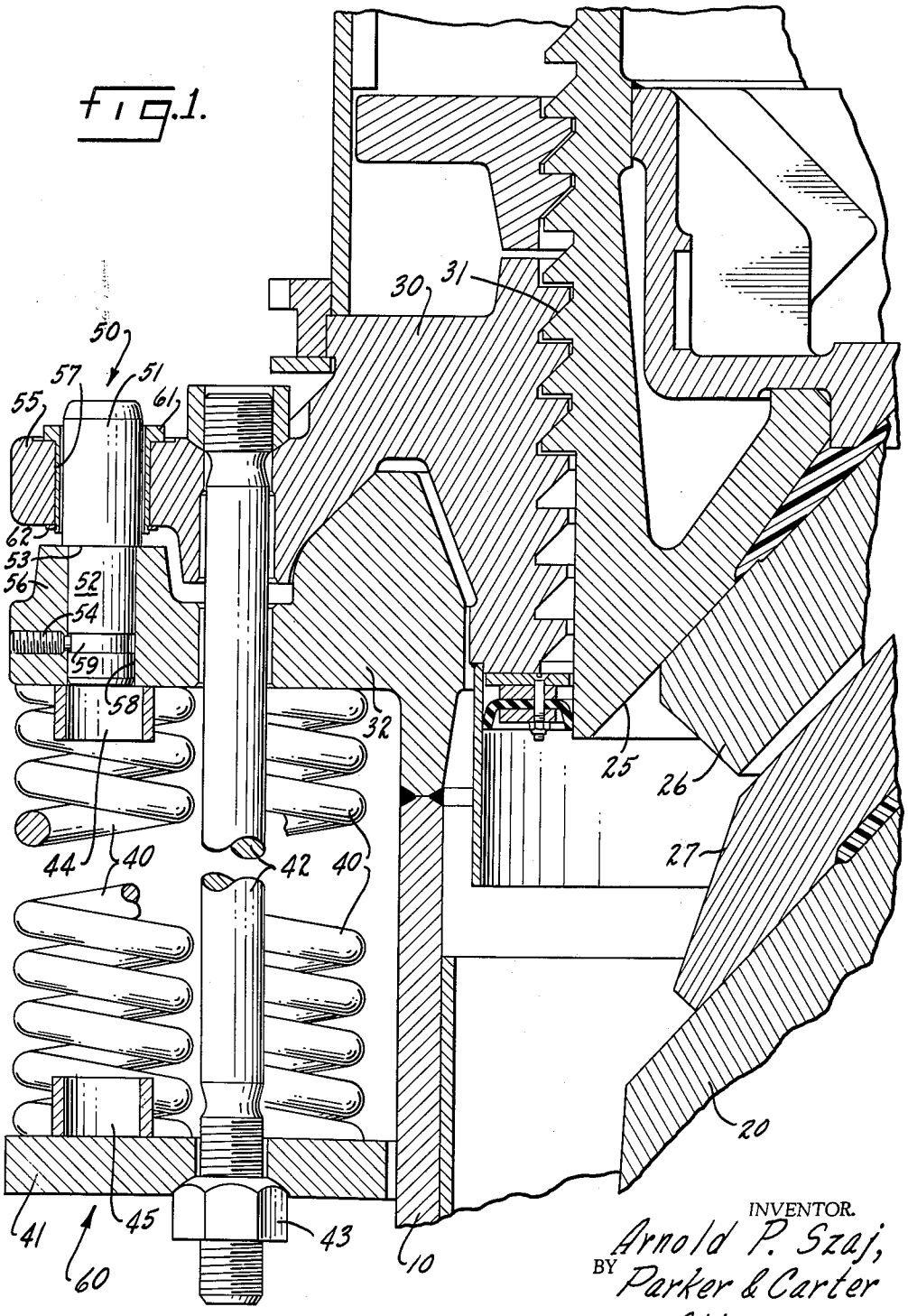
May 7, 1963 A. P. SZAJ 3,088,684

EXTERNAL MAIN FRAME PIN

Filed Nov. 14, 1961 2 Sheets-Sheet 1

Fig. 1.



