June 15, 1954 F. STINDT 2,681,152

UNLOADER FOR CENTRIFUGAL MACHINES

Filed Feb. 23, 1949

3 Sheets-Sheet 1

Fig. 1.

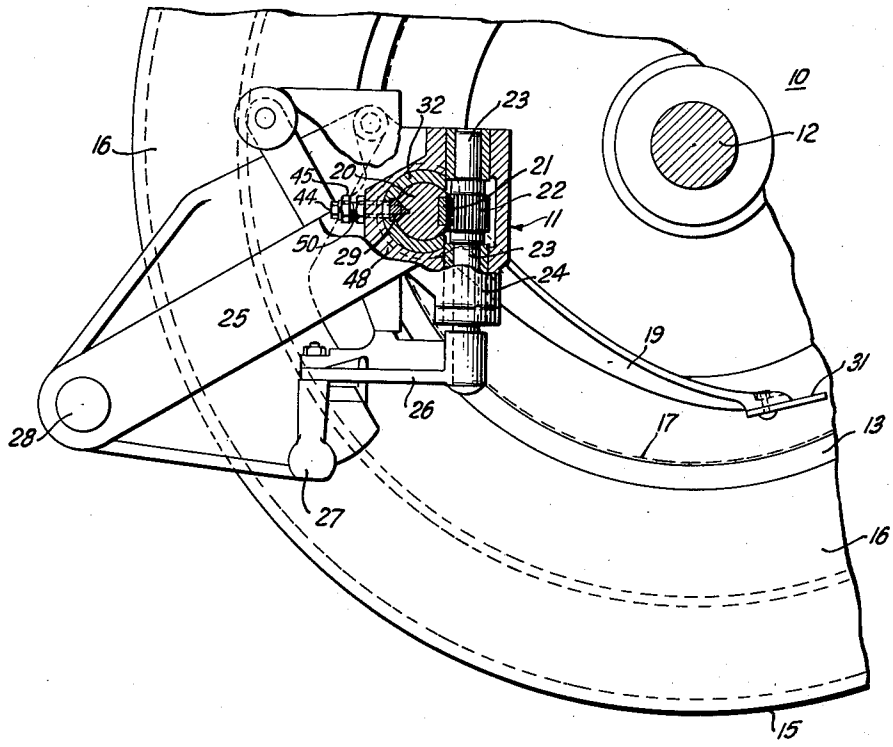
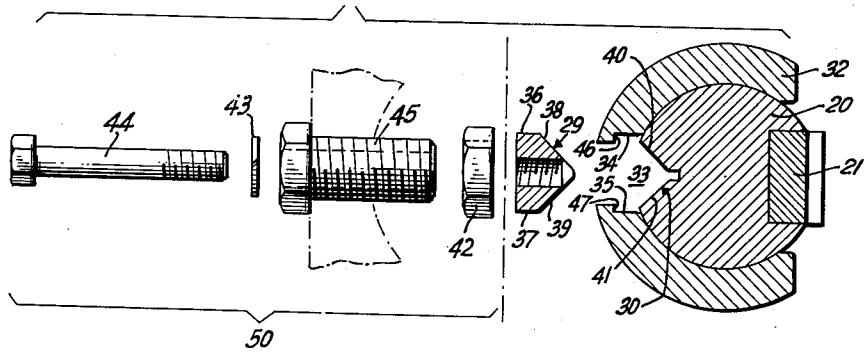


Fig. 3.



