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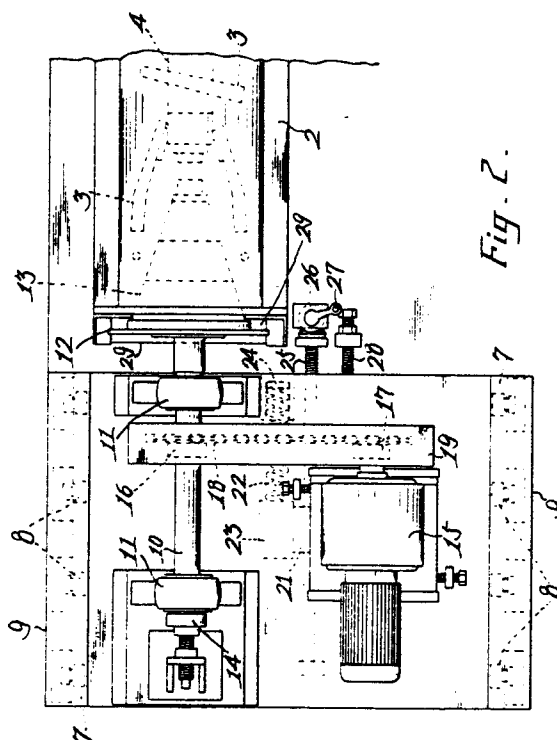
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54 **Apparatus for crushing and washing ballast, sand and the like.**

57 Apparatus for crushing and washing ballast, sand and the like comprises a cylindrical body (2) mounted on a base (1), a slide table (6) slidably mounted on the base (1), and a rotatable jack shaft (10) mounted on the slide table (6) on a coaxis with the cylindrical body (2) and having a crush bowl (13) arranged to co-operate with a discharge port (29) in the cylindrical body (2). A coil spring (22) acts between the slide table (6) and the base (1) for biasing the crush bowl (13) towards the discharge port (29) and the slide table (6) is engageable with a stop (28) for controlling the degree of engagement between the crush bowl (13) and the discharge port (29). Both the biasing and the degree of engagement are preferably adjustable.



APPARATUS FOR CRUSHING AND WASHING BALLAST, SAND AND THE LIKE

This invention relates to apparatus for crushing and washing ballast, sand and the like and in particular, though not exclusively to apparatus for crushing and washing ballast and sand collected at mountains, lands, etc. in order to obtain good ballast and sands for concrete aggregate for use in construction.

The conventional apparatus for crushing and washing ballast and sand includes a slidable and rotatable shaft provided thereon with a crush bowl, and pressure applied to the crush bowl is adjusted by advancing and retracting the rotatable shaft forwardly and backwardly. However, since the pressure applied to the crush bowl is directly transmitted to the rotatable shaft, this type of conventional apparatus has the disadvantage that the rotatable shaft carried on a bearing is worn in a short time and the push pressure is not sufficiently controlled.

The object of the present invention is to provide apparatus for crushing and washing ballast, sand and the like which remedies the disadvantage of the known apparatus above-described.

According to the broadest aspect of the present invention apparatus for crushing and washing ballast, sand and the like is characterised by a base, a cylindrical body mounted on the base, a rotatable main shaft having at least one crush blade disposed within the cylindrical body, a slide table slidably mounted on the base, a rotatable jack shaft mounted on the slide table on a coaxis with the cylindrical body and having a crush bowl adapted to co-operate with a discharge port in the cylindrical body, and spring means acting between the slide table and the base for biasing the crush bowl towards the discharge port.

The main advantage of the invention is that pressure applied to the crush bowl during operation is absorbed by the spring means thereby reducing mechanical wear of the jack shaft.

The biasing force exerted by the spring means is preferably adjustable thereby enabling the push pressure to be accurately controlled to wash effectively ballast, sand and the like depending on the quality thereof.

Advantageously the slide table is engageable with a stop to limit the degree of engagement between the crush bowl and the discharge port and the stop is preferably adjustable enabling the degree of engagement to be accurately controlled.

In a preferred embodiment of the present invention apparatus for crushing and washing ballast, sand and the like is characterised by a base, a cylindrical body mounted on the base, a rotatable main shaft having a crush blade disposed within the cylindrical body, a slide table slidably mounted

on the base in front of the cylindrical body, a rotatable jack shaft mounted on the slide table on a coaxis with the cylindrical body, a cone-shaped crush bowl mounted on the jack shaft and adapted to engage with a discharge port formed in the cylindrical body, a threaded sleeve interposed between the slide table and the base, a threaded shaft attached at one end thereof with an operation handle supported by the base and threadedly engaged with the threaded sleeve, a coil spring disposed between the threaded sleeve and the front end of the slide table, and a stop disposed at a pre-determined location on the base and adapted to stop the movement of the slide table towards the cylindrical body.

