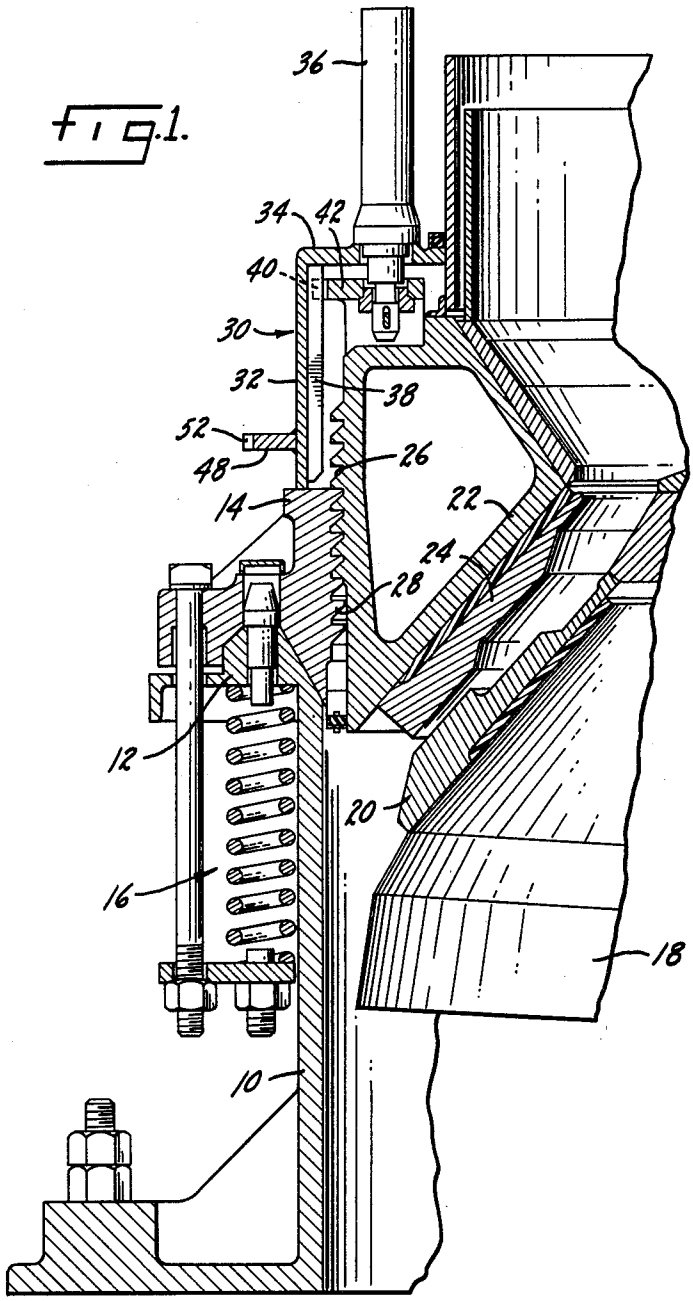
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LOCK STRUCTURE FOR CRUSHER ADJUSTMENT

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Fig. 1.



