

[54] **ADJUSTABLE AND YIELDABLE BREAKER BAR SUPPORTS FOR IMPACT CRUSHER**

[75] Inventors: **Keith B. Lowe; William R. Gray,**
both of Appleton, Wis.

[73] Assignee: **Allis-Chalmers Corporation,**
Milwaukee, Wis.

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[51] Int. Cl. **B02c 13/31**

[58] Field of Search **241/5, 32, 275, 286, 289,**
241/290, 191

[56] **References Cited**

UNITED STATES PATENTS

2,525,795	10/1950	Grisdale	241/32
3,295,773	1/1967	Nixon	241/191
3,455,517	7/1969	Gilbert	241/191 X
3,701,485	10/1972	Kimble et al.	241/32

FOREIGN PATENTS OR APPLICATIONS

1,274,059	9/1961	France	241/286
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Primary Examiner—Roy Lake

Assistant Examiner—E. F. Desmond

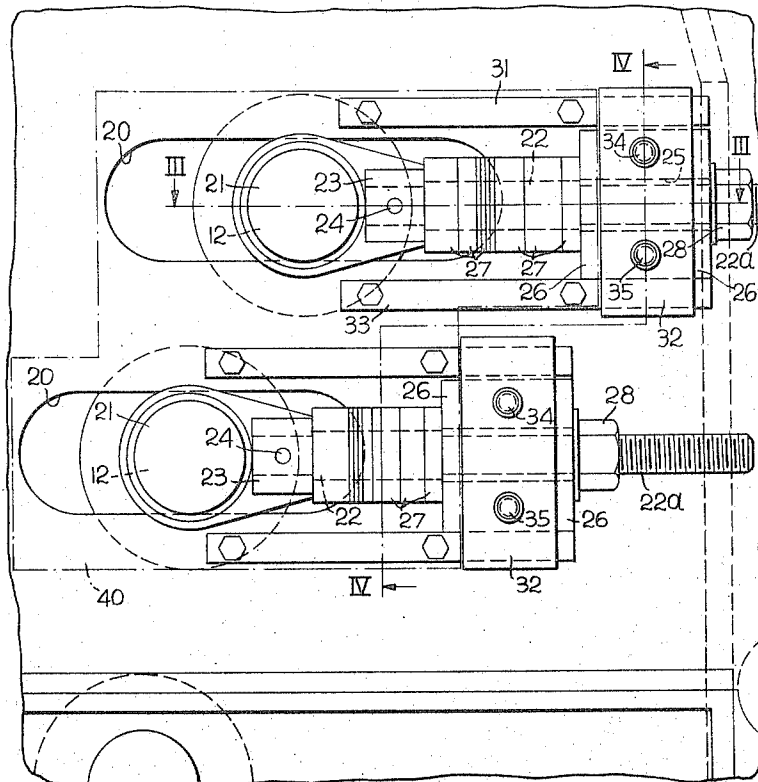
Attorney, Agent, or Firm—Arthur M. Streich

[57] **ABSTRACT**

An impact crusher is disclosed having a rotor carrying hammers arranged to strike and throw material against target breaker bars, and an adjustable and yieldable support assembly for each end of a target breaker bar. The support assembly includes a threaded arm connected at a right angle to the bar and projecting

through a bore in a rectangular shear block. The shear block is arranged in a box defined by a U-shaped channel assembly fitted over the shear block with its open end attached to the adjacent housing sidewall. The box holds the shear block against turning and a pair of shear pins which pass through the shear block and are journaled in the box, hold the shear block against axial movement. The position of the connected breaker bar is established and adjusted relative to the housing by a plurality of shims which are mounted on the arm between the breaker bar and the shear block. A nut on the arm on a side of the shear block opposite the shims, clamps the shims tightly between the breaker bar and the shear block, and overload forces are transmitted from the breaker bar through the shims to the shear block, and not through the threaded arm to the shear block, so the arm and nut threads are protected from possibly being damaged by overload forces before the pins shear. The shear pins are arranged horizontally in a common vertical plane perpendicular to the arm with one above the arm and one below the arm. Each shear pin has two axially spaced circumferential shear grooves with one groove in the vertical plane between one vertical side of the shear block and the housing sidewall, and the other groove in the vertical plane between the other vertical side of the shear block and the channel assembly. Overload forces therefore are relieved by the shear block being pushed between ends of a pair of double shear groove pins and thus cause the two pins to be sheared within the confines of the four grooves which are uniformly spaced around the pushing arm, while the shims continue to be securely clamped between the breaker bar and shear block, and present no personnel hazard of flying parts.

