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

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Description

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.

Apparatus for crushing and washing ballast and sand is know in accordance with the prior art portion of Claim 1 from Japanese Patent Application No. 58-144 071 laid open to public inspection on the 22nd February 1985 under No. 60-34 750 (& US-A-4 694 993, published 22.09.87).

In this prior art apparatus a rotatable main shaft has at least one crush blade disposed within a cylindrical body mounted on a base, a rotatable jack shaft slidably mounted on a bearing has a crush bowl adapted to co-operate with a discharge port in the cylindrical body, and spring means acting on the rotatable jack shaft biasses the crush bowl towards the discharge port whereby the pressure applied to the crush bowl is adjusted by advancing and retracting the rotatable jack shaft forwardly and backwardly.

With this arrangement, however, the pressure applied to the crush bowl is directly transmitted to the rotatable jack shaft and this has the disadvantage that the rotatable jack shaft mounted on the bearing is worn in a short time and the push pressure is not sufficiently controlled.

The present invention as claimed is intended to remedy the disadvantage of the known apparatus above-described. It solves the problem of the known apparatus by mounting the jack shaft on a slide table slidably mounted on the base and arranging the spring means to act between the base and the slide table.

The main advantage of the invention is that pressure applied to the crush bowl during operation is absorbed by displacement of the slide table against the biassing of the spring means thereby reducing mechanical wear of the jack shaft mounted on the slide table.

The biassing 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 comprises 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 meachanism 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 biassing 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 biassing 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 biassing 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 biassing 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 comprises 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 rotatable jack shaft (10) mounted on a coaxis with the cylindrical body (2) and having a crush bowl (13) adapted to cooperate with a discharge port (29) in the cylindrical body (2), and spring means (22) biassing the crush bowl (13) towards the discharge port (29) characterised in that the jack shaft (10) is mounted on a slide table (6) slidably mounted on the base (1) and the spring means (22) acts between the slide table (6) and the base (1) for biassing the crush bowl (13) towards the discharge port (29).

2. Apparatus according to Claim 1 characterised in that the biassing of the spring means (22) is adjustable.

3. Apparatus according to Claim 2 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 biassing of the coil spring (22).

4. Apparatus according to Claim 3 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 according to any one of the preceding Claims characterised in that the slide table (6) is slidably carried by a plurality of rollers (8) arranged in two rows on the base (1).

6. Apparatus according to any one of the preceding Claims 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).

7. Apparatus according to Claim 6 characterised in that the stop (28) is adjustable.

8. Apparatus according to any one of the preceding Claims 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.

Patentansprüche

1. Apparat zum Zerkleinern und Waschen von Schotter, Sand und dergleichen, mit einer Basis (1), einem auf der Basis (1) montierten zylindrischen Gehäuse (2), einer drehbaren Hauptwelle (4), welche mindestens eine in dem zylindrischen Gehäuse (2) angeordnete Zerkleinerungsklinge (3) aufweist, einer drehbaren Zwischenwelle (10), welche koaxial zu dem zylindrischen Gehäuse (2) montiert ist und eine Brechschüssel (13) trägt, welche für die Zusammenarbeit mit einer Auslaßöffnung (29) in dem zylindrischen Gehäuse (2) ausgebildet ist und mit Federeinrichtungen (22), welche die Brechschüssel (13) in Richtung der Auslaßöffnung (29) vorspannen, dadurch gekennzeichnet, daß die Zwischenwelle (10) auf einem Gleittisch (6) montiert ist, welcher auf der Basis (1) gleitbar gelagert ist, und daß die Federeinrichtungen (22) zwischen dem Gleittisch (6) und der Basis (1) wirksam sind, um die Brechschüssel (13) in Richtung der Auslaßöffnung (29) vorzuspannen.

2. Apparat nach Anspruch 1, dadurch gekennzeichnet, daß die Federvorspannung der Federeinrichtungen (22) verstellbar ist.

