Operation of the Bico Chipmunk Jaw Crusher

Introduction

The Bico Chipmunk Jaw Crusher Model 241-36 WD is designed for the rapid reduction of rocks into granular particles. Rocks are placed into the hopper of the machine and are crushed between two jaws in the interior of the machine. The movement of the jaws not only crushes the rock, but forces the discharge down and out of the machine where it is collected in a metal sample tray. Jaw spacing may be adjusted to grind to as fine as 3 to 5 mm.

The primary use of the jaw crusher is to reduce the grain of the material for analysis or for further processing by other machines (i.e. Spex Shatterbox, Brinkmann Grinder, etc.). Typical uses are to prepare hand-samples of rock for X-ray diffraction, whole-rock analysis, or other analytical work.

The jaw crusher is under the supervision of Dr. Abdul Mehdi-Ali of the E&PS Analytical Geochemistry Laboratory. With prior approval of Dr. Ali, the key to the lab containing the crusher may be checked out from the main office.

Description of the Bico Jaw Crusher

In the description that follows, the numbers in parenthesis refer to various machine parts as labeled on Figure 1. Many parts are not user serviceable or the service of them is beyond the scope of this procedure, and these parts are not labeled or described.

The Bico Jaw Crusher is a shock load crushing device driven by a 220 volt 60 cycle continuous motion motor that is coupled to the crusher by a belt driven pulley system. Because of routine maintenance requirements, the user of the jaw crusher must be familiar with much of the machine. The feed hopper (1) is located about mid-machine directly behind (when viewing the machine from the front) and above the stationary jaw shield plate. Beneath the stationary jaw shield plate is the jaw cam-lock (3) which is part of the securing apparatus for the stationary jaw (7). The adjustment hand knob (5) is located in the lower front on the right hand side of the machine. On the left side of the machine, directly opposite of the hand knob is the square-head adjustment locking bolt (not shown). An oil cup (not shown) for the adjustment assembly is located on the front of the machine, between and above the hand knob and locking bolt. To the left and right, behind the hopper are two grease caps (6) that grease bearings for the moveable jaw (4), a third grease cup is located further back on the machine in the center. Below the third grease cap on the back of the machine is the spring rod assembly (8), and beneath the spring rod assembly is a second oil cup. Under the machine is a space for the sample collection tray (not shown). The power control (not shown) is mounted on the wall close to the crusher, and consists of two buttons (red and green). The green button starts the machine while the red button stops it. There is also a breaker box located close to the machine with a clearly labeled, separate breaker switch for the crusher circuit.

Procedure

1. The jaw crusher should be greased and oiled regularly; this should be done prior to each use. To do this, simply turn all grease caps one full turn (clockwise) and put a few squirts of oil in both of the oil cups. If grease caps are tight, add more grease (see MAINTENENCE below).

2. Check jaws for cleanliness and clean them if needed. Loosen the wing nuts and remove the front shield, then loosen the hopper wing nuts (located below the hopper on the left and right of the machine) and move it up and back so that the jaw cam lock is exposed. Lift the cam lock up to release the stationary jaw so that it may be lifted straight out. If it is jammed, the cam lock may be freed by tapping lightly with a mallet or ball-peen hammer. Once the stationary jaw has been removed, the movable jaw will be exposed inside the machine. Brush both jaws with a large bristle brush. If any residual sample material adheres to the jaws, it may be removed by brushing with a large stainless steel bristle brush. After brushing, blow the jaws off with compressed air. The hopper and sample collection trays should not be brushed, but should be blown off with compressed air. Reassemble the jaws and put the sample hopper back in place, hand-tightening the wing-nuts and replace the front shield.

3. Adjustment of jaw spacing: Turn the circuit breaker (located in the breaker box) to the "ON" position. While the crusher is empty, start the machine and allow it to come up to full speed. The machine must be adjusted while running. Loosen the square-head bolt (left). This will allow the hand knob (or right) to turn. Slowly turn the hand-knob clockwise until the jaws of the crusher can be heard just touching each other, and then back off the hand knob (turn counter-clockwise) just slightly. Slowly begin to re-tighten the square-head locking bolt. As this is done, the clearance of the jaws will decrease and may become too close. If this happens back the hand knob off slightly. Repeat this process until the bolt can be tightened completely without significant tapping of the jaws. It may take some practice to do this properly. This procedure will set the machine to grind as fine as possible (approximately 3 to 5 mm particle size) without damage to the jaws. If larger particles are acceptable, jaw clearance may be set to more than the minimum distance.

4. Once the jaws have been set, place a clean sample collection tray under the machine to collect the crushed sample. ***If concerned about contamination of sample material by skin oils and/or perspiration, wear clean, powder free latex (or equivalent) gloves while handling the samples***. When sample volumes permit, it is recommended that the machine be "pre-contaminated". This is done by processing a small amount of the sample to be crushed (thus coating the inner workings of the machine) and discarding the resultant product. This reduces the amount of sample contamination from the machine.

   The lower opening of the hopper is 2 3/8" x 4". This limits the size of material that may be crushed. If a sample is to big to fit easily through the opening, then it is too big for the machine to process and must be reduced by other means to an acceptable size. Once a sample passes through the lower hopper opening, it will be quickly crushed and the product will be forced out through the bottom of the machine into the sample collection tray.