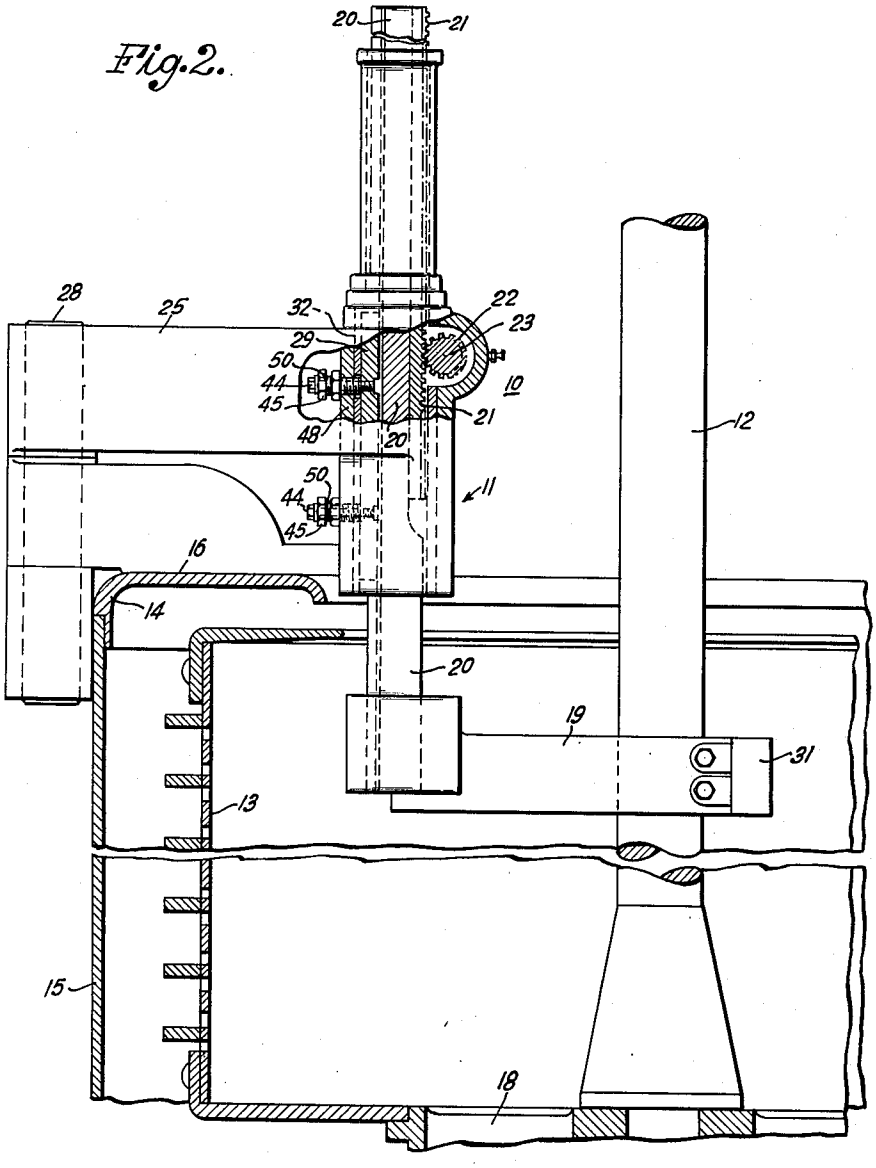
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Fig. 2.



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Fig. 4.