5 Claims, 4 Drawing Figures



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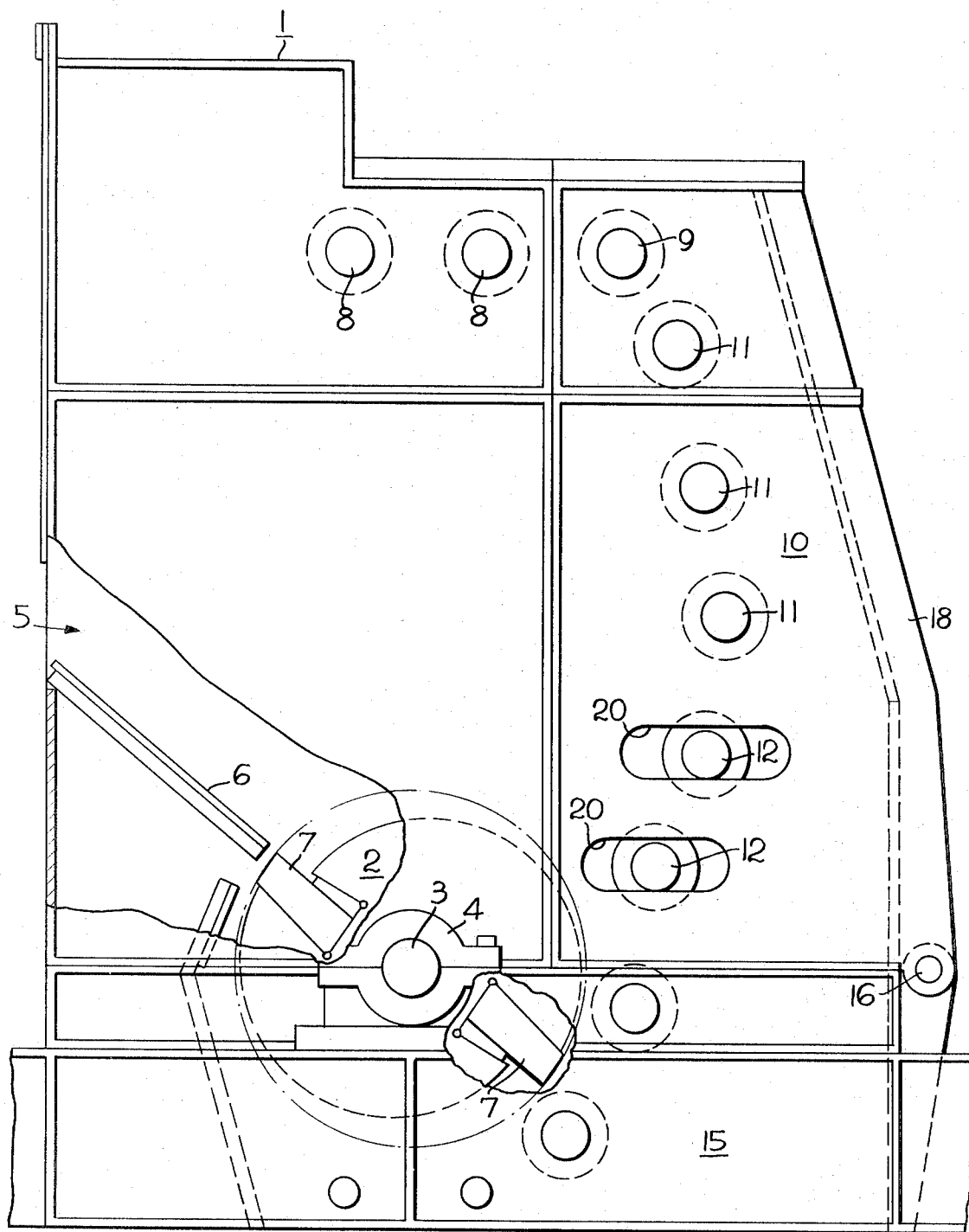