   Overheating: If for some reason the machine jams or stops running in the middle of processing, turn the circuit breaker for the machine "OFF" before doing any inspection. Once the circuit breaker is off, the thermal relay and motor relay will need to be reset. Press the red stop button for the machine and reset the relay for the motor (it is located on the motor). Wait a few minutes for the motor to cool. Before turning the breaker switch "ON" and restarting the machine, make sure the cause of the stoppage has been alleviated. ***NEVER work on the machine while the breaker switch is in the "ON" position.***

5. When the crushing process is complete, remove the sample collection tray and transfer its contents to a clean container.
6. Prior to next use, clean the crusher and collection tray(s) as described previously. When done for the day, make sure the lab is cleaner than it was when you started, that the breaker to the crusher is turned off, lights are out, and door closed and locked.

Maintenance

1. When they may no longer be tightened as described in PROCEDURE Item 1, the grease caps will need to be refilled. Remove the caps, fill them with high-temperature grease, and replace them. If the machine has been operated properly, all caps should need refilling at about the same time. Caps should be checked regularly, generally every week or two.
2. The crushing plates on the outside of the jaws may become worn, making proper adjustment of the machine difficult. Unless previously done, the plates may be switched end-for-end. Remove the stationary jaw from the machine and loosen the center nut on the back of the jaw which holds the plate in place. Once loosened, the jaw plate can be lifted and rotated 180 degrees and the center nut retightened. The moveable jaw can be rotated the same way in the machine. Its center nut is located in the back of the machine, and may require the use of a large socket wrench to loosen it. If the plates have previously been turned, then they must be completely replaced. Remove the center nuts completely, pull off the worn plates and replace them with new ones.

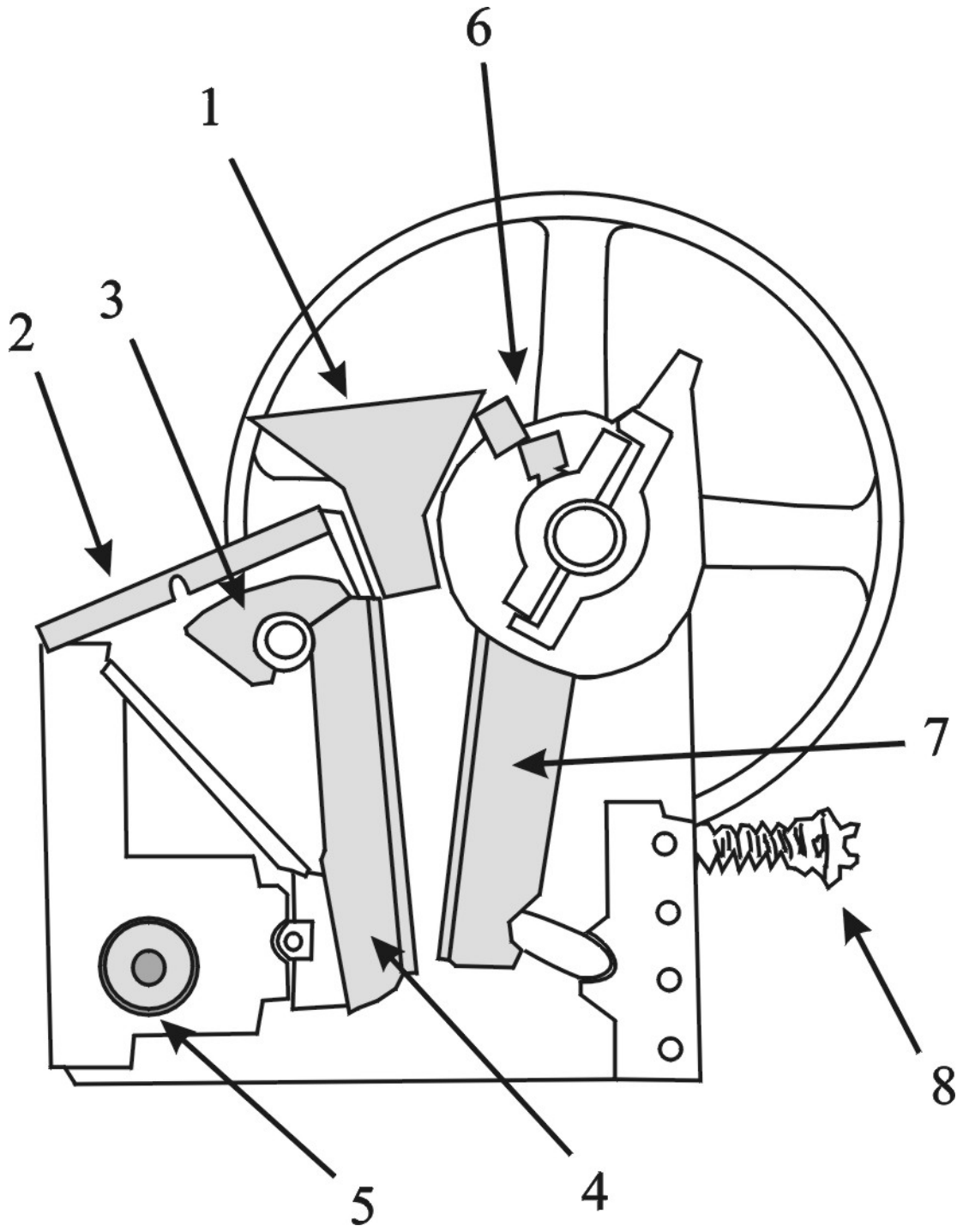

Figure 1: Side View of the Bico Jaw Crusher. Numbers refer to parts mentioned in text.