

Shaking Table

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I. Overview

6-S shaker belongs to gravity beneficiation equipment, developed from the plane chute, characterized by its asymmetric reciprocating motion and its own system. Suitable for sorting 2-0.037 mm ore and slime grade gold, tungsten, tin, tantalum, iron, manganese, chromium, titanium, bismuth, lead and other nonferrous, black, rare and precious metal minerals, sorting 4-0.037 mm pyrite; After changing the form of the bed bar properly, it can select the non-metal such as coal and coal slime, monazite, rutile, and other mixed materials with enough specific gravity difference and particle size composition.

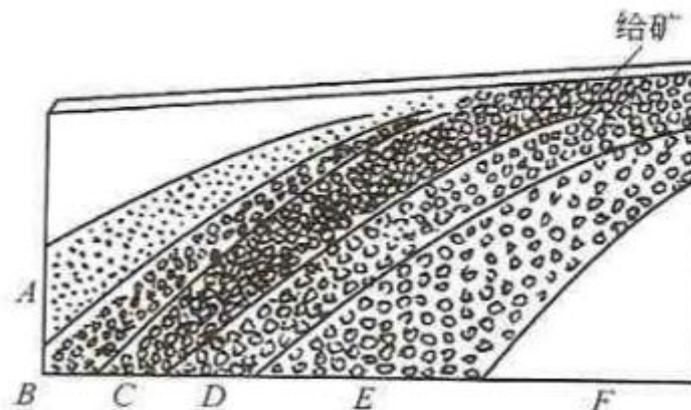
The beneficiation process of the shaker is carried out on the inclined bed surface with repeated strips. The ore particles are sent from the feed trough at the corner of the bed surface, and the transverse washing water is supplied to the feed trough. Under the action of gravity, the transverse water impulse, the inertia and friction caused by the reciprocating asymmetric movement of the bed surface, the ore particles are stratified according to specific gravity and particle size. The longitudinal motion along the bed surface and the transverse motion along the inclined bed surface are made. Therefore, the ore particles with different specific gravity and particle size gradually fan down in their respective direction of movement, respectively from different areas of the concentrate end and tailings side, and finally are divided into concentrate, ore and tailings.

The outstanding advantage of 6-S shaker is that the separation accuracy is high, and the final concentrate, middle ore and waste tailings can be obtained after a single

separation, and multiple products can be obtained at the same time. The concentration ratio of concentrate is high, the sorting efficiency is high, the care is easy, and the stroke is easy to adjust.

II. The working principle

Shaker sorting is realized under the joint action of bed shaking and transverse water flow. Bed bed strips are longitudinal and the direction of water flow is close to vertical. When water flow crosses each bed strip laterally, eddy currents are formed in the groove. The combined action of eddy currents and bed shaking can loosen the mineral sand layer and stratify it according to density. The upper light ore particles are subject to the greater impulse of the water flow, while the lower heavy ore particles are subject to the lesser impulse, so the transverse movement speed of the light ore particles on the bed is greater than that of the heavy ore particles on the bed. This process is called "delamination".



矿粒在床面上的扇形分布

A—精矿；B—中矿 I (次精矿)；C—中矿 II；
D—贫中矿；E—尾矿；F—溢流及矿泥

In the longitudinal direction, the differential movement of the bed surface, at first at a