Fig.-1

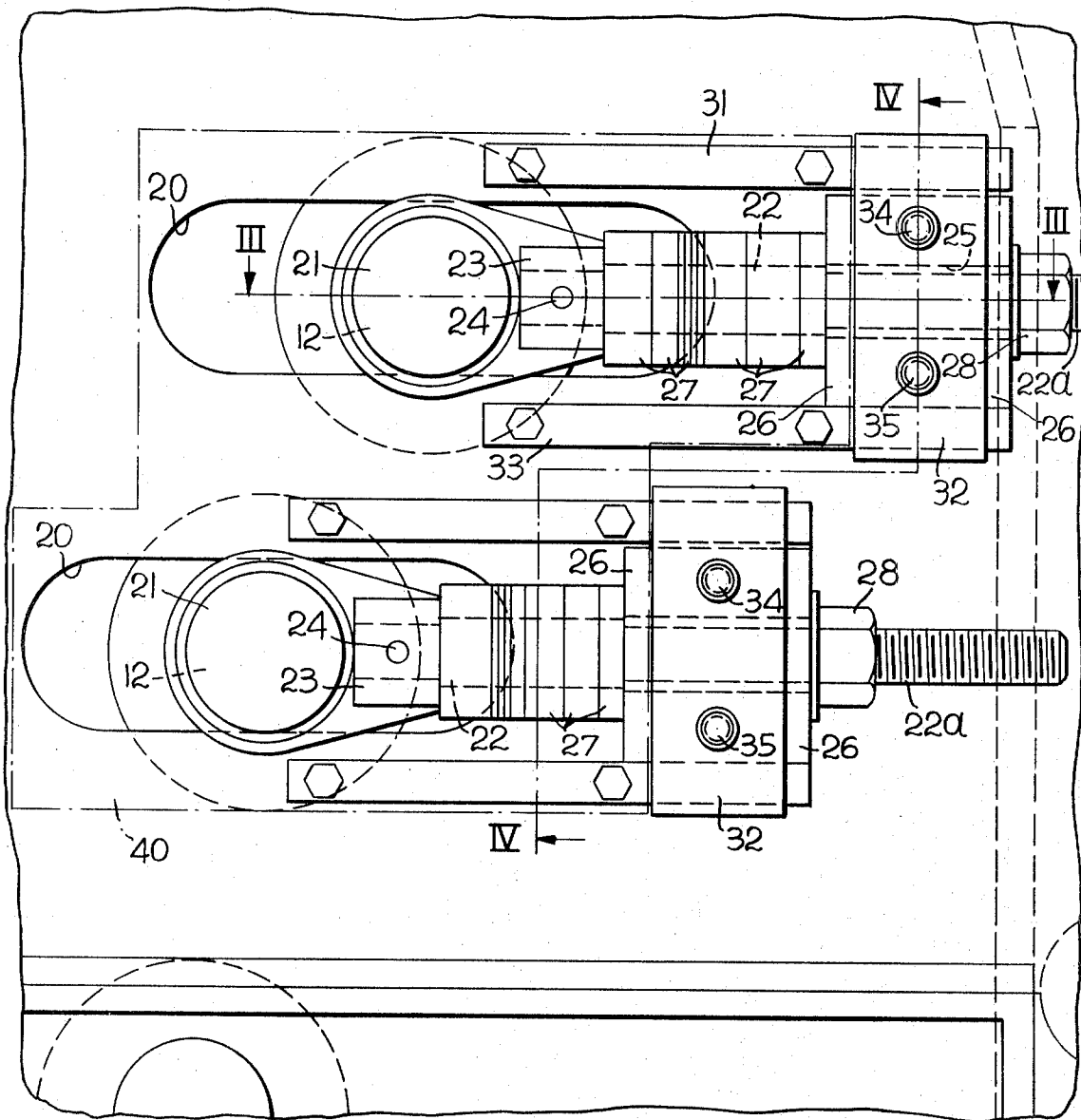