3. Apparat nach Anspruch 2, dadurch gekennzeichnet, daß die Federeinrichtungen eine Schraubenfeder (22) aufweisen, welche zwischen dem Gleittisch (6) und einer auf einer Gewindewelle (25) montierten Gewindehülse (21) wirksam ist, wobei die Gewindewelle (25) auf der Basis (1) gelagert ist und durch einen Steuerhandgriff (27) zur Verstellung der Federvorspannung der Schraubenfeder (22) betätigbar ist.

4. Apparat nach Anspruch 3, dadurch gekennzeichnet, daß die Gewindehülse (21) einstückig mit einem Federlager (23) versehen ist, welches fest mit einem Ende der Schraubenfeder (22) verbunden ist, und daß das andere Ende der Schraubenfeder (22) durch eine Lagerhülse (24) am Vorderende des Gleittisches (6) getragen ist.

5. Apparat nach einem der vorstehenden Ansprüche, dadurch gekennzeichnet, daß der Gleittisch (6) gleitbar durch eine Vielzahl von Rollen (8) getragen ist, welche in zwei Reihen auf der Basis (1) angeordnet sind.

6. Apparat nach einem der vorstehenden Ansprüche, dadurch gekennzeichnet, daß der Gleittisch (6) mit einem Anschlag (28) in Eingriff bringbar ist, um den Grad des Eingriffs zwischen der Brechschüssel (13) und der Auslaßöffnung (29) zu begrenzen.

7. Apparat nach Anspruch 6, dadurch gekennzeichnet, daß der Anschlag (28) verstellbar ist.

8. Apparat nach einem der vorherstehenden Ansprüche, dadurch gekennzeichnet, daß die Hauptwelle (4) und die Zwischenwelle (10) je betriebsmäßig mit einem entsprechenden Antriebsmotor (5, 15) verbunden sind, wobei die Antriebsmotoren (5, 15) betätigbar sind, um die Wellen (4, 10) relativ zueinander in entgegengesetzten Richtungen anzutreiben.

Revendications

1. Appareil de broyage et de lavage de ballast, sable et similaires comprenant une base (1), un corps cylindrique (2) monté sur la base (1), un arbre tournant principal (4) comportant au moins un couteau broyeur (3) disposé à l'intérieur du corps cylindrique (2), un contre-arbre tournant (10) monté coaxialement au corps cylindrique (2) et muni d'une cloche de broyage (13) adaptée pour l'entrée dans un orifice de décharge (29) du corps cylindrique (2) et des ressorts (22) poussant la cloche de broyage (13) vers l'orifice de décharge (29), caractérisé par le fait que le contrearbre (10) est monté sur une table coulissante (6) capable de glisser sur la base (1) et que les ressorts (22) agissent entre la table coulissante (6) et la base (1) de façon à pousser la cloche de broyage (13) vers l'orifice de décharge (29).

2. Appareil selon la revendication 1 caractérisé par le fait que la poussée des ressorts est réglable.

3. Appareil selon la revendication 2 caractérisé par le fait que les ressorts (22) comprennent un ressort hélicoïdal (22) agissant entre la table coulissante (6) et un manchon fileté (21) monté sur une tige fileté (25) supporté sur la base (1) et manœuvrable par une manivelle (27) pour régler la poussée élastique du ressort hélicoïdal (22).

4. Appareil selon la revendication 3 caractérisé par le fait que le manchon fileté (21) est muni d'un support de ressort (23) faisant corps avec lui et auquel est fermement attachée une extrémité du ressort hélicoïdal (22), l'autre extrémité du ressort hélicoïdal (22) étant maintenue par un manchon (24) à l'extrémité avant de la table coulissante (6).

5. Appareil selon l'une ou l'autre des revendications précédentes caractérisé par le fait que la table coulissante (6) est supportée, pour sa translation, par plusieurs galets (8) disposés en deux rangées sur la base (1).

6. Appareil selon l'une ou l'autre des revendications précédentes caractérisé par le fait que la table coulissante (6) peut entrer en contact avec une butée (28) pour limiter le degré de mise en prise de la cloche de broyage (13) sur l'orifice de décharge (29).