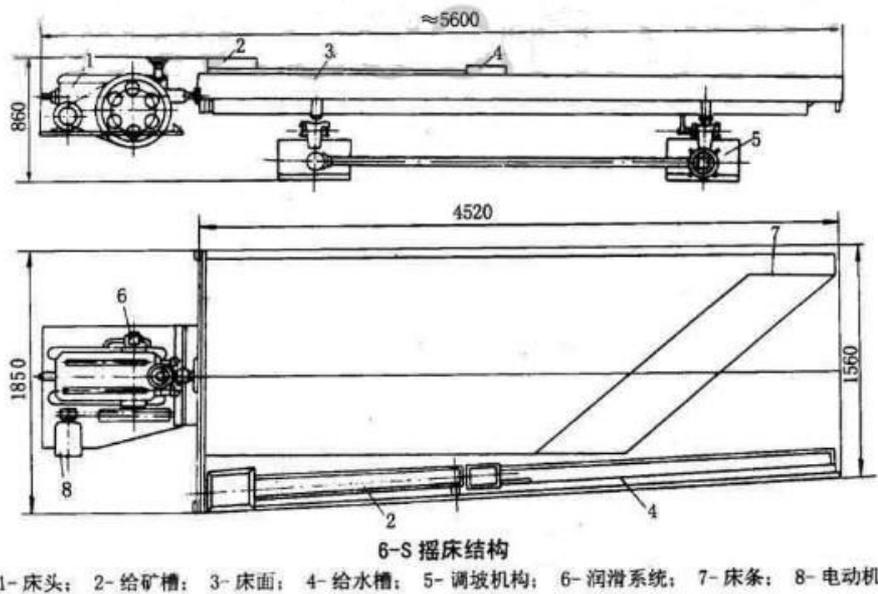
slow speed and gradually accelerate, to the maximum speed when the sudden retreat, the speed gradually decreases during the retreat process, and then forward, repeat the above process, not only promote the loose stratification of the ore layer, but also make the heavy ore particles move forward along the longitudinal at a larger speed, so that the light ore particles move forward at a smaller speed. Where the ore particles go depends on the combination of longitudinal velocity and transverse velocity. Heavy minerals have smaller transverse velocity and larger longitudinal velocity, and light minerals have larger transverse velocity and smaller longitudinal velocity. Applying the parallelogram rule to synthesize the longitudinal velocity and transverse velocity, it can be seen that the combined velocity of heavy minerals is inclined to the concentrate end of the shaker, light minerals are inclined to the tailings side of the shaker, and medium density particles are located between the two. This process is called "transport banding". Since the height of the bed is gradually reduced along the longitudinal direction of the self-driving end, the stratified ore particle groups in the groove are continuously stripped off during the movement to the concentrate end. The light minerals in the upper layer of the groove are first stripped off and moved to the tailings side along the horizontal direction of the bed surface, and the heavy minerals are discharged from the concentrate end. Therefore, the minerals on the whole bed surface show a fan distribution according to different gravity and different particle size, so as to obtain a variety of products.

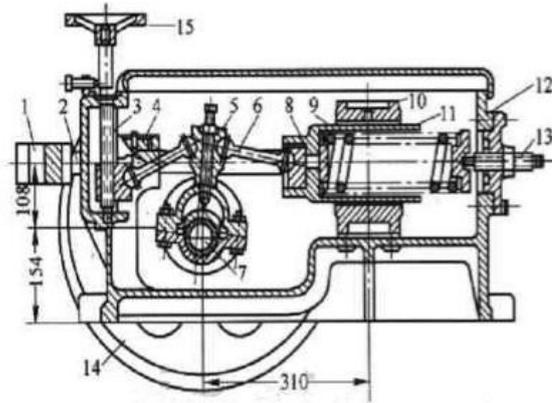
The concentrate strip is washed by transverse water flow in the smooth area of the bed surface (no bed strip area), so that a few gangue particles mixed in it are washed

out, and the grade of the concentrate is further improved.

III. Structure

The 6-S shaker is composed of three parts: head (transmission mechanism), bed surface and frame. The head of the bed is driven by a motor, and the bed surface is connected by a tie rod to make the bed surface move asymmetrically along the longitudinal direction. The bed surface is generally made of glass fiber reinforced plastic, its shape is trapezoidal, and it is equipped with a ore trough and a water trough on the bevelled side, and bed strips or grooves are installed on the bed surface along the longitudinal side. The shaker is supported by a frame, which is equipped with a slope adjusting mechanism to adjust the transverse slope of the bed surface.





6-S偏心连杆式床头

1—连动座;2—往复杆;3—调节丝杆;4—调节滑块;5—摇动杆;6—肘板;7—偏心轴;8—肘板座;
9—弹簧;10—轴承座;11—后轴;12—箱体;13—调节螺栓;14—大皮带轮;15—冲程手轮

Turn the stroke handwheel 15 above the box 12 clockwise to adjust the Angle between the screw rods, thereby reducing the stroke. Turn the stroke handwheel 15 counterclockwise and adjust the slider to move downward to increase the stroke. The range of strokes varies from 8 to 36 mm. After the stroke adjustment is determined, tighten the fixing bolt at the lower part of the stroke handwheel 15. When adjusting the stroke, it is necessary to adjust the spring adjusting bolt 13 at the back of the transmission box at the same time, and the degree of tightness should be appropriate to avoid damage to the parts due to too loose or too tight spring.