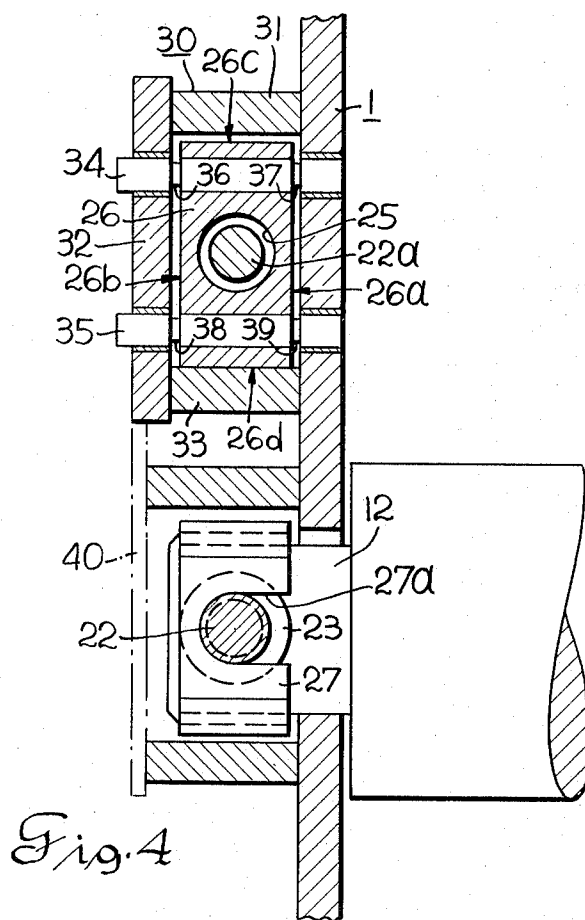
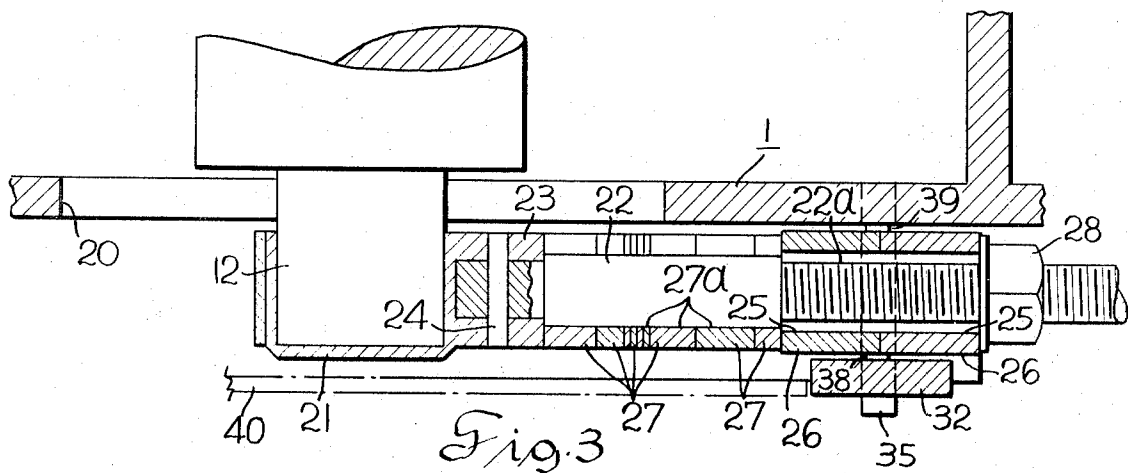