7. Appareil selon la revendication 6 caractérisé par le fait que la butée (28) est réglable.

8. Appareil selon l'une ou l'autre des revendications précédentes caractérisé par le fait que l'arbre principal (4) et le contre-arbre (10) sont chacun couplés, respectivement de façon active, à des moteurs d'entraînement couplés (5, 15), les moteurs d'entraînement (5, 15) étant capables d'entraîner les arbres (4, 10) en rotation, et ce de façon opposée.

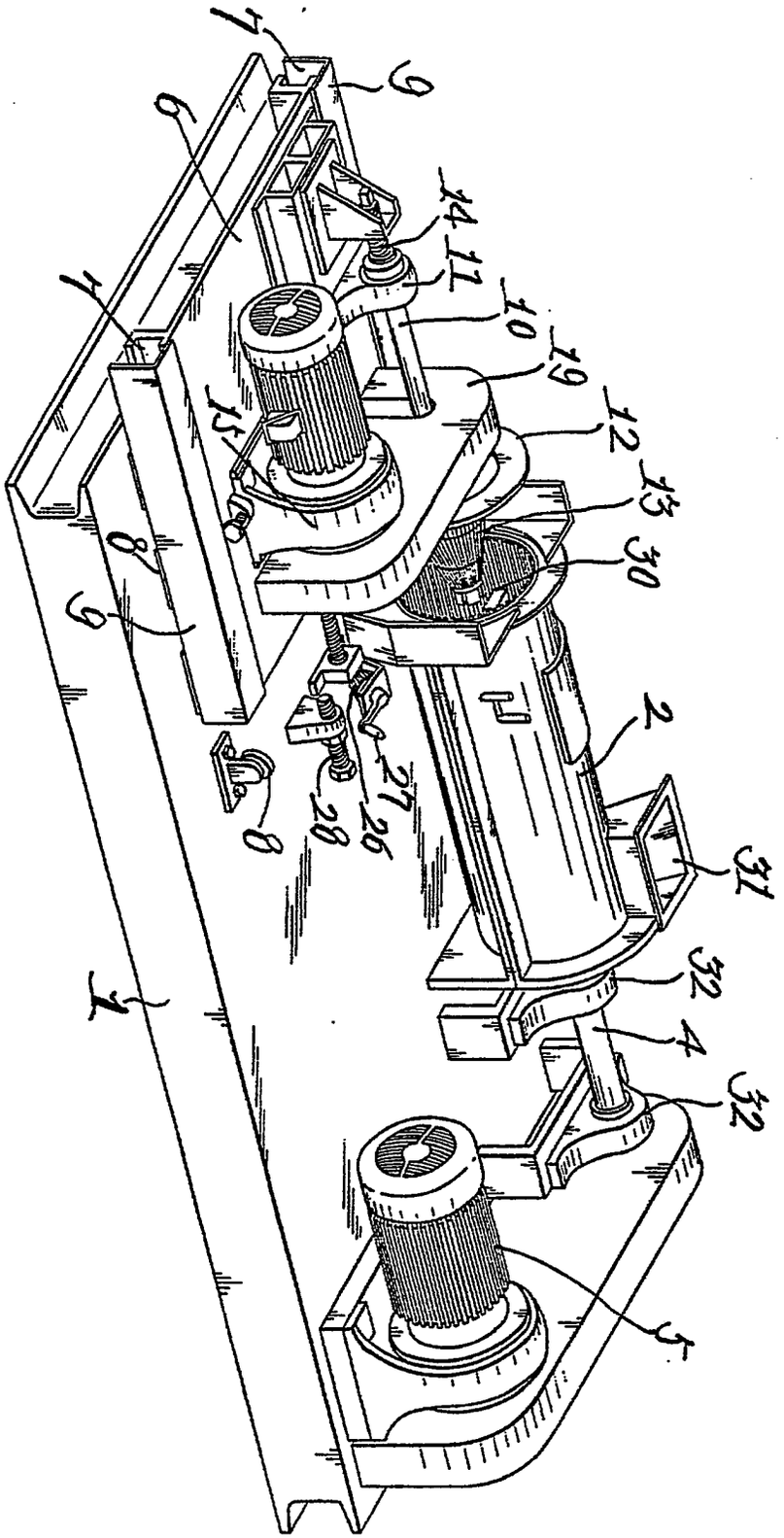

Fig. 1.