Head reciprocating rod, elbow plate, rocking rod and back seat and other whole transmission mechanism are sealed in the box, the box contains a small amount of lubricating oil, outside the box eccentric shaft 7 end, install a gear oil pump. Oil is sent to each friction point for lubrication, and can avoid oil leakage in the transmission box due to too much oil.

(2) Bed surface: the shape is a right Angle trapezoid, the general size is

4500*1850*1560mm (length * transmission end width * concentrate end width), other

models are used in experiments and other special cases of sorting (see technical parameters). The bed surface is made of polyurethane FRP wrapped steel framework, the working surface is a special wear-resistant layer, and the bed is injected with wear-resistant material into the mold and the bed surface at the same time, the general bed direction is parallel to the transmission direction (straight groove), divided into two kinds of rubber bed surface and paint-ash groove bed surface, rubber bed surface is mostly used for selecting coarse sand, Lacquer-ash groove bed is divided into coarse sand (2-0.5mm) bed (46 slots, 60 slots), fine sand (0.5-0.074mm) bed (88 slots, 100 slots, 110 slots), mineral mud (0.074-0.037mm) bed (136 slots), Comprehensive recovery (2-0.037mm) bed surface (straight groove 120 slots), but also the middle section of the bed is arranged into a inclined shape, becoming a waveform bed (single wave bed and double wave bed), in the inclined strip area light minerals are easy to discharge, thus helping to improve the processing capacity of the equipment and increase the metal recovery rate (waveform table), There is also a special bed surface for desulphurization of tungsten ores (floating table).

(3) Frame: Composed of channel steel bracket and slope adjuster (machine foot), the head of the bed is placed on the frame, the bed is supported on the four support boxes on the slope adjuster (as shown below), the support box makes the bed surface in the vertical plane arc fluctuation and reciprocating movement, the support box is divided into rocking support and sliding support, fixed on the adjusting seat plate through the channel steel, rocking support is mostly used to select coarse sand, The sliding support is mostly used for fine sand and slime. When the adjusting seat plate is rotated on the

saddle-shaped seat by the adjusting screw with the hand wheel, the lateral Angle of the bed can be adjusted. The slope adjuster is placed on the channel steel bracket, and the whole frame is fixed by the ground Angle screws to make the shaking table run stably.

IV, Installation

1. Before installing the shaker of different frames, please pour cement and bury the anchor bolts according to their respective installation foundation drawings, and fix the channel steel bracket first during installation (the fixed shaker is directly installed on the cement foundation).

2, after the longitudinal fixing of the channel steel bracket, install the head and the slope adjuster (machine foot) on the bracket, the slope handwheel is set in the direction of the mine, and the center point of the two slope adjuster and the center three points of the bed linkage seat must be in a straight line, otherwise when the bed is tilted, it will accelerate the wear of the copper sleeve, and even break the reciprocating rod.

3. According to the center distance on the slope adjuster (see the slope adjuster structure diagram), correct the exact position of the four support boxes and the bed surface, fix the bolts, inject an appropriate amount of lubricating oil into the support box, and then place the bed surface smoothly on the support box, and correct the contact position between the support box and the bed surface base. Rotate the large pulley on the head of the bed by hand to make the reciprocating rod pull into the box to the end, connect the bed traction rod with the head of the bed linkage seat in a straight line and tighten the bolt to fix it. When there is an error in the height of the traction screws between the linkage seat and the bed surface, the bolts under the support box can be

adjusted to eliminate it.

4, and then install the motor, the belt is too loose or too tight can move the motor position to adjust, and finally all the screws are fixed.

V, Lubrication

1, the head of the bed: in addition to the eccentric shaft cone bearing using the oil of the box for lubrication, the rest of the parts through the eccentric shaft end gear oil pump centralized lubrication, oil pump through the distribution of oil pipe in the box to the lubrication point. The parts to be lubricated are: rear shaft bearing, reciprocating rod, crankjournal, rear shaft, liner plate.