Fig. 2



ADJUSTABLE AND YIELDABLE BREAKER BAR SUPPORTS FOR IMPACT CRUSHER

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to impact crushers which have a rotor carrying hammers arranged to strike and throw rock to disintegrate upon impact with elongated target breaker bars spaced from the rotor, and in particular to an improved support assembly for the ends of adjustably positioned target bars, including shear pins for protecting machine parts from damage by uncrushable oversize material or objects.

2. Description of the Prior Art

U.S. Pat. No. 1,864,973 of June 28, 1932 is an example of an early impact crusher patent disclosing target breaker bars which are protected from damage by uncrushable oversize material or objects, such as tramp iron, by mounting such target bars to move away from the crushing position against the bias of coil springs. More recent prior patents showing arrangements which utilize one or more springs include U.S. Pat. No. 2,486,421 of 1949; U.S. Pat. No. 2,597,635 of 1952; and U.S. Pat. No. 2,767,928 of 1956.

It is also known to the prior art that target bars held in a crushing position by threaded bolts and nuts in planes parallel to forces applied thereto by uncrushable oversize material, will be released to move away from the crushing position when such forces cause such threads to be stripped. An example of such an arrangement is shown in U.S. Pat. No. 2,862,669 of 1958.

Arrangements are also known utilizing a single shear pin as shown in U.S. Pat. No. 2,646,224 of 1953; and U.S. Pat. No. 3,096,035 of 1963 and 3,202,368 of 1965 show single pins having a pair of axially spaced circumferential shear grooves to provide for shearing a midportion of the pin from its two end portions. With such arrangements overload force caused by uncrushable material is directed at the midportion of the pin to shear the pin in two parallel planes, one on each side of such a force.

Arrangements have also been disclosed in which a pair of shear pins are each sheared in a single plane by overload force directed between the two pins. Examples of such arrangements are disclosed in U.S. Pat. No. 2,525,795 of 1950 and U.S. Pat. No. 3,701,485 of 1972.

Still another arrangement is disclosed in U.S. Pat. No. 3,455,517 of 1969, in which overload force of uncrushable material causes a plunger rod to punch a hole through a disc and thereby permit target bars to move away from a crushing position.

SUMMARY OF THE PRESENT INVENTION

According to the present invention an impact crusher having a rotor carrying hammers arranged to strike and throw material against target breaker bars, is provided with an improved adjustable and yieldable support assembly for each end of a target breaker bar, having threads which cannot be stripped if shear pin fracture is delayed, and having shims which cannot fly about and cause injury after shear pins do fracture.

The support assembly includes a threaded arm connected at a right angle to the bar and projecting through a bore in a rectangular shear block. The shear block is arranged in a box defined by a U-shaped channel assembly fitted over the shear block with its open

end attached to the adjacent housing sidewall. The box holds the shear block against turning and a pair of shear pins which pass through the shear block and are journaled in the box, hold the shear block against axial movement. The position of the connected breaker bar is established and adjusted relative to the housing by a plurality of shims which are mounted on the arm between the breaker bar and the shear block. A nut on the arm on a side of the shear block opposite the shims, clamps the shims tightly between the breaker bar and the shear block, and overload forces are transmitted from the breaker bar through the shims to the shear block, and not through the threaded arm to the shear block, so the arm and nuts threads are protected from possibly being damaged by overload forces before the pins shear.

The shear pins are arranged horizontally in a common vertical plane perpendicular to the arm with one above the arm and one below the arm. Each shear pin has two axially spaced circumferential shear grooves with one groove in the vertical plane between one vertical side of the shear block and the housing sidewall, and the other groove in the vertical plane between the other vertical side of the shear block and the channel assembly. Overload forces therefore are relieved by the shear block being pushed between ends of a pair of double shear groove pins and thus cause the two pins to be sheared within the confines of the four grooves which are uniformly spaced around the pushing arm, while the shims continue to be securely clamped between the breaker bar and the shear block, and present no personnel hazard of flying parts as has been the case with certain arrangements of the prior art.

Other features of the invention will appear from the more detailed description to follow with reference to an embodiment of the present invention shown in the accompanying drawings.

