and the like, includes an annular mold and pressing rollers revolvable in the mold and supported on eccentric pins. These eccentric pins have extensions supported in a roller web, and plates are non-rotatably mounted on these extensions for angular adjustment conjointly with the extensions to adjust the relative eccentricity of the roller supporting bearing spindles of the pins.

Common clamping elements are engageable with the plates and are operable to maintain the latter in their adjusted angular positions. The peripheral surfaces of the plates preferably are frustoconical.

The plates are clampable against the roller web, and either a single plate may be provided for each pin or a pair of plates may be provided for each pin, with one being disposed on each side of the roller web.

Background of the invention

The invention is directed to feed cube presses including an annular mold and further including a roller carrier and a roller web disposed adjacent respective opposite axial end surfaces of the mold, with the web spaced a fixed axial distance from the mold surface adjacent thereto to receive clamping elements. The carrier and the web are interconnected for rotation as a unit, and the mold and the unit are relatively rotatable. Pins extend through the mold between the roller carrier and the roller web, and each pin has a leg engaged in the roller carrier and an extension, concentric with the leg, engaged in the roller web and arranged for angular adjustment in the roller web. Intermediate its leg and extension, each pin includes a bearing spindle which is eccentric relative to its leg, and rollers are disposed within the mold and each rotatable on a respective bearing spindle. In a known feed cube press of this type, such as shown in U.S. Patent No. 2,700,940, the roller web is slotted at the bores receiving the pin extensions, and the eccentric pins are secured in angularly adjusted position by reducing the sizes of the bores by means of several screws operable on one or both sides of the slot. Thereby, the cylindrical extension of the eccentric pins is clamped against relative rotation.

However, a clamping means of this type has been found to have some disadvantages. For example, the solid roller web used for clamping must be deformable, that is, it must be elastic in the area which receives the extension, and this complicates the formation of the web. The tractive force exerted by the screws on the roller web is only partly effective for clamping the extensions, since the screws must also be able to overcome the force resisting deformation of the roller web. A further disadvantage is the relatively small radius of the extension on which the rotation preventing means are operable.

In order to secure the eccentric pins more firmly against rotation, it has already been suggested to provide a larger radius for the extensions. For example, in U.S. Patent No. 2,240,660, toothed or gear segments are

secured on the extensions and mesh with a common gear that has a lever arm and is adjustable in its angular position by means of adjusting spindles. A disadvantage of an arrangement of this type is that it is not possible to adjust each eccentric pin separately.

It is also known, from U.S. Patent No. 2,958,990, to provide lever arms engaging the extensions and which can be adjusted by separate spindles. The spindles are secured by locks and lock nuts, or two spindles are provided which are threadable in opposed directions and which are secured in place by threaded elements. A disadvantage of an arrangement of this type is that the line of action of the pressure force caused by the securing element of the spindles coincides with the adjusting direction of the spindles. Thus, by tightening the securing elements, it is possible to vary the angle of the exactly adjusted eccentric pins. A further disadvantage is that at least one of the two spindles must be provided with additional securing means, which results in a technically complicated construction for this purpose.

In addition to the disadvantages mentioned above, all of the noted arrangements require parts of complicated design, and thus are unduly expensive in construction, assembly and operation.

Summary of the invention

The present invention relates to a feed cube press of the type mentioned and, more particularly, to an improved clamping arrangement including plates non-rotatably mounted on the extensions of the eccentric pins, for angular adjustment conjointly with the latter, and which plates can be clamped to maintain an angularly adjusted position by means of common clamping elements.

The advantage of the invention arrangement is that the plates secured against rotation with respect to the extensions of the eccentric pins maintain the adjusted angular positions of the pins after clamping. Through their extensions, the eccentric pins can be adjusted individually and independently of each other into selected angularly adjusted positions. The securing of the eccentric pins against rotation is effected by a single common screw. In addition, the clamping elements are rather simple in their design, and thus greatly expedite the assembly of the press.

The construction is very simple if the roller web is used as one of the common clamping elements. In an embodiment of the invention wherein plates, and straps clamping the plates, are arranged on opposite surfaces of the roller web and on the extensions of the eccentric pins, the traction force of the screws is doubly effective as a clamping force.

The edges of the plates can be frustoconical, and the straps engageable with the clamping plates can have mating frustoconical edges. The resulting wedging effect between the plates and the straps additionally reinforces the security against rotation of the eccentric pins, by increasing the frictional force.

The frustoconical circular edge of each plate can, in accordance with the invention, be made to extend through only a part of the periphery of the plate, the remainder of the plate periphery being recessed radially inwardly. Thereby, the space requirements in the proximity of the feed is reduced.

An object of the invention is to provide, in a feed cube press including rollers mounted on eccentric pins, improved means for maintaining the adjusted eccentricity of the pins.

A further object of the invention is to provide, in such a feed cube press, an arrangement whereby the adjusted angular position of the eccentric pins can be clamped by common clamping elements.

A further object of the invention is to provide, in such

a feed cube press, improved clamping means for maintaining the adjusted angular positions of the pins after clamping, and in which the eccentric pins can be adjusted individually and independently of each other.