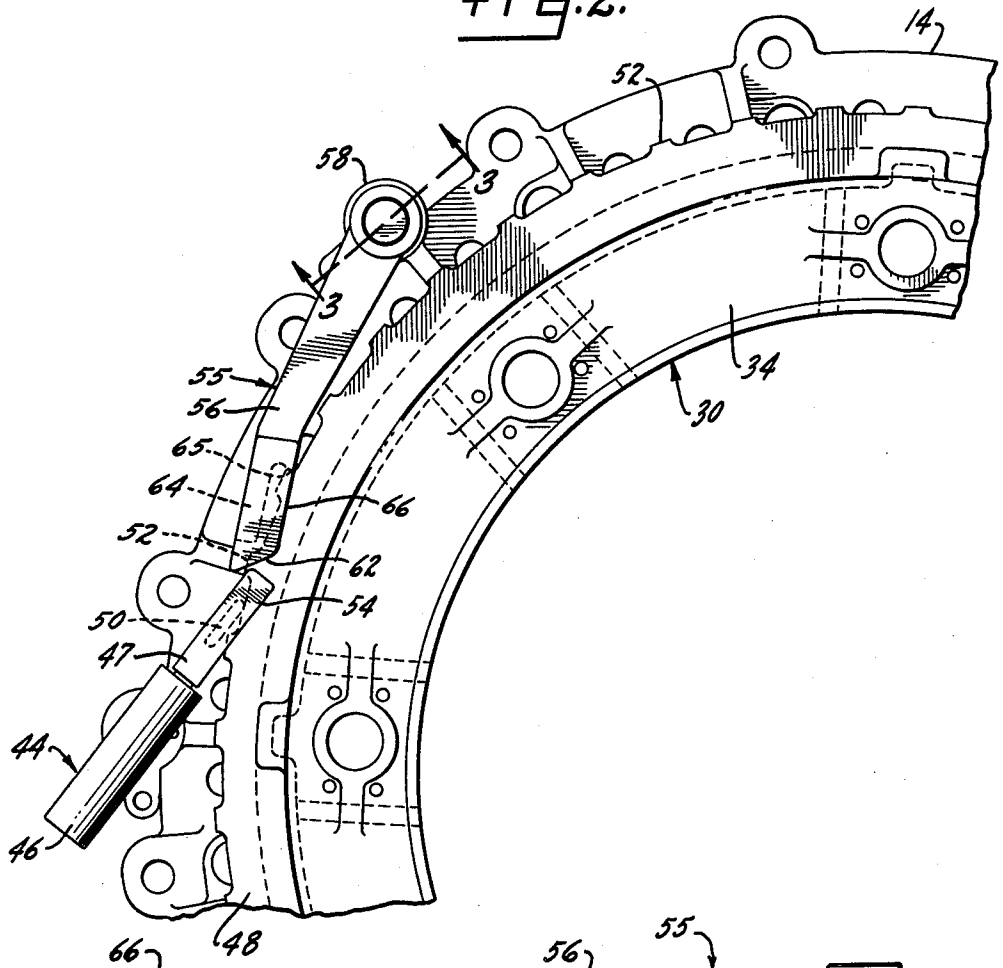
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Fig. 2.



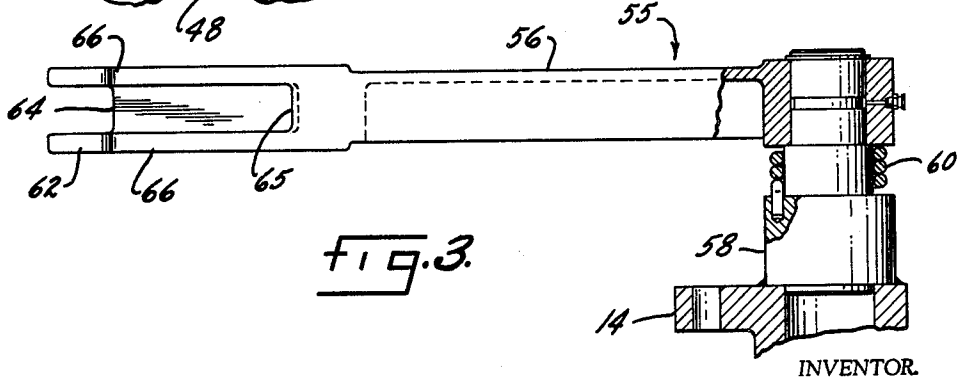


Fig. 3.

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LOCK STRUCTURE FOR CRUSHER ADJUSTMENT

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10 Claims. (Cl. 241—286)

This invention relates to a system of bowl adjustment for use on a gyratory crusher or the like, and in particular to a means for providing a positive lock between the bowl and the main frame.

A primary purpose of the invention is a lock structure for use on a gyratory crusher which positively locks the bowl to the main frame and which can be automatically released when it is desirable to rotate the bowl relative to the main frame.

Another purpose is a system of bowl adjustment of the type described in which the ram for rotating the bowl relative to the main frame automatically releases the lock structure.

Another purpose is a lock structure of the type described which is simple in construction nad reliably operable.

Another purpose is a system of bowl adjustment using at least one fluid operated ram to rotate the bowl relative to the main frame, and including a lock structure which locks the bowl to the main frame and is automatically released by movement of the ram.

Other purposes will appear in the ensuing specification, drawings and claims.

The invention is illustrated diagrammatically in the following drawings wherein:

FIGURE 1 is a partial vertical section through a cone crusher showing a bowl adjustment arrangement,

FIGURE 2 is a partial top plan view of the crusher illustrated in FIGURE 1, and

FIGURE 3 is a section along plane 3—3 of FIGURE 2.