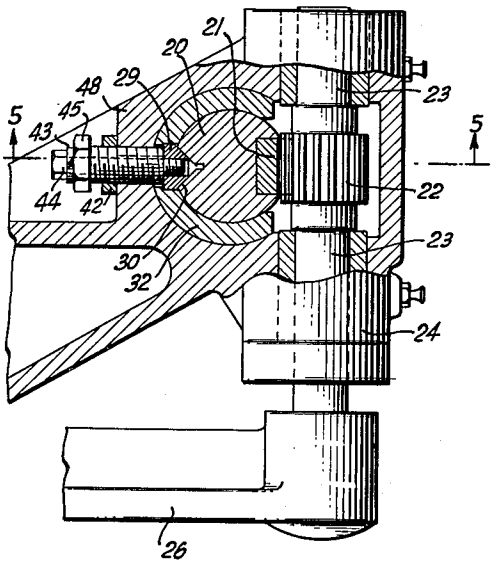
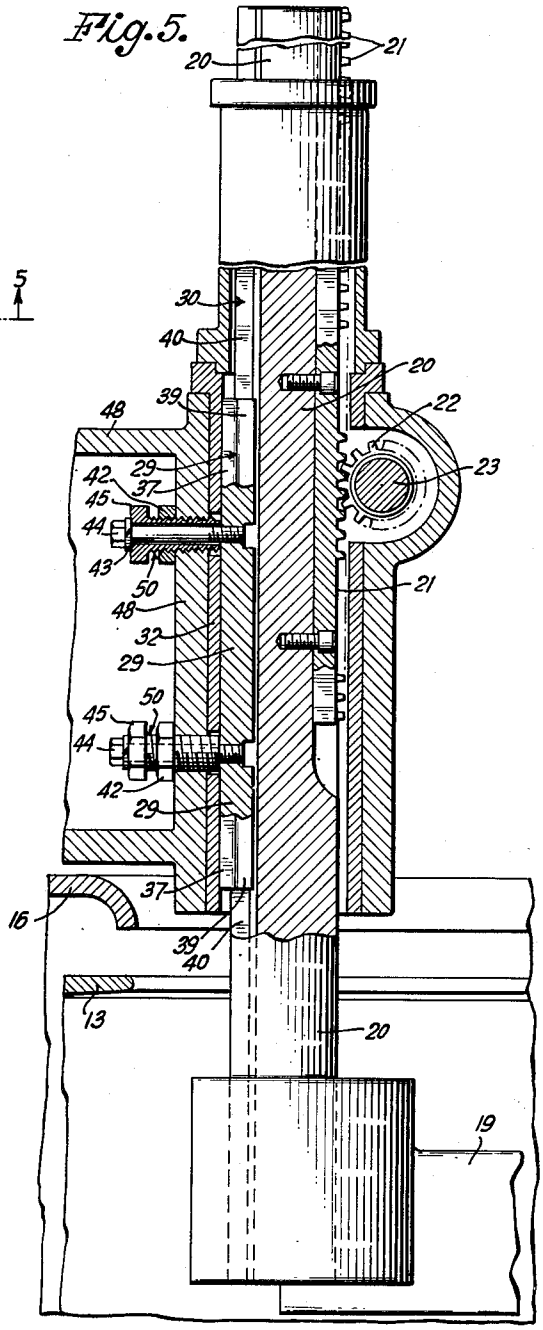


Fig. 5.



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UNLOADER FOR CENTRIFUGAL MACHINES

Frederick Stindt, Cliffside Park, N. J.

Application February 23, 1949, Serial No. 77,927

6 Claims. (Cl. 210—70)

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This invention relates to sugar centrifugal machines and more specifically to improvements in mechanical unloaders for such machines.

It is an object of this invention to reduce the free motion of the plow tip in mechanical unloaders for centrifugal machines.

Patent 1,205,128 issued November 14, 1916, to E. D. Mackintosh discloses an unloader for a centrifugal machine of the type used for processing sugar. The unloader mechanism includes a plow which bites into the sugar wall built up on the inside of the basket during the centrifuging process. The plow is attached to the lower end of a vertical rod which is moved vertically in a sleeve on the end of a swingable horizontal bar or arm. This vertical movement is accomplished by turning a winch and a pinion with teeth which mesh with corresponding teeth in the vertical rod, the winch and the pinion being secured to a shaft journaled in a lug that forms part of the horizontal arm. Movement of the plow horizontally can be accomplished by moving the horizontal bar. Turning movement of the vertical rod with respect to the horizontal bar is prevented by the use of a vertical "feather" or key fitting in a groove in the rod and secured in the sleeve in the horizontal bar. This key has a square or rectangular horizontal cross-section and is non-adjustable.

An unloader of the type disclosed in the Mackintosh patent functions very well when it is new but there is a decided "play" in the apparatus after years or even months of use. The connection between the plow and the vertically moving rod can be kept tight because the plow never moves with respect to this rod. However, it is difficult to keep the same tight connection between the vertically moving rod and the swingable horizontal arm because the vertical rod is continually moving up and down and the pressure of the sugar on the plow is a force which tries to rotate the plow slightly, causing a substantially magnified pressure of the side of the keyway in the vertical rod against the side of the key. The key must be sufficiently loose in the keyway when the unloader is new to permit the shaft to slide up and down easily and this looseness permits the plow tip to have a free play of perhaps one eighth of an inch which is nowhere near enough to allow it to swing (accidently) enough to catch the sugar wall when the centrifugal is running at full speed. However, as the vertical rod is frequently moved up and down, wear occurs both in the keyseat in the rod and on the side of the key, and the more

