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⑤④ **Apparatus for washing sand and the like.**

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Description

This invention relates to apparatus for washing sand and the like and in particular, though not exclusively, to apparatus suitable for washing sands mixed with a lot of soft stones, lumps of clay, lumps of tough loam, etc. in order to obtain sands for making a high quality concrete aggregate for use in construction.

Heretofore, there has been known apparatus for washing sands mixed with soft stones, lumps of clay, lumps of tough loam, etc. in order to remove soft stones, lumps of clay, lumps of tough loam, etc.

therefrom. This conventional apparatus is provided at its discharge port with two cover boards or caps each formed with a hole and overlapping one upon the other.

When in use, the caps are slidable with respect to each other to adequately vary the hole size of the caps depending on the conditions of sands to be washed. The sands are washed by appropriately controlling the resistance applied thereto by varying the caps' size.

The conventional apparatus of this type, however, has a crucial disadvantage in that a discharge port formed in the cap is frequently blocked. If more quantity of sands, lumps of clay, etc. are mixed in the sands, the foregoing disadvantage is more easily obtained. Thus, sands of high quality are not effectively obtained.

Apparatus for washing sand is known 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. 6 034 750.

In this prior art apparatus the discharge port is closed by the pressure cap fixedly secured to the cylindrical body and the pressure cap is formed with a plurality of discharge holes for the washed sand. The size of the holes may be changed by fitting a different pressure cap. This apparatus also suffers from the disadvantage that the holes may become blocked in use.

The present invention as claimed is intended to remedy the disadvantage of the known apparatus abovescribed. It solves the problem of the known apparatus by the pressure cap having a feed water port and being biased towards the discharge port by spring means arranged to act between the pressure cap and a support arm therefor.

The main advantage of the present invention is that sand and the like effectively crushed by the crush blade means and agitated by the agitation vane positioned in front of the discharge port is thoroughly washed by water from the feed water port in the pressure cap prior to being discharged between the discharge port and the pressure cap under the control of the resilient biasing of the pressure cap. In this way the risk of the apparatus becoming blocked is reduced and sands and the like of high quality can be obtained.

Advantageously the spring means is adjustable to vary the biasing force according to requirements thereby further contributing to the quality of sands and the like that can be obtained.

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

Fig. 1 is a front view of apparatus for washing sand according to the present invention;

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

Fig. 3 is a vertical sectional view of part of the apparatus shown in Figs. 1 & 2;

Fig. 4 is an exploded perspective view, partly cut away, showing the pressure cap and wear plate assembly; and

Fig. 5 is a front view of the moving vane.

In the drawings, reference numeral 1 generally denotes a lateral cylindrical body comprising upper and lower semi-cylindrical shells 4 and 5 mounted on the upper surface of a base plate 3 supported by legs 2, 2' so as to be inclined downwardly from left to right as viewed in Figure 1.

The shells 4,5 have opposed flanges 7,7' respectively on each side of the cylindrical body which are releasably secured together by screws, bolts or the like and the cylindrical body 1 has an inside panel 6 attached to its internal surface by screws to form a two-layer structure.

The cylindrical body 1 is inclined downwardly from its rear end to its front end and is provided on the upper surface at the rear end with a feed port 8 for feeding sands therein. Also provided on the upper surface of the cylindrical body 1 are inspection doors 9 for checking the interior thereof.

A cantilever rotatable main shaft 10 is disposed on the central longitudinal axis of the body 1. One end portion of the main shaft 10 extends near to the front end of the body 1. The other end portion of the main shaft 10 projects from the rear end of the body 1 and is carried by spaced apart bearings 11 fixed to the upper surface of the base plate 3. A drive motor 12 is connected to the main shaft 10 by a chain (not shown).

The main shaft 10 has mounted thereon a plurality of square-shaped sleeves 13. The sleeves 13 are provided at the outer peripheries with mounting plates 14 projecting in a spiral form or circumferentially repeated form therefrom. The mounting plates 14 are attached each with a crush blade 15 by screws.

The main shaft 10 is provided at the front end thereof with a moving vane 16. The moving vane 16 is attached at its front end with a square-shaped shaft plate 17 by screws. On three sides of the shaft plate 17 are attached respective mounting plates 18 projecting therefrom so as not to interfere with the mounting operation of the crush blade 15 provided at the front end of the main shaft 10. The mounting plates 18 are attached each with an agitation wing 19 by screws.

A spline shaft 20 is carried on a bearing 21 fixed to the flanges 7,7' on one side of the body 1 at the front end. One end of the spline shaft 20 is connected with a threaded rod 22. The threaded rod 22 passes through a check plate 23 secured to the flanges 7,7'. The threaded rod 22 is threadedly en-

gaged with nuts 24 arranged on both sides of the check plate 22. Due to the foregoing arrangement, the spline shaft 20 is adjustable in the longitudinal direction.

The other end of the spline shaft 20 is pivotally attached to one end of a support arm 25. The other end of the support arm 25 is formed with a fork-shaped portion 26. This fork-shaped portion 26 receives a threaded rod 28 pivotally attached to a bracket 27 fixed to the flanges 7,7' on the other side of the body 1 at the front end. The support arm 25 is adjustably and releasably attached to the rod 28 by a nut 29 and handle checkscrew 30 threadedly engaged on the rod 28.