2, slope adjusters part: support box with oil lubrication, adjustment seat, screw, nut and other grease lubrication.

VI. Debugging

1. Preparation before starting:

(1) Turn on the machine and inject oil into the head of the bed to the bottom plate of the bearing seat. Each lubrication point of the head of the bed must be sprayed with oil, and add an appropriate amount of oil to the support box. During normal operation, check the lubrication of the head of the bed and the shaking part at any time to keep the oil circuit unblocked.

(2) Manually turn the big belt wheel three times before starting to see whether it is flexible, after starting the big belt wheel should run clockwise, if there is a reversal should adjust the power wiring, otherwise the oil pump can not work normally.

(3) All screws of the machine must be tightened before starting, and check whether the

stroke handwheel and the slope adjustment handwheel are flexible. electricity

2. Start the motor after everything is normal and start debugging:

(1) When debugging, the head spring should not be too tight, should be slightly relaxed so that it has a slight impact sound during operation, at this time should gradually tighten the bolt at the back of the transmission box until the sound disappears, so as not to damage the parts in the box.

(2) The shaker should check the lubrication of the head of the bed and the shaking part at any time during normal operation to keep the oil circuit unimpeded.

(3) Stroke adjustment: rotate the stroke handwheel clockwise up to reduce the stroke, rotate the stroke handwheel counterclockwise down to increase the stroke, and the variation range of the stroke is between 8 and 36 mm. After the stroke adjustment is determined, tighten the fixing bolt at the lower part of the stroke handwheel. When adjusting the stroke, the spring adjusting bolt at the back of the transmission box must be adjusted accordingly at the same time, and the degree of tightness should be appropriate to avoid damage to the parts due to too loose or too tight spring.

(4) Adjustment of the stroke: replace the motor pulley, the larger the diameter of the motor pulley, the larger the stroke, and the smaller the vice versa.

(5) Adjustment of transverse slope: turn the hand wheel of slope adjustment on the slope adjuster (machine foot) to fine tune, turn the hand wheel clockwise, and the bed surface rises to the mine end; The hand wheel turns counterclockwise and the bed surface drops to the mine end.

(6) Longitudinal slope adjustment: Adjust on the support box of the slope adjuster (foot).

First loosen the channel steel bolt of the foot and turn the screw on the side of the connecting box to make the box rise or fall to adjust the longitudinal slope of the bed surface. After the slope is determined, tighten the fixing bolts of the channel steel.

The company's shaker has been in the factory for empty load debugging operation qualified, the user should first make two small time and space load movement debugging operation after the equipment is installed, and check the following: during the operation of the motor is normal, the bed is running smoothly, the contact of the parts and the wear of the friction joint, whether there is abnormal noise, whether the lubrication is normal. After debugging everything is normal, it will be given to the pulp for formal production.

VII. Operation

1. Preparation of ore before being selected:

In order to facilitate the selection of suitable operating conditions of the shaker, the ore should be graded before being selected. The average particle size of the heavy mineral is much smaller than that of the light mineral in the product obtained by hydraulic fractionation method, so it is conducive to the resolution stratification. Hydraulic classifier is often used to grade raw materials in production.

The upper grain size of the shaker treated ore is 2mm (except coal, iron), and the lower grain size of the mud shaker is generally 0.037mm. Even finer particles are difficult to settle and recover under the influence of turbulent water flow. If the feed contains a large amount of fine slime, it is not only difficult to recover, but also cause multiple

mineral losses due to the increase of pulp viscosity and the decrease of delamination speed. Therefore, when there is a large amount of mud in the raw material (referring to the -10-20 μ m particle level), it is necessary to desliming in advance, and desliming buckets are generally used in production.

2, the main operating factors: feed concentration, feed particle size, feed amount, horizontal slope, flushing water, stroke and stroke, longitudinal slope.

(1) Feed concentration: normal 15~30%, the concentration of small ditch; When the concentration of sand is large, the amount of water to the ore should be adjusted.