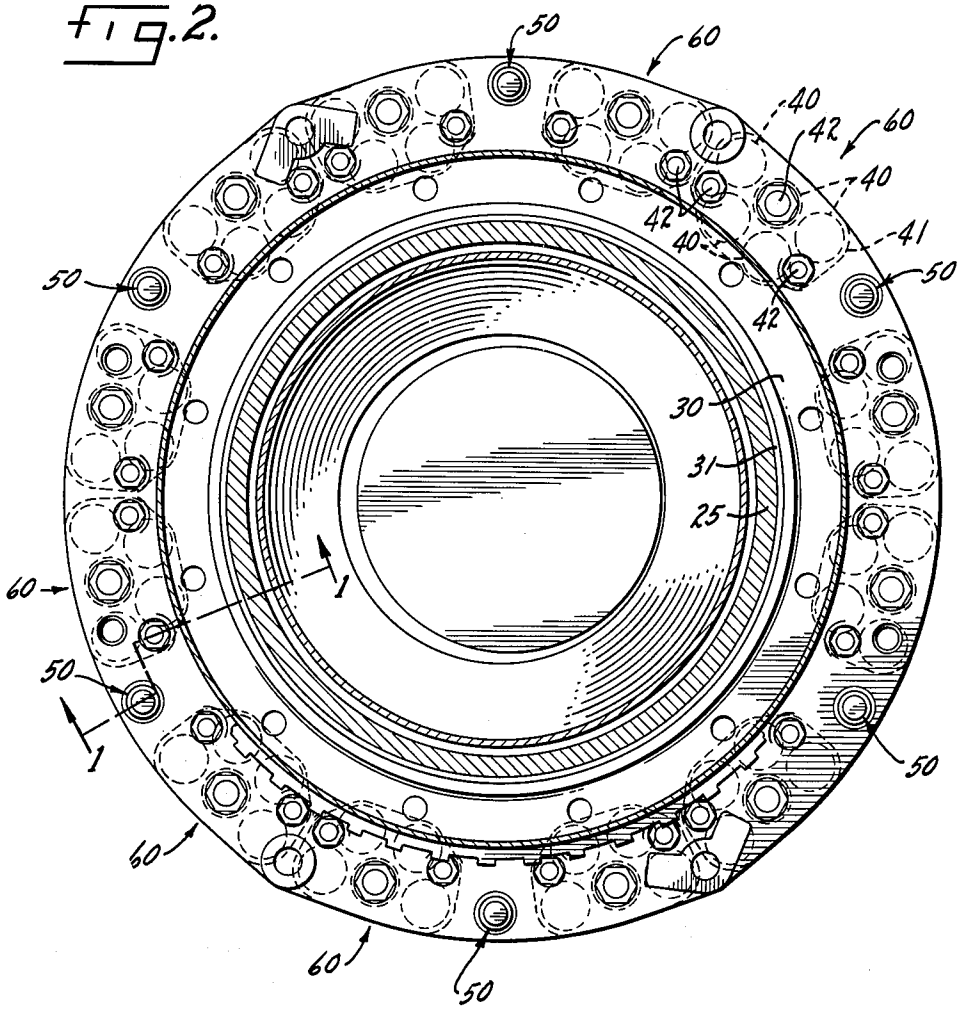
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Fig. 2.



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EXTERNAL MAIN FRAME PIN

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This invention relates generally to gyratory crushers, in particular, to a pin assembly for restricting rotational movements of a crushing part.

A primary object of this invention is to provide a torsion pin assembly to restrict rotational movement of a crushing surface unit in a gyratory crusher.

A further object is to provide a torsion pin assembly on a gyratory crusher which can be easily observed for wear.

A still further object is to provide a torsion pin assembly on a gyratory crusher which can be easily replaced when worn.

Yet another object is to provide an external torsion pin assembly which restricts rotational or incremental movement of a crushing unit in the gyratory crusher.

Yet another object is to provide a torsion pin assembly on a gyratory crusher wherein the pin is free from radial confinement so that it can be easily replaced.

A still further object is to provide a torsion pin assembly unit which can be adapted to existing gyratory crushers.

A particular object is to provide a torsion pin assembly externally fixed to the body frame and to the adjustment ring of a gyratory crusher.

The foregoing objects and other objects which will become apparent from time to time are now realized by the present invention which is illustrated, in part diagrammatically, in the enclosed drawing wherein:

FIGURE 1 is a partial view in cross section of a gyratory crusher taken on line 1—1 of FIGURE 2, and

FIGURE 2 is a top plan view of a gyratory crusher in partial section with parts omitted for clarity.

The drawing indicates some of the principal features of a well-known gyratory crusher. Such a crusher has a generally cylindrical main body frame **10**, a gyratory head **20** within the main frame, a bowl **25** with a crushing member **26** spaced from a coacting crushing surface of the mantle **27** on the head **20** to define a crushing cavity therebetween. The head **20** is generally conical in shape and gyrates within the main frame **10** by an eccentrically driven shaft in an eccentric sleeve fixed to a rotational base (not shown).