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this wears the greater becomes the free motion of the plow tip, because whatever wear there is on the key and keyseat is multiplied many times, for example 12–15 times, due to the greater distance of the plow tip from the center of the vertical rod. Finally, if this wear is not corrected, the plow tip may have as much as two inches or more of free swing and it has been known to catch in the sugar with the basket running full speed with resulting damage to the apparatus. If excessive wear occurs in an unloader of the type just described, there is nothing that can be done about it except to provide a new key and a new vertical rod, the latter being relatively expensive, and for this reason there is danger that the unloader may be continued in service during a period under conditions which are highly dangerous.

In accordance with the invention, these disadvantages are greatly alleviated and in large part removed by the provision of a key and keyseat which provides convenient and effective compensation for the wear just described.

In an exemplary embodiment of this invention, these desirable results are accomplished by providing a key which has a horizontal cross-section, unchanged throughout its height, in which two opposite sides taper away from a dimension which is a minimum at the portion thereof nearest the axis of the shaft to a much larger dimension between these sides at a point farther away from said axis, and these two sides of the keyseat have a corresponding slope. More specifically, by way of example, the key has a pentagonal cross-section and fits into a keyseat which is triangular in cross-section. Hence, when wear takes place, the play between the key and keyseat can be taken up by pushing the key further into the vertical rod so as to maintain contact with the rod. This is accomplished by adjusting screws, of which there are two sets, one near the top and one near the bottom of the key.

The invention will be more readily understood by referring to the following description taken in connection with the accompaying drawings forming a part thereof, in which:

Fig. 1 is a plan view, partly in cross-section, of a portion of a centrifugal basket and an unloader arrangement in accordance with the invention;

Fig. 2 is a vertical section of the arrangement of Fig. 1;

Fig. 3 is an enlarged exploded view, in plan, of a portion of the arrangement of Fig. 1 show-

ing the pentagonal key in accordance with the invention and certain parts adjacent thereto;

Fig. 4 is an enlarged plan view of a portion of the arrangement of Fig. 1 showing to greater advantage the pentagonal key and parts adjacent thereto; and

Fig. 5 is a vertical section, drawn to a larger scale, of a portion of the arrangement of Fig. 1 in a plane line 5—5 of Fig. 4.

Referring more specifically to the drawings, Figs. 1 and 2 show, by way of example for illustrative purposes, a sugar centrifugal 10 having an unloader arrangement 11 including novel features in accordance with the invention. The centrifugal comprises a rotatable vertical shaft or spindle 12 adapted to be driven by any suitable means such as an electric or hydraulic motor (not shown) mounted above it. Suspended from the spindle is a perforated basket 13 having a stationary outer casing or curb 14. This curb has a cylindrical side wall 15, a top 16 and a bottom (not shown) which can be provided, in a manner well-known, with suitable annular troughs to carry away the various liquids ejected from the basket 13 during the centrifuging process. As is well-known, massecuite or magma is placed in the basket and the latter is rotated at high speed for several minutes causing green syrup to be thrown through the apertures in the basket, striking the curb wall and flowing down its sides to the annular troughs below. Washing fluid can then be introduced and the wash syrup (possibly mixed with a little green syrup) is also caused to strike the curb wall and is collected below. This centrifuging process leaves a wall of sugar grains (represented by the dashed-line circle 17 in Fig. 1) on the inside of the basket 13. In order to remove this sugar and permit it to pass through a central opening 18 in the bottom of the basket (which opening is covered during the centrifuging process), a plow 19 is provided. This plow is fastened and keyed to the lower portion of a vertical rod or shaft 20 which has teeth 21 cut therein. These teeth mesh with those of a gear 22 mounted on a shaft 23. This shaft is mounted on an arm 24 of the frame 25 and can be turned by a crank 26 having a handle 27. The frame 25 pivots about shaft 28 making it possible to move the plow 19 into the sugar wall 17. To prevent rotation of the vertical shaft 20 with respect to the arm 24 during the plowing and at other times, a key 29 is provided so that as the rod on shaft 20 is moved up and down, the key seat 30 (see Fig. 4) therein slides up and down on this key. The present invention is primarily concerned with the shape of the key 29 and of the key seat 30 and with means associated therewith for maintaining the key in close contact with the keyseat.