(2) The granularity of the ore: the particle size is generally not more than 2mm, the minimum is 0.037mm, to be pre-graded to ensure uniform particle size at all levels, the granularity of the ore to be appropriate, can be judged by observing the ore zone in the concentrate belt and the tailings to be checked by washing.

(3) Ore feed rate: The allowable ore feed rate is related to ore beneficiability and ore feed size. When the amount of ore is large, there is no zone. At this time, the concentrate interceptor plate must be moved to increase the flushing water and the lateral slope.

Restore normal operating conditions until bed making is eliminated. During operation, stratified zone and sand free zone are observed to judge the ore feed. If the stratified zone is thick and the sand-free zone is too narrow, it means that the ore supply is large.

(4) Horizontal slope and flushing water: the ore is coarse, the concentration is large, the ore is large, the slope is large and the water is added. The amount of water and the regulation of slope are related. Observe slurry flow rate and concentrate zone during operation: if water flow distribution is uniform, no ditch, no sand pile, concentrate

bandwidth and thin, obvious zoning, which is suitable for slope and water quantity; If the slurry flow rate is large and the grain zone is narrow, the slope is too large; The slurry flow rate is slow, the concentrate zone is unclear, that is, the slope is too small. Too much water, narrow concentrate zone, part of the concentrate into the middle ore, concentrate grade increased, but the recovery rate decreased. Water volume is too small, part of the bed surface exposed anhydrous film.

(5) Stroke and stroke: increase the stroke coarse grain moves fast, increase the stroke fine grain moves fast. Select coarse grains (2-0.5mm) to have large strokes and small strokes; On the contrary, the selection of fine particles (0.5-0.074mm) and slime (0.074-0.037mm) requires small strokes and large strokes. Mineral processing indicators are generally not adjusted after stability, but when there is an anomaly, attention should be paid to whether the stroke stroke is inappropriate and adjusted in time.

(6) Longitudinal slope: The concentrate end is raised, the coarse sand has a 1-2 degree tilt in the longitudinal direction, the fine sand has a 0.5-1 tilt, and the slime has no slope, which is determined when the equipment is installed.

3. Bed area and its control: the bed is divided into sand-free area, stratified area, primary selection area and selected area, as shown in the following figure:

(1) No sand area: desliming dehydration, if the ore contains high mud, no sand area turbidity; If the feed grain size is coarse or the stroke is large and the transverse slope is small, the sand area is not wide. The normal width is 0.9~1.4m

(2) Stratified area: It is required that the ore flow is stable and does not produce rapids or trenches, and the mineral layer is too thick and thin, and can be covered by water. It

can be controlled by adjusting the concentration of feed ore and the sand hole of feed tank.

(3) The primary selection: it is the interval of separating the middle ore, and the middle ore is rushed out as far as possible. To prevent the middle ore from entering the selected area, it is adjusted by adjusting the flushing water and the lateral slope.

(4) Select area: This area requires the obvious zoning of various specific gravity minerals, so that the select area and the primary selection area form a stable and obvious boundary, which is controlled by adjusting the flushing water and the lateral slope.

4, the material in the bed surface zoning and product interception: when the operating conditions are appropriate, the material in the shaking table zoning is obvious, and the product is in accordance with the required separation indicators to intercept, can be divided into concentrate, ore, tailings and other 2~4 products. Intermediate ore is usually reprocessed. When the operating conditions change, the zoning situation will change, and the location of the access must be adjusted accordingly to ensure the stability of the selection index.

5. Stop:

(1) Stop the ore feed first, stop the water supply after there is no ore on the bed surface, and then stop the machine first press the stop button, and then pull down the tool switch.

(2) After stopping the locomotive, clean the bed with water to avoid impurity oxidation and scaling. If there is scaling, it should be removed.

(3) When the accident stops, the stop button should be immediately pressed, and the

tool switch should be pulled down, and the mineral sand on the bed should be washed away.

VIII. Maintaining

1. When the shaker is running, pay attention to whether the machine has noise and whether the movement of the bed is balanced.
- 2, the lubricating oil in the head of the bed should always be maintained in the specified amount, the bearing, support box, slope mechanism to keep clean, regular oil. Regular maintenance of other parts, such as excessive wear should be replaced in time to avoid damage to other parts.