It is conventional in cone crushers, for example gyratory crushers, to have a bowl which forms or defines the upper side of the crushing cavity, adjustably mounted on the crusher frame. It is also conventional to have an adjustment ring on the crusher frame which threadedly mounts the bowl so that the bowl may be rotated and easily moved up and down to compensate for wear of the bowl liner, usually formed of manganese steel or the like. The present invention relates to a system of adjustment for the bowl and to a positive lock between the bowl and adjustment ring.

In FIGURE 1, a crusher, which may be any type of cone crusher, and as shown herein is a gyratory crusher, has a main frame 10 with an upper outwardly directed flange 12 upon which is mounted an adjustment ring 14. A plurality of spring assemblies 16 may be circumferentially positioned around the crusher frame and yieldingly hold the adjustment ring to the frame. It is necessary to yieldingly hold the adjustment ring and bowl to the frame so that when tramp iron, such as dipper teeth or the like, pass through the crushing cavity, the bowl can move up to pass this material.

The crushing cavity is defined by a head 18 having a mantle 20 and a bowl 22 having a bowl liner 24. The bowl is threaded, as at 26, and the adjustment ring 14 is threaded as at 28. Rotation of the bowl on the ring 14 moves the bowl up and down on the crusher frame to vary the size of the crushing cavity and to compensate for wear of the bowl liner 24 and mantle 20.

The adjustment ring 14 may mount a rotary cap 30 which may include an upwardly directed side wall 32 and a cover 34, which may be integral with the wall 32 or may be separately welded thereto. The cover 34 may mount a plurality of piston and cylinder assemblies 36

which may be of the type shown in application Serial No. 131,629, filed August 15, 1961, and assigned to the assignee of the present invention. The piston and cylinder assemblies 36 are designed to provide an upthrust to the bowl such that any play or clearance in the threads between the bowl and the adjustment ring is always at the bottom of the bowl threads and so that these threads are always in firm contact. Inside the wall 32 is an inwardly directed bar 38 positioned between a pair of spaced ears 40 extending outwardly from a bowl flange 42. The ears 40 and the bar 38 provide a lock between the cap 30 and the bowl so that they rotate together.

I may mount at least one and preferably two fluid or hydraulic rams 44 about the periphery of the crusher. Preferably the rams are arranged diametrically opposite each other. Although I show hydraulic rams, in some applications they may be air operated. The rams 44 each consist of a cylinder 46 having an operating head 47 which is adapted to contact a toothed driver ring 48 mounted on the exterior of the cap 30. In operation, the ram will move forward until its central web 50 contacts one of the teeth 52 on the driver ring and thus rotates the ring, in a clockwise direction as shown in FIGURE 2. The web 50 is bounded by flat surfaces 54 on its upper and lower edges, the surfaces 54 extending beyond the outside edge of the ring 48.

In order to lock the ring 48 and the bowl to the main frame I have provided a lock structure 55 including a pivotal arm 56 extending toward its corresponding ram. The arm 56 may be mounted on a suitable post or the like 58 and is biased by a coil spring 60 inwardly toward the bowl and the ring 48. The spring 60 may be wound around the post 58 as illustrated in FIGURE 3.

The arm 56 may have an inner cam face 62 which is opposite the ram 44, and may have an irregular central web 64 with a corner 65 which abuts the ring 48. The web 64 may be bounded by upper and lower surfaces 66 which extend inwardly beyond the outer edge of the ring 48. In operation, as soon as the ram starts its movement to rotate the ring, the front surface of the ram will contact the cam surface 62 of the arm 56 and rotate the arm out of contact with the driven ring and thus release it.

It should be noted in FIGURE 2 that in the at rest position of the rams 44, the leading edge of the web 50 is spaced somewhat from the next tooth 52 on the ring 48. Also, the upper and lower flat surfaces 54 are practically in contact with the cam face 62 on the lock structure. Thus during the initial excursion of the ram, the web 50 will merely slide along the ring 48. But during this initial excursion, prior to the web 50 contacting the tooth 52, the flat surfaces 54 of the ram will be in contact with the cam face 62 of the lock structure and will cam it out. The initial movement of the ram might be referred to as a dead or idling stroke, the object being that the lock is first released, and only after the bowl has been unlocked does the ram contact one of the teeth of the ring 48 and apply a thrust to the bowl.

I have said that the lock structure is between the main frame and bowl, and in this context I am considering the adjustment ring as an extension of or associated with or a part of the main frame, since it does not rotate with the bowl. But it should be understood that the adjustment ring in this type of crusher is a positive and distinct part.