BRIEF DESCRIPTION OF THE PRESENT INVENTION

FIG. 1 of the drawing is a view in elevation showing an impact crusher with certain of the target breaker bars having end portions mounted in oblong slot openings in housing sidewalls;

FIG. 2 is a fragmentary view to enlarged scale, showing the bar end portions in the oblong housing wall slots, and a mechanism adjustably and yieldably positioning the bar end portions in the slots, according to the present invention;

FIG. 3 is a view taken along line III—III in FIG. 2 and viewing the structure in the direction indicated by arrows; and

FIG. 4 is a view taken along line IV—IV in FIG. 2 and viewing the structure in the direction indicated by arrows.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. 1, an impact crusher is shown which comprises a housing 1 having disposed within a lower area thereof a rotor 2 mounted on a shaft 3 which is carried by suitable journal bearings 4. The housing 1 defines a material feed opening 5 over a feed chute 6 inclined downwardly toward the rotor 2. The feed chute 6 delivers rock to hammers 7 which are carried by the rotor 2.

Chute 6 directs feed rock to rotor 2 at a location where its hammers 7 are ascending with the result that the impact of hammers 7 on rock breaks the rock into smaller particles which are thrown upwardly to break into even smaller particles upon impact with a complement of primary target breaker bars 8 and 9 which are carried by the casing 1. A secondary crushing occurs when such particles drop downwardly from bars 8 and 9 to be again struck by hammers 7 and thrown toward a discharge area 10 where the particles impact with a vertical array of secondary target bars 11. Close to the periphery of rotor 2, one or more adjustable and yieldable breaker bars 12 are arranged. Adjustable and yieldable mounts such as for bars 12 will hereinafter be described with reference to FIGS. 2, 3 and 4. Any particles not passing between the bars 11 and into discharge area 10, progress downwardly toward the bars 12 where such particles are subjected to a final crushing as the particles are nipped and urged through the space between rotor 2 and bars 12 to the lowest portion of the discharge area. The casing 1 may include a pivotal portion 18 connected to base structure 15 by a hinge 16, operative to open the casing and provide access to internal mechanisms.

Referring to FIGS. 2 and 3, end portions of the bars 12 project through oblong slot openings 20 in sidewalls of casing 1. The oblong openings 20 are oriented to permit movement of bars 12 toward and away from rotor 2 in a horizontal plane. A cap 21 fitted on the end of bar 12 connects bar 12 to an arm 22 projecting horizontally therefrom at a right angle to bar 12 and in a direction away from rotor 2. The end of arm 22 adjacent cap 21, projects into a bushing 23 which is attached to cap 21, and a pin 24 extends through bushing 23 to connect bushing 23 and cap 21 to arm 22. An end 22a of arm 22 projecting away from bar 12, is threaded and projects through a central bore 25 in a shear block 26 (which may comprise two pieces as shown in FIG. 3). A plurality of shims 27 are mounted on arm 22 between bushing 23 and shear block 26, and a threaded nut 28 is turned on the threaded end 22a of arm 22 on the side of shear block 26 opposite the shims 27.

As shown in FIG. 4 the shear block 26 is rectangular with parallel sides 26a, 26b and 26c, 26d, and the shear block 26 is arranged with a slightly loose fit in a boxlike structure 30. The box 30 is defined by the adjacent housing sidewall 1 and a U-shaped channel which is in turn defined by walls 31, 32 and 33. The channel 31, 32, 33 is fitted over the shear block 26 with its open end between walls 31 and 33 directed horizontally and closed by attachment to the adjacent housing sidewall 1 to complete the boxlike enclosure 30 around shear block 26. A pair of shear pins 34, 35 pass through shear block 26 with their inner ends journaled in housing sidewall 1 and their outer ends journaled in channel wall 32 of the box 30. The shear pins 34, 35 are arranged in a common vertical plane and parallel to each other, with pin 34 above the end 22a of arm 22 and pin 35 below the end 22a of arm 22. Shear pin 34 has two axially spaced circumferential shear grooves 36, 37 and shear pin 35 has two axially spaced circumferential shear grooves 38, 39. The pin grooves 37, 39 are substantially coplanar with the vertical side 26a of shear block 26 adjacent wall 1 and in the plane between shear block 26 and wall 1. The pin grooves 36, 38 are substantially coplanar with the vertical side 26b of shear block 26 adjacent channel wall 32 and in the

plane between shear block 26 and wall 32. A cover plate 40 indicated by phantom lines in FIGS. 2, 3 and 4, may be attached to the channel walls 31, 33 on the side of wall 32 toward bars 12, to cover the entire mechanism and insure that the shims 27, which may have U-shaped slots 27a as shown in FIG. 4, do not work their way off arm 22.