One exemplary embodiment of the present invention will now be described in more detail with reference to the accompanying drawings, wherein:

Fig. 1 is a perspective view of apparatus for crushing and washing ballast and sand according to the present invention; and

Fig. 2 is a plan view of part of the apparatus shown in Fig. 1.

In the drawings, reference numeral 1 denotes a base. Mounted on the upper surface of the base 1 is a two-layer structure comprising a lateral cylindrical body 2 having detachably attached to the internal surface thereof a lining (not shown).

Disposed on the central longitudinal axis of the cylindrical body 2 is a rotatable main shaft 4 having attached at the periphery thereof a plurality of crush blades 3 disposed within the cylindrical body 2. The main shaft 4 extends from near the front end of the cylindrical body 2 outwardly from the rear end of the cylindrical body 2 and is supported on the base 1 in cantilever fashion by spaced apart bearings 32. A drive motor 5 is connected to the main shaft 4 through a chain (not shown).

The base 1 is provided thereon with a plurality of rollers 8 arranged in two rows and engaged in respective guide grooves 7 formed in opposed sides of a substantially reversed U-shaped slide table 6 to support slidably the table 6 on the base 1. The engagement of the rollers 8 in the guide grooves 7 is concealed by respective cover frames 9.

A rotatable jack shaft 10 carried by spaced apart bearings 11 on the slide table 6 is disposed on the coaxis of the cylindrical body 2 in alignment with the main shaft 4. One end of the jack shaft 10 is attached with a cone-shaped crush bowl 13 having a collar 12 for co-operating with a discharge port 29 at the front end of the cylindrical body 2. The other end of the jack shaft 10 is engaged with a pressure member 14.

The jack shaft 10 is provided with a sprocket 16 between the bearings 11. The sprocket 16 is connected to a sprocket 17 mounted on a drive motor 15 on the slide table 6 through a chain 18. The chain 18 is covered with a chain cover 19.

Between the under surface of the slide table 6 and the upper surface of the base 1, a threaded sleeve 21 is engaged with a threaded shaft 25 carried at one end on a bearing on the base 1 and engaged at the other end with an operation handle 27 through a bevel gear mechanism 26. One end of a spring 22 is secured to spring bearing 23 integral with the sleeve 21 and the other end thereof is carried by a bearing sleeve 24 secured to the under surface of the slide table 6 at that end near to the cylindrical body 2. Due to this arrangement the slide table 6 is movable towards the cylindrical body 2 on actuation of the handle 27 to move the sleeve 21 and spring bearing 23 towards the body 2 thereby pressurising the spring 22.

Disposed on the upper surface of the base 1 is an adjustable stop provided by threaded shaft 28 carried by a bearing. The shaft 28 is engageable with the slide table 6 to limit movement of the slide table 6 towards the cylindrical body 2. Due to the foregoing arrangement, the degree of engagement between the crush bowl 13 and the discharge port 29 at the front end of the cylindrical body is adjustable. In addition, the biasing effect of the spring 22 on the table 6 and the crush bowl 13 carried thereby is also adjustable at the limit position of the table 6.

The cylindrical body 2 is provided at the front end with a feed water port 30 near to the discharge port 29 and at the rear end with a ballast feed port 31 on the upper portion thereof.

When ballast and sand are crushed and washed by using the apparatus according to the present invention, the operation handle 27 is rotated to move the slide table 6 towards the cylindrical body 2 as far as the limit position set by the engagement of the slide table 6 with the shaft 28 to provide the required degree of engagement between the crush bowl 13 and discharge port 29.

In the limit position, the biasing force of the coil spring 22 acting on the slide table 6 and the hence the crush bowl 13 may be set to any required level by further rotation of the control handle 27 to compress the spring 22.

Next the drive motors 5, 15 are actuated causing the main shaft 4 and the jack shaft 10 to rotate in opposite directions and the collected ballast is fed into the cylindrical body 2 through the ballast feed port 31 while feeding water therein through the water feed port 30.

The ballast is transferred toward the discharge port 29 while being agitated by the crush blades 3 spirally disposed on the rotary main shaft 4 where it is strongly rubbed against the crush bowl 13 rotating in the opposite direction by pressure of the succeeding ballast.