I find it both practical and convenient in this type of crusher to mount the lock structure on the adjustment ring so that the locking action takes place between the rotatable bowl and the adjustment ring. Since the adjustment ring is pinned to the main frame and cannot rotate, this arrangement, in effect, locks the bowl to the main frame.

The use, operation and function of the invention are described as follows:

In present-day cone crushers, for example gyratory crushers, it is necessary to adjust the bowl relative to the main frame to vary the size of the crushing cavity to compensate for wear to the manganese steel, in order to adjust the crusher for different materials. As shown in the drawings, a pair of hydraulic rams, preferably diametrically opposed, are used to move a driven ring or a toothed ring on the periphery of the bowl. The rams will move this ring and hence the bowl in increments to vary the size of the crushing cavity.

At times during operation, there may be some movement of the bowl relative to the main frame. It is desirable to provide a positive lock between the bowl and main frame to prevent this movement. It is also desirable to provide a means for automatically releasing this lock as soon as the rams are actuated to rotate the bowl. By having an automatic release for the lock it is not necessary for an operator to go over to the crusher and release these locks manually prior to adjustment of the bowl. The rams themselves may be remotely operated and by having the positive lock also remotely operated and preferably automatically operated by the rams, a great savings in bowl adjustment time can be accomplished.

Each lock may include an arm which cooperates with its corresponding ram and is yieldingly urged toward the driven or toothed ring. A coiled spring or the like urges the arm inwardly toward the toothed ring and an undercut part of the arm is positioned against the leading edge of a tooth to prevent movement of the ring. The arm has a cam face which opposes or is adjacent to its corresponding ram and when the rams move forward to rotate the ring, they will strike the cam faces and pivot or rotate the locking arms in an outward direction to release them. The rams will move the bowl forward in increments and each time they move forward to rotate the bowl they will push the locking arms outward and release the bowl. The entire system is automatic and may be remotely operated.

The invention should not be limited to the particular lock structure shown as what is important is to provide a positive lock that is automatically released by the rams.

Whereas the preferred form of the invention has been shown and described herein, it should be realized that there are many modifications, substitutions and alterations thereto within the scope of the following claims.

I claim:

1. In a system of bowl adjustment for a crusher or the like, a main frame, a bowl mounted on the frame for rotary adjustment relative thereto, means for rotating the bowl relative to the main frame to effect adjustment thereof, including at least one fluid operated ram adapted to apply a tangential thrust to the bowl to rotate it relative to the main frame, and a lock structure for applying a positive lock between the bowl and frame, said lock structure being positioned for contact by the ram such that movement of the ram in applying a tangential thrust to the bowl unlocks said lock structure.

2. The structure of claim 1 further characterized in that said lock structure includes an arm pivotally mounted on the main frame and yieldingly urged toward the bowl.

3. The structure of claim 2 further characterized in that movement of said ram to apply a tangential thrust to the bowl is effective to pivot said arm outwardly away from the bowl.

4. The structure of claim 1 further characterized in that said lock structure is automatically released upon application of a tangential thrust to the bowl by the ram.

5. The structure of claim 1 further characterized in that the initial movement of said ram unlocks said lock structure, with subsequent movement of said ram applying a tangential thrust to rotate the bowl relative to the main frame.

6. The structure of claim 1 further characterized by and including an adjustment ring releasably mounted on the main frame, said bowl being screw threaded into the adjustment ring, and a pair of spaced fluid rams for applying a tangential thrust to the bowl to rotate it relative to the adjustment ring, said rams being mounted on said adjustment ring, said lock structure being positioned for contact by one of said rams and being effective to apply a positive lock between the bowl and adjustment ring.

7. The structure of claim 6 further characterized by a toothed ring secured to the bowl for movement therewith, each of said rams being positioned to engage said toothed ring.

8. The structure of claim 7 further characterized in that said lock structure includes an arm mounted on said adjustment ring and yieldingly urged toward said toothed ring for engagement therewith.

9. The structure of claim 7 further characterized in that said lock structure includes an arm pivotally mounted to the adjustment ring, a spring yieldingly urging said arm toward the bowl and toothed ring, said arm having portions thereof positioned to be inserted between adjacent teeth of the ring to resist rotation thereof.

10. The structure of claim 9 further characterized in that said arm has a cam face positioned for contact by said one ram, movement of the ram to apply tangential thrust to the toothed ring being effective to pivot said arm outwardly away from the ring to release the bowl for rotation.

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