Still another object of the invention is to provide, in a feed cube press, a clamping arrangement of the type just mentioned in which clamping of the eccentric pins in angularly adjusted position is effected by a single common screw.

A further object of the invention is to provide, in a feed cube press, a clamping arrangement which is simple in design and facilitates assembly of the press.

Yet another object of the invention is to provide, in a feed cube press, a clamping arrangement of the type mentioned in which a roller web is used as one of the common clamping elements.

A further object of the invention is to provide, in a feed cube press, a clamping arrangement of the type just mentioned wherein clamping plates, and straps for clamping the plates, are arranged on opposite surfaces of the roller web on the eccentric pin extensions whereby traction forces of holding screws can be additionally utilized for clamping.

Still another object of the present invention is to provide, in a feed cube press, a clamping arrangement including clamping plates and in which the peripheries of the plates are frustoconical with the clamping straps, associated with the plates, having mating frustoconical edges.

A further object of the invention is to provide, in the clamping arrangement just mentioned, an arrangement wherein the frustoconical circular plate edge extends through only a part of the plate periphery, with the periphery being recessed radially inwardly in its remaining part, thereby reducing space requirements in the proximity of the feed.

Brief description of the drawings

For an understanding of the principles of the present invention, reference is made to the following description of typical embodiments thereof as illustrated in the accompanying drawings.

In the drawings:

FIG. 1 is an axial sectional view through a feed cube press embodying the invention, taken along the line I—I of FIG. 2;

FIG. 2 is a front elevation view corresponding to FIG. 1;

FIG. 3 is a sectional view taken along the line III—III of FIG. 2;

FIG. 4 is an elevation view of a clamping plate illustrating a modification of the invention; and

FIG. 5 is a view similar to FIG. 3 but illustrating a further modification of the invention.

Description of the preferred embodiments

Referring first to FIGS. 1, 2 and 3, an annular mold 1, formed with radial bores for extrusion of feed, is fixedly connected with either a rotary or stationary mold holder which has not been shown in the drawings. A roller carrier 3, which is rotatable relative to mold 1, serves to receive and support legs 4 of eccentric pins 5. Each eccentric pin 5 includes a bearing spindle 6 which is eccentric relative to leg 4 and disposed within mold 1, and an extension 7 which is concentric with leg 4 or coaxial therewith.

Extensions 7 of eccentric pins 5 are mounted, for angular adjustment, in a roller web 10 interconnecting the extensions 7. Roller web 10 is maintained at a fixed axial spacing from roller carrier 3 by shouldered stay bolts 8 and nuts 9 (FIG. 2). Roller carrier 3, eccentric pins 5 and roller web 10 conjointly form a unit or frame.

The extension 7 of each eccentric pin 5 includes a first or innermost polygonal, preferably hexagonal, part 20 immediately adjacent bearing spindle 6. Outwardly of part 20, each extension 7 includes a cylindrical part 22 extending, for angular adjustment, through roller web 10.

part 23, and the outermost end of each extension 7 is formed with a second polygonal, but preferably hexagonal, part 23, and the outermost end of each extension 7 is formed as a third polygonal, preferably hexagonal, part 24 for the application of a wrench to the extension to adjust the eccentric pin.

The feed cube press includes press rollers 25 each of which is supported by roller bearings 26 on the spindle 6 of a respective eccentric pin 5. A spacing ring 27 is interposed between roller bearings 26, and the left end of each spindle bearing 6, as viewed in FIG. 1, is threaded at 28 to receive a nut 32 maintaining the roller bearings assembled, the assembly further including spacer rings 29 separated by dust protecting rings 30 from the inner races of roller bearings 26. The roller bearing assembly further includes two bearing covers 31 engageable with the respective press roller 25 and the outer races of roller bearings 26.

In accordance with the embodiment of the invention shown in FIGS. 1, 2 and 3, plates 40 and 41 are associated with each extension 7 of an eccentric pin 5, these plates being circular plates having polygonal, preferably hexagonal, axial openings conformingly engaging the correspondingly shaped polygonal parts 20 and 23, respectively, of each extension 7. Plates 40 and 41 have frustoconical peripheries 42 and are clamped between straps 43 and 44, representing common clamping elements, and roller web 10. Those surfaces of straps 43 and 44 engaging the plates 40 and 41, are circular arcs conforming to the periphery of the plates 40 and 41, and have frustoconical configurations mating with the frustoconical surfaces 42 of plates 40 and 41. Straps 43 and 44 are braced against each other by a screw 45 extending freely through the aperture in strap 44 and through an aligned aperture in roller web 10, and threaded into strap 43.

To adjust eccentric pins 5, screw 45 is loosened and, by turning hexagonal part 24 of each pin 5, it is possible to increase or decrease the distance between the associated press roller and the inner surface of mold 1. The respective spacings of press rollers 25 from mold 1 can be varied individually and independently. When the desired spacings have been set, straps 43 and 44 are drawn toward each other by turning screw 45, and this has the effect of clamping plates 40 and 41 between roller web 10 and straps 43 and 44, respectively.