As a result, the ballast pushes back the crush bowl 13 together with the slide table 6 away from the discharge port 29 against the force of the spring 22 creating a space between the crush bowl 13 and the discharge port 29 through which the ballast is discharged.

The ballast is discharged after soft stones, lumps of tough loam, lumps of clay, etc. mixed in the ballast are completely crushed and angular corners of the crushed stones and dusts attached to the ballast are completely removed due to the crushing effect of the crush blades 3, the crush bowl 13 rotating within the cylindrical body 2 and the rubbing effect among the ballast and the like. As a result, a mass production of high quality ballast washed by water fed through the feed water port 30 can be obtained in an efficient manner.

Further, since the pressure applied by the ballast to the crush bowl 13 is dumped through the coil spring 22 disposed on the slide table 6, mechanical wear is extremely small and the apparatus can operate for a long time without problems. In addition maintenance is easy.

Moreover, since the degree of engagement between the crush bowl 13 and the discharge port 29 at the front end of the cylindrical body 2 and the biasing force of the coil spring 22 are adjustable by operating the operation handle 27 and the stop shaft 28, when in use, the degree of engagement of the crush bowl 13 and the biasing force of the coil spring 22 can be properly adjusted depending on quality of the ballast.

Although in the exemplary embodiment above-described the apparatus is used for crushing and washing ballast and sand, it will be understood that the apparatus may be used for crushing and washing other materials, for example concrete structures or glass products.

Claims

1. Apparatus for crushing and washing ballast, sand and the like characterised by a base (1), a cylindrical body (2) mounted on the base (1), a rotatable main shaft (4) having a crush blade (3) disposed within the cylindrical body (2), a slide table (6) slidably mounted on the base (1) in front of the cylindrical body (2), a rotatable jack shaft (10) mounted on the slide table (6) on a coaxial with the cylindrical body (2), a cone-shaped crush bowl (13) mounted on the jack shaft (10) and adapted to

engage with a discharge port (29) formed in the cylindrical body (2), a threaded sleeve (21) interposed between the slide table (6) and the base (1), a threaded shaft (25) attached at one end thereof with an operation handle (27) supported by the base (1) and threadedly engaged with the threaded sleeve (21), a coil spring (22) disposed between the threaded sleeve (21) and the front end of the slide table (6), and a stop (28) disposed at a predetermined location on the base (1) and adapted to stop the movement of the slide table (6) towards the cylindrical body (2).

2. Apparatus according to claim 1 characterised in that the main shaft (4) is connected with a first drive motor (5) mounted on the base (1) through a chain and the jack shaft (10) is connected with a second drive motor (15) through a chain (18), the main shaft (4) and the jack shaft (10) being rotatable in the opposite directions with respect to each other.

3. Apparatus according to claim 1 or claim 2 characterised in that the slide table (6) is slidably carried by a plurality of rollers (8) arranged in two rows on the base (1).

4. Apparatus according to any one of the preceding claims characterised in that the threaded sleeve (21) is integrally provided with a spring bearing (23) fixedly attached with one end of the coil spring (22) and the other end of the coil spring (22) is carried by a bearing sleeve (24) at the front end of the slide table (6).

5. Apparatus for crushing and washing ballast, sand and the like characterised by a base (1), a cylindrical body (2) mounted on the base (1), a

rotatable main shaft (4) having at least one crush blade (3) disposed within the cylindrical body (2), a slide table (6) slidably mounted on the base (1), a rotatable jack shaft (10) mounted on the slide table (6) on a coaxis with the cylindrical body (2) and having a crush bowl (13) adapted to co-operate with a discharge port (29) in the cylindrical body (2), and spring means (22) acting between the slide table (6) and the base (1) for biasing the crush bowl (13) towards the discharge port (29).

6. Apparatus according to claim 5 characterised in that the biasing of the spring means (22) is adjustable.

7. Apparatus according to claim 6 characterised in that the spring means (22) comprises a coil spring (22) acting between the slide table (6) and a threaded sleeve (21) mounted on a threaded shaft (25) supported on the base (1) and operable by a control handle (27) to adjust the resilient biasing of the coil spring (22).

8. Apparatus according to any one of claims 5 to 7 characterised in that the slide table (6) is engageable with a stop (28) to limit the degree of engagement between the crush bowl (13) and the discharge port (29).

9. Apparatus according to claim 8 characterised in that the stop (28) is adjustable.

10. Apparatus according to any one of claims 5 to 9 characterised in that the main shaft (4) and jack shaft (10) are each operatively connected to a respective drive motor (5,15), the drive motors (5,15) being operable to rotate the shafts (4,10) in opposite directions relative to each other.

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Fig. 1.