Up to this point, the apparatus that has been described, except for the key 29 and keyseat 30, is all old in the art and the present inventor lays no claim thereto. In such a prior art unloader, the key (corresponding to key 29) has had a rectangular shape. As pointed out above, such an unloader (with a key of rectangular cross-section) functions very well when it is new but the tip 31 of the plow 19 has too much play therein when the unloader has been used for some time. The key must be sufficiently loose in its keyseat when the unloader is new to permit the rod or shaft 20 to slide up and down easily and this looseness permits the plow tip 31 to have a free play of perhaps one eighth of an

inch, which is not objectionable. However, as the vertical rod 20 is frequently moved up and down, wear occurs both in the keyseat in rod 20 and on the side of the key (still referring to a key of rectangular cross-section), and the more this wear the greater becomes the free motion of plow tip 31 because whatever movement there is between the key and the keyseat is multiplied 12 to 15 times, for example, at the plow tip due to the leverage factor. If something is not done about this wear, the plow tip may have a free swing of several inches and may even catch in the sugar, as the basket is running at full speed, with resulting damage to the apparatus and danger to the operator.

In the prior art unloader mentioned above, a new key and a new shaft must be provided to correct this condition caused by wear. However, in the present invention, such an expensive change is not necessary for reasons which will now be described.

Referring now to Figs. 3 to 5, inclusive, as well as to Figs. 1 and 2, it will be seen that the key 29 is of pentagonal cross-section (instead of rectangular) and it slides within a triangular keyseat 30 in the vertical rod or shaft 20. The sleeve 32 surrounding rod 20 has a cut-out portion 33 thereof with sides 34 and 35 which are adapted to contact the correspondingly adjacent sides 36 and 37 of the feather key 29. The sides 38 and 39 of the key 29 respectively contact the sides 40 and 41 of the triangularly shaped (in cross-section) keyseat 30.

When wear of the key 29 and keyseat 30 takes place, causing a play therebetween, this play can be taken up by pushing the key 29 further into the vertical rod 20 so as to maintain contact with the rod. The assembly 50 shown in exploded view in Fig. 3 to the left of key 29 accomplishes this result. The play is taken up by slacking off on lock nut 42 and also on lock 43 and screw 44 and then screwing in the hollow screw 45 (which screws into support 48—see Fig. 5) until the key 29 properly engages its keyseat 30; whereupon lock-nut 42 is tightened and screw 44 is pulled tight, holding the key 29 firmly in its new position. Of course, it is to be understood that the key 29 is placed originally in the keyseat 30 by means of a vertical rather than a horizontal movement since it is prevented from moving into and out of a keyseat 30 by the shoulders 46 and 47 (see Fig. 3). Preferably there are two sets of these adjusting screw assemblies 50, one at the upper portion and one at the lower portion of the key 29. Such an arrangement is shown in Fig. 5.

It will be readily seen that when wear on the key and keyseat occurs, adjustment can be quickly made to take up the play caused by this wear and keep the free swing of the end of the plow within safe limits. This adjustment permits the limitation of the movement of the plow tip to a range which will not include the surface of the sugar when walled up in the basket. Because this adjustment can be made so easily, there will be no extended period during which the user may be tempted to keep an unsafe unloader in operation in order to reduce the expenditures for replacements.

Obviously, the invention is not limited to the specific shapes of key and keyseat disclosed herein merely by way of example as any other shapes which will perform the desired functions set forth above can be used as well. Moreover, any other suitable adjusting arrangement can be

used in place of the assembly 50. Various other changes can be made in the embodiment disclosed without departing from the spirit or letter of the invention, the scope of which is indicated in the appended claims.