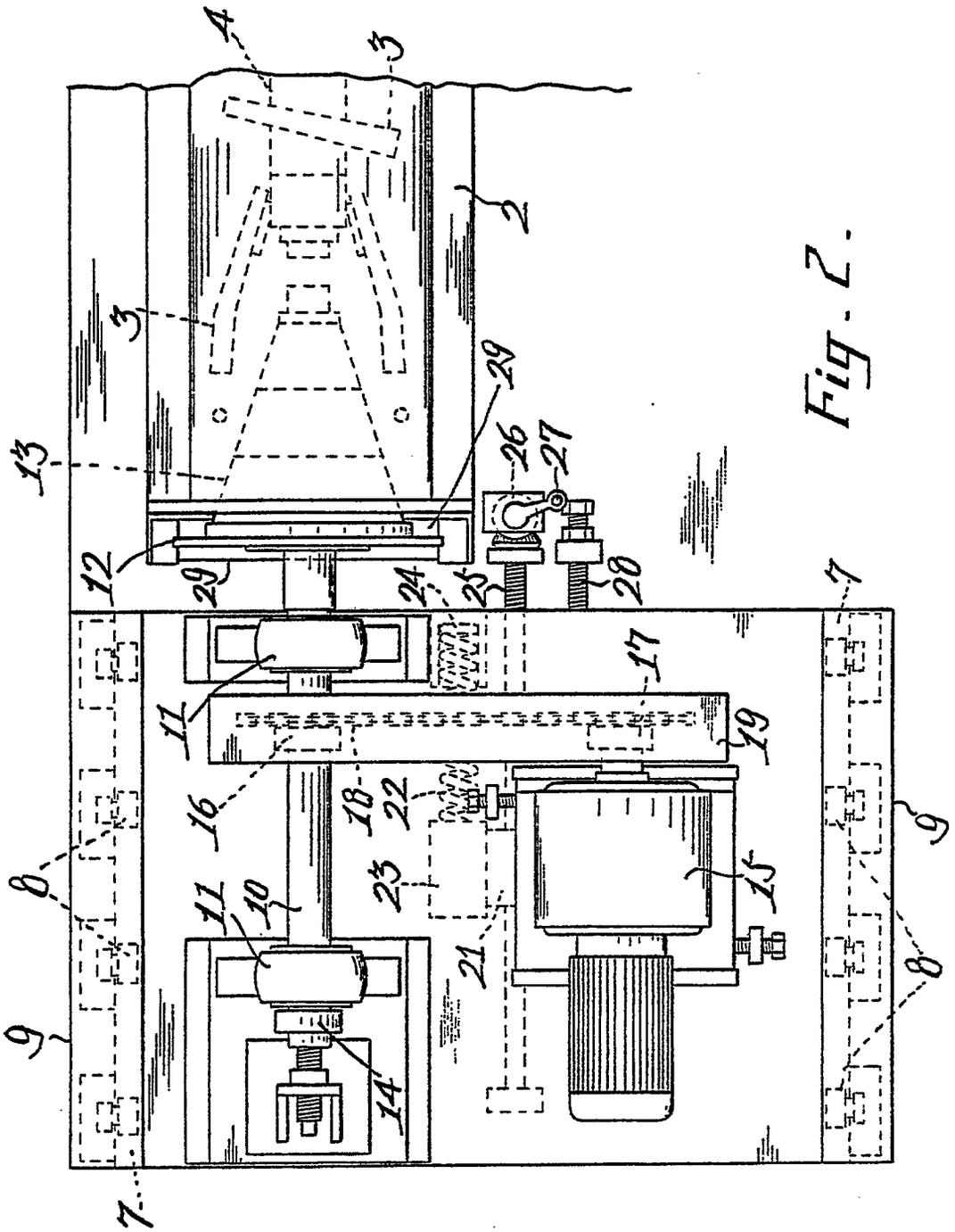
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Fig. 2.