The bowl **25** can be adjusted up and down to increase or decrease the crushing cavity formed by the crushing surfaces **26** and **27**. This adjustment may be attained by raising or lowering the bowl **25** which is threaded at **31** to the adjustment ring and which is seated on the flange **32** of the main frame **10**. The bowl **25** and the adjustment ring **30** threaded thereto are designed to jointly make a releasing movement or to move in response to uncrushable material, such as tramp iron, entering the crushing cavity. Such movement is necessary so the gyratory crusher will not be damaged by the force of the gyrating conical head when it meets resistance from uncrushable material. When such uncrushable material enters the crushing cavity, the bowl **25** and the adjustment ring threaded thereto releasably move in a generally up and down path until the uncrushable material passes out or is removed from the crushing cavity. The releasing movement of the bowl and adjustment ring when uncrushable material enters the crushing cavity is both permitted and restricted by the action of a spring cluster or a group of springs **60** which is best seen in FIGURE 2. The individual springs **40** with the cluster **60** are contained at the top by both the transverse member **32** of the body

frame and at the bottom by a lower abutment or segment **41**. The lower abutment **41** is independent of the body frame **10** and may be held in place by one or more elongated bolts as at **42** and secured by a nut as at **43**. Some of the springs **40** may be engaged at the top by a boss or lug **44** depending from the main frame and engaged at the bottom by a boss or lug **45** projecting from the abutment **41**. The lower abutment **41** may be a circumferential or arcuate plate designed to fit the side of the body frame **10** and may be of sufficient size to hold a cluster of such springs. A number of such plates holding a cluster of springs are circumferentially spaced around the body frame and provide tension to allow limited up and down movement of the bowl and associated adjustment ring.

While it is desired to have a releasable movement of the bowl and associated adjustment ring from the main body frame when uncrushable material passes through the crushing cavity, it is not desirable to have rotational or incremental movement of the bowl and associated adjustment ring. Such rotational movement would twist or otherwise damage the spring bolts **42**. To restrict such rotational movement, a plurality of torsion pin assemblies generally shown at **50** are employed. The pins are preferably of generally cylindrical shape and have an enlarged upper portion or an enlarged upper diameter **51** separated from a lower portion or reduced lower diameter **52** by a shoulder or offset **53**. The torsion pin sits in a central passageway formed by an upper bore **57** in an upper extension **55** of the adjustment ring and a lower bore **58** in a lower extension **56** of the main body frame.

It is provided that the torsion pin assembly is externally placed so that any wear thereto can be instantly observed and that worn pins can be easily replaced. Such external placement is provided because the pin assembly is positioned in the upper extension **55** from the adjustment ring and the matching lower extension **56** from the main body frame.

The pin assembly may be placed at various distances and positions along the periphery of the gyratory crusher. The illustration in FIGURE 2 shows the pin assemblies spaced at generally equal distances along the periphery and located between paired spring clusters.

The upper bore or passageway **57** in the upper extension **55** is preferably of an enlarged diameter, and in this enlarged upper bore may be placed a bushing **61** held in place by a snap ring **62**. The upper portion of the pin is loosely fitted in the upper bore, even when a bushing is present so that releasing movement of the adjustment ring can take place when an uncrushable material passes through the crushing cavity. The lower portion of the torsion pin is preferably made to snugly but releasably fit the lower bore in the lower projection or ear extending from the body frame. The shoulder **53** of the pin abuts the upper face of the lower extension **56** when the pin is fully seated. The pin may be secured in the lower extension by a set-screw **54** engaging a groove **59** in the lower portion of the pin. In such an assembly, the torsion pin and the bushing are readily visible and any wear thereto can be instantly noted.

It should be understood that such a torsion pin assembly can be fitted on pre-existing gyratory crushers not equipped therewith. A bracket assembly having an upper member and a lower member may be welded or secured by other means respectively to the adjustment ring and to the transverse member of the body frame. Such upper and lower members may have corresponding upper and lower bores to define a common passageway to receive a torsion pin. A dummy pin may be placed in such a bracket assembly for purposes of alignment prior to insertion of the actual torsion pin.

To attain full advantage of this invention, it is intended that the torsion pin be easily withdrawn from the

common pasageway in the upper and lower extensions. The pin, therefore, should not be confined or secured by any means other than externally releasable means, if any at all. The absence of such confinement renders removal and insertion of the pin a simple operation. The torsion pin may be seated in the common passageway without any confinement, but some confinement means may be optionally used to limit axial movement of the pin. The shoulder **53**, of course, restricts such downward axial movement but it may be desired to have additional means such as the setscrew **54** engageable with the groove **59** in the lower portion of the torsion pin.