The provision of the mating conical engaging surfaces, such as the surface 42 of each plate 40 and 41, results in a wedging effect between plates 40 and 41 and straps 43 and 44, respectively, which increases the frictional force. The clamping surface 42 has a large radius compared to that of extensions 7, and this, together with the wedging effect, greatly improves the securing of eccentric pins 5 against angular displacement after adjustment. Due to that component of the force between plates 40, 41 and straps 43, 44 extending longitudinally of roller web 10, cylindrical parts 22 of extensions 7 are pressed against the surface of the respective bores in roller web 10, thus producing additional frictional forces increasing the clamping effect.

The angle of inclination of the frustoconical surfaces can be so selected that the resultant wedging effect is self-locking when screw 45 is tightened. In this case, for the purpose of disassembly, a tool can be inserted between roller web 10 and straps 43 and 44 in order to loosen the latter. Such a design of the frustoconical engaging surfaces insures that there can be no displacement in operation, even if screw 45 should loosen. In this design, the major part of clamping effect is produced in the frustoconical surfaces 42.

Other advantages of the described embodiment are that only a single common screw 45 need be loosened when eccentric pins 5 are to be adjusted. As stated, the pins can be adjusted individually, through their extensions 7, and independently of each other with respect to their relative angular adjusted positions. The screws 45, passing

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freely through the bore of roller web 10, permits utilizing the traction force thereof for clamping straps 43, 44 arranged at opposite surfaces of roller web 10.

In the alternative embodiment of the invention shown in FIG. 4, the frustoconical circular surface 42' is provided over only a part of the periphery of each plate 41', and the remainder of the periphery is recessed radially inwardly. This arrangement has the advantage that the space requirements, in the proximity of the feed, can be reduced.

In accordance with the embodiment illustrated in FIG. 5, plates 41 and the common strap 44' can be clamped directly with roller web 10 by a screw 45'. In cases where the securing against angular displacement of the eccentric pins can be effected by a single clamping plate 41, it is possible to use a strap 44' on only one side of roller web 10.

The invention can be used in cube feed presses with a rotary mold and a stationary roller carrier, in such presses with a stationary mold and a rotary roller carrier, and in such presses where both the mold and the roller carrier are rotatable but at different speeds.

What is claimed is:

1. In a feed cube press, an annular mold, a roller carrier and a roller web disposed adjacent respective opposite axial end surfaces of the mold, with the web spaced a fixed axial distance from the adjacent mold surface to receive clamping elements, means interconnecting the carrier and web for rotation as a unit, the mold and the unit being relatively rotatable, pins extending through the mold between the roller carrier and the roller web and each having a leg engaged in the roller carrier and an extension concentric with the leg and engaged in the roller web and arranged for angular adjustment in the roller web, each pin including a bearing spindle intermediate its leg and extension and eccentric relative to its leg, and rollers within the mold each rotatable on a respective bearing spindle: the improvement comprising, in combination, plates non-rotatably mounted on said extensions for angular adjustment conjointly with the associated extension; and common clamping elements frictionally engageable with all said plates and operably maintaining the latter in their adjusted angular positions, said clamping elements, when released from frictional engagement with said plates, providing for angular adjustment of each extension independently of each other extension.

2. In a feed cube press, the improvement claimed in claim 1, in which said roller web is one of said common clamping elements.

3. In a feed cube press, the improvement claimed in claim 2, including a clamping screw bracing each other clamping element relative to said roller web.

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4. In a feed cube press, the improvement claimed in claim 3, in which, for each eccentric pin extension, there is a respective plate, said plates engaging the outer surface of said roller web; and a common clamping element engaged with said plates and positioned adjacent the outer surface of said roller web.

5. In a feed cube press, the improvement claimed in claim 1, in which said plates include, for each eccentric pin extension, plates arranged on respective opposite surfaces of said roller web; said common clamping elements clamping each pair of plates against said roller web.

6. In a feed cube press, the improvement claimed in claim 5, in which said clamping elements include a pair of clamping elements one adjacent each side of said roller web and common to the plates on the same side of the roller web.

7. In a feed cube press, the improvement claimed in claim 6, including a single common screw drawing said two mutually braced clamping elements into clamping position.

8. In a feed cube press, the improvement claimed in claim 1, in which the peripheral edges of said clamping plates are frustoconical; the common clamping elements associated with said plates having frustoconical surfaces mating with the frustoconical peripheral surfaces of said plates.

9. In a feed cube press, the improvement claimed in claim 8, in which the angle of inclination of said frustoconical surfaces is selected so that the resultant wedging effect is self-locking on tightening of said clamping elements.

10. In a feed cube press, the improvement claimed in claim 8, in which said clamping plates are circular and said frustoconical peripheral edges extend through only a portion of the periphery of each plate, the remaining portion of the periphery of each plate being recessed radially inwardly.

11. In a feed cube press, the improvement claimed in claim 1, in which each extension has an operating portion projecting outwardly of said plates for engagement by an eccentricity adjusting tool.

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ROBERT W. MICHELL, Primary Examiner
J. SHEA, Assistant Examiner

U.S. Cl. X.R.