What is claimed is:

1. The combination with a centrifugal machine, of a vertical bar adapted to be moved vertically, an unloader plow attached to said bar, a guide-member for said bar, said bar and said guide member having vertical keyways therein at adjoining portions thereof, a feather key in said keyways, said key having a cross-section in which the distance between opposite sides is much smaller at the portion thereof nearer the axis of the vertical bar than at the portion of said key at the periphery of said bar and which opposite sides are parallel within the keyway in said guide-member, and said keyways in the bar and in the guide-member having sides respectively complemental to said opposite sides of said key, and means for adjusting the position of said key in a direction perpendicular to the axis of said bar.

2. The combination with a centrifugal machine, of a vertical bar adapted to be moved vertically, an unloader plow attached to said bar, a guide-member for said bar, said bar and said guide member having vertical keyways therein at adjoining portions thereof, a feather key in said keyways, said key having a cross-section in which the distance between opposite sides is much smaller at the portion thereof nearer the axis of the vertical bar than at the portion of said key at the periphery of said vertical bar and which opposite sides are parallel within the keyway in said guide-member, and said keyways in said bar and in the guide-member having sides respectively complemental to said opposite sides of said key, and lock-screw means for adjusting the pressure of the key against the said keyway in said rod.

3. The combination with a centrifugal machine, of a vertical bar adapted to be moved vertically, an unloader plow attached to said bar, a guide-member for said bar, said bar and said guide member having vertical keyways therein at adjoining portions thereof, a feather key in said keyways, said key having a pentagonal cross-section and the keyway in said bar having a triangular cross-section in which two of the sides taper to a point in the interior of said bar and correspond in slope to two of the sides of said pentagonal key and the keyway in said guide-member having two parallel sides to engage two other sides of said pentagonal key, and means for adjusting the position of said key in a direction perpendicular to the axis of said bar.

4. The combination with a centrifugal machine, of a vertical bar adapted to be moved vertically, an unloader plow attached to said bar, a guide-member for said bar, said bar and said guide member having vertical keyways therein at adjoining portions thereof, a feather key in said keyways, said key having a pentagonal cross-section and the keyway in said bar having a triangular cross-section in which two of the sides taper to a point in the interior of said bar and

correspond in slope to two of the sides of said pentagonal key and the keyway in said guide-member having two parallel sides to engage two other sides of said pentagonal key, and lock-screw means entering the fifth side of said pentagonal key for maintaining a firm contact between said two sides of said key and said two sides of said triangular keyway.

5. The combination with a centrifugal machine, of a vertical bar adapted to be moved vertically, an unloader plow attached to said bar, a guide-member for said bar, said bar and said guide member having vertical keyways therein at adjoining portions thereof, a feather key in said keyways, said key having a pentagonal cross-section and the keyway in said bar having a triangular cross-section in which two of the sides taper to a point in the interior of said bar and correspond in slope to two of the sides of said pentagonal key and the keyway in said guide-member having two parallel sides to engage two other sides of said pentagonal key, and lock-screw means for maintaining a firm contact between said two sides of said key and said two sides of said triangular keyway, said lock-screw means including a support member, a hollow member threaded on the outside and screwing into said support member, a lock nut around the outside of said hollow member to fix the position of said hollow member with respect to said support member, a screw adapted to pass through the interior of said hollow member and the fifth side of said key be in position to force the key against the keyway in said rod, and a locking member to lock said screw in position.

6. The combination with a centrifugal machine, of a vertical bar adapted to be moved vertically, an unloader plow attached to said bar, a guide-member for said bar, said bar and said guide member having vertical keyways therein at adjoining portions thereof, a feather key in said keyways, said key having a pentagonal cross-section and the keyway in said bar having a triangular cross-section in which two of the sides taper to a point in the interior of said bar and correspond in slope to two of the sides of said pentagonal key and the keyway in said guide-member having two parallel sides to engage two other sides of said pentagonal key, and two lock-screw means entering the fifth side of said pentagonal key, one acting on the upper portion of said key and one acting on the lower portion thereof, for maintaining a firm contact between said two sides of said key and said two sides of said triangular keyway.

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