The use and operation of my invention are as follows:

The gyratory movement of the head **20** within the body frame of a gyratory crusher imparts a rotational force to the bowl and this tends to translate such force into rotational movement of the bowl and adjustment ring. To prevent this rotational tendency from damaging the coil springs and elongated bolts in the clusters around the outer circumference of the crusher, the torsion pin assemblies are spaced around the periphery of the body frame **10** and the adjustment ring **30**. In particular, such torsion pins are placed in a common passageway formed by the upper and lower bores in corresponding extensions from the adjustment ring or equivalent extension of the bowl, on one hand, and a transverse member or similar extension of the body frame, on the other hand. The assembly permits an up and down release movement of the adjustment ring and bowl because the upper bore in the upper projection is slightly larger than the diameter of the upper portion of the torsion pin. The torsion pin may be seated in the common passageway by having its shoulder abutting against the lower extension.

At all times, both the pin and the bushing are readily visible and any wear may be instantly observed. When such wear to the bushing and the pin reaches a level that requires replacement, the bushing is quickly and simply removed and replaced. It is not necessary to dismantle or remove any of the large parts of the gyratory crusher. The adjustment ring is left intact as well as the bowl threaded thereto. The replacement can be performed quickly and without requiring specialized tools.

In gyratory crushers of the type described, it has been found satisfactory to space six torsion pin assemblies at substantially equal distances along the periphery of the body frame and the adjustment ring. It should be understood, however, that the number of such torsion pin assemblies may be any number of two or more, and such actual number will be determined by the choice of the operator, the size of the gyratory crusher and the rotational force imparted to the bowl by the gyratory movements of the head.

The pin assembly has been described as externally positioned in extensions which have been shown as continuous along the periphery of the crusher. It will be apparent that such a torsion pin can be placed in non-continuous extensions or separated projections. Such a pin assembly will still be externally placed and will still provide the other advantages such as visual observance of wear and easy removal and replacement.

The foregoing invention can now be practiced by those skilled in the art. Such skilled persons will know that the invention is not necessarily restricted to the particular embodiments presented herein. The scope of the invention is to be defined by the terms of the following claims as given meaning by the preceding description.

I claim:

1. In a gyratory crusher having a main frame, a head within the frame mounted for gyratory movement, a bowl in the main frame spaced from the head to define a crushing cavity, an adjustment ring with a continuous extension from the bowl to raise and lower the bowl, said ring seated on a continuous extension from the main frame, a combination to allow releasing movement of the adjustment ring, yet prevent rotational movement of the adjustment ring, which includes, a plurality of spring cluster units, each unit having a group of individual springs, said cluster units circumferentially distributed below the extensions and releasably holding the ring down on the frame, said cluster units separated by a space on the extensions substantially greater than the space between the individual springs in the cluster unit, a torsion pin in a space of the extensions between adjacent cluster units, said torsion pin seated in a bore formed in the extensions, said extensions generally coextensive with the spring clusters, said pin adapted to be dropped into the bore and removed from the bore without being secured to the extensions, and said pin being observable for wear at all times in the bore.

2. The crusher of claim 1 further characterized in that the frame extension and the ring extension have aligned passageways to form a bore for seating the torsion pin, and the ring passageway is larger to allow releasing movement of the ring about the torsion pin.

3. The crusher of claim 1 further characterized in that a plurality of spaces between adjacent spring clusters have a torsion pin seated in a bore formed in the extensions.

4. In a gyratory crusher having a main frame, a head within the frame mounted for gyratory movement, a bowl in the main frame spaced from the head to define a crushing cavity, an adjustment ring with a continuous extension from the bowl to raise and lower the bowl, said ring seated on a continuous extension from the main frame, a combination to allow releasing movement of the adjustment ring, yet prevent rotational movement of the adjustment ring which includes a plurality of paired spring cluster units, each unit in a pair having a group of individual springs, said paired cluster units circumferentially distributed below the extension and releasably holding the ring down on the frame, said paired cluster units separated by a space on the extensions substantially greater than the space between the units in a pair and substantially greater than the space between the individual springs of a cluster unit, a torsion pin in a space of the extensions between adjacent paired cluster units, said torsion pin seated in a bore formed in the extension, said extensions generally coextensive with the spring clusters, said pin adapted to be dropped into the bore and removed from the bore without being secured to the extensions, and said pin being observable for wear at all times in the bore.

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