In the operation of the described support assembly to adjust the position of the target bars 12 relative to the rotor 2 and hammers 7, the nut 28 on the arm 22 is first turned to move away from the shear block 26. Cover 40 is removed and one or more shims 27 are removed or added to the group on arm 22 in order to provide a number of shims 27 of a thickness appropriate for a new position of bar 12 relative to rotor 2. Replacing cover 40 insures that shims 27 cannot fall off arm 22 and turning nut 28 again toward bar 12 securely clamps shims 27 between the bushing 23 and the shear block 26. Thereafter bar 12 will be held securely in its designated position unless and until overload forces are applied to bar 12 by uncrushable material such as tramp iron caught between the rotor 2 and the bar 12. The application of such overload forces to bar 12, if and when they occur, are transmitted through bushing 23 and shims 27 to shear block 26 which is pushed axially through the box 30 to shear pins 34, 35 within the confines of their circumferential shear grooves 36, 37, 38 and 39. Thus, there is no danger of overload forces stripping the threads of either arm 22 of nut 28, and the shims 27 continue to be securely contained between the bushing 23, the shear block 26 and the cover 40, even after pins 34, 35 shear. There is, therefore, no hazard to personnel from flying parts when the pins shear or to the machine and its parts except for the inexpensive easily replaceable shear pins.

From the foregoing detailed description of the present invention it has been shown how the desirable features of the present invention have been attained in a preferred manner. However, modification and equivalents of the disclosed concepts such as readily occur to those skilled in the art are intended to be included in the scope of this invention. Thus, the scope of the invention is intended to be limited only by the scope of the claims such as are or may hereafter be, appended hereto.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. An impact crusher having a housing enclosing a rotor carrying hammers arranged to strike and throw input material to disintegrate upon impact with target breaker bars spaced from the rotor, and an improved support assembly for each end of an adjustably positioned target breaker bar having end portions projecting through horizontally extended oblong openings in sidewalls of said housing; and said support assembly comprising:

- a. an arm having a bushing at one end connected at a right angle to said projecting bar end portion, with an end of said arm opposite said bushing being threaded and projecting horizontally away from said rotor and beyond said sidewall opening;
- b. a shear block with a central bore through which the threaded end portion of the arm projects;
- c. a plurality of shims on said arm between said bushing and said shear block;

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d. a threaded nut turned on the end of the arm projecting through the shear block and clamping said shims between said bushing and said shear block;

e. a channel fitted over the shear block, having an open end directed horizontally toward and attached to the adjacent housing sidewall to define a box surrounding and holding the shear block against rotation about the arm; and

f. a pair of parallel shear pins arranged in a vertical plane and on opposite sides of the arm, with each shear pin having its ends journaled in said box and a midportion thereof extending through a bore in the shear block to hold the shear block against axial movement within said box unless and until said shear pins are sheared by overload force applied to the supported target bar by such as uncrushable material.

2. A crusher according to claim 1 in which said shear block is rectangular, and said channel is a U-shaped assembly of walls loosely holding the shear block against the adjacent housing sidewall.

3. A crusher according to claim 1 in which said arm is connected to the projecting bar end portion by a cap member connected to the arm and fitted over the end of the bar to engage the circumference thereof, whereby when the nut is turned on the arm to move away from the shear block, the target breaker bar can be moved toward and away from the rotor.

4. A crusher according to claim 2 in which shear pins are arranged in horizontal positions with one above the arm and one below the arm, and one end of each pin is journaled in said adjacent housing sidewall and the other end of each pin journaled in the U-shaped channel assembly.

5. A crusher according to claim 4 in which each shear pin has two axially spaced circumferential shear grooves with one shear groove of each pin substantially coplanar with the vertical side of said shear block adjacent said housing wall and the other shear groove of each pin substantially coplanar with the vertical side of said shear block remote from said housing wall.

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