The support arm 25 is integrally provided at the intermediate portion thereof with a triangular shaped body 31. The body 31 is provided at each corner portion thereof with a respective threaded sleeve 32. Each threaded sleeve 32 is engaged with a respective threaded pressure rod 33 having a handle 34. Each pressure rod 33 is engaged at the front end thereof with a respective spring 35. The springs 35 are adapted to bias a pressure cap 37 against a discharge port 36 of the body 1.

The pressure cap 37 is provided at the centre of the outer surface facing the support arm 25 with a spline shaft 38 projecting therefrom and received in a bearing 40 integrally formed at the centre of the body 31. In this way, the pressure cap 37 is slidably supported by the support arm 25.

The spline shaft 38 is formed with a central bore providing a feed water port 39 which is connected with a feed water pipe 49. A second feed water pipe 50 is connected to the lower rear end of the body 1.

Fig. 4 illustrates a wear plate assembly consisting of three wear plates 41,42,43 which are attached to the inner surface of the pressure cap 37 facing the discharge port 36. The disc-shaped wear plate 41 is secured to the centre portion of the inner surface of the pressure cap 37 by bolts received in aligned holes in the wear plate 41 and pressure cap 37. The wear plate 41 is formed with a central hole communicating with the feed water port 39 and is provided at the periphery thereof with the wear plates 42, 43.

The annular wear plate 42 is made up of three similar pieces 45 which engage the inner surface of the pressure cap 37 on one side and are formed at the outer periphery on the other side with a step portion 46 corresponding to the front end of the body 1.

The annular wear plate 43 is also made up of three similar pieces 47 and overlies the wear plate 42 inwardly of the step portion 46. The wear plates 42,43 are secured to the inner surface of the pressure cap 37 by bolts 48 received in aligned holes therein. By this arrangement the wear plate 43 which is subject to the greatest wear can be easily replaced.

When sands are washed by the apparatus according to the present invention, firstly, the threaded pressure rods 33 are rotated by the associated handles 34 to adjust the biasing force exerted by the springs 35 on the pressure cap 37 depending on the sands' state. Thereafter, the drive motor 12 is actuated to rotate the main shaft 10 and the sands

are fed into the body 1 through the feed port 8. At the same time, water is fed to the body 1 through the feed water pipes 49,50.

The sands mixed with soft stones, lumps of clay, lumps of tough loam, etc. are transferred from the rear end of the body 1 towards the discharge port 36 at the front end while being agitated by the crush blades 15 rotating within the body 1. At the front end of the body 1, the sands are urgedly pushed against the wear plates 41,43 by the pressure of the succeeding sands, while at the same time being powerfully agitated by the rotary vane 16 and washed by water fed from the feed water port 39. The washed sands are finally discharged from the body 1 through a space created between the discharge port 36 and step portion 46 at the peripheral edge of the wear plate 42 as the pressure cap 37 and wear plate assembly is pushed back against the biasing of the springs 35 by the sand pressure.

As a result, soft stones, lumps of clay, lumps of tough loam etc. mixed with the sands are completely crushed by the crushing effect of the crush blades and the rotary vane as well as the friction effect among the sands etc. and the crushed material is washed and discharged from the front end of the body between the discharge port and the peripheral edge of the wear plate assembly. Thus there can be effectively obtained sands of good quality.

In addition, since the pressure of the wear plate assembly with respect to the sands can be adequately controlled by adjusting the biasing force of the springs acting on the pressure cap, sands of the best quality can be obtained by adjusting the pressure as required.

Although in the above embodiment the apparatus according to the present invention is described for washing sands, it may be effectively used for crushing a concrete structure or a glass product. More specifically, the apparatus according to the present invention can be used for crushing blocks, for example obtained from old structures, into powder-like cement and the like which may be effectively reused for making a ground bed for a buried pipe or ballast and the like which may be used for a concrete aggregate. Likewise, glass products such as old bottles may be crushed into reusable powder-like glass material in large quantity with ease by using the apparatus according to the present invention.

Claims

1. Apparatus for washing sand and the like comprises a cylindrical body (1) having a feed port (8) at one end and a discharge port (36) at the other end, a rotatable main shaft (10) disposed within the body (1), crush blade means (15) mounted on the main shaft (10) and protecting therefrom, an agitation vane (16) mounted to the front end of the main shaft (10), and a pressure cap (37) mounted in opposed relationship to the discharge port (36), characterised in that the pressure cap (37) has a feed water port (39) and is biased towards the discharge port (36) by spring means (35) arranged to act between a sup-

port arm (25) mounted at the other end of the body (1) and the pressure cap (37) supported by the support arm (25).

2. Apparatus according to claim 1 characterised in that the cylindrical body (1) comprises two semicylindrical shells (4, 5) and has an inside panel (6) attached to the internal surface thereof.

3. Apparatus according to claim 1 or claim 2 characterised in that the main shaft (10) is provided with a plurality of sleeves (13) on which crush blades (15) are mounted in a spiral form or a circumferentially repeated form.

4. Apparatus according to any one of the preceding claims characterised in that the agitation vane (16) comprises a plurality of agitation wings (19) projecting from the outer periphery of a shaft plate (17) therefor.

5. Apparatus according to any one of the preceding claims characterised in that the support arm (25) is integrally provided with an angular body (31) having at each corner a respective threaded sleeve (32) in which a threaded pressure rod (33) is engaged, and the spring means (35) comprises a respective spring (35) acting between each pressure rod (33) and the pressure cap (37) to bias the pressure cap (37) towards the discharge port (36) with the pressure rods (33) each having a respective handle (34) for adjusting the biasing force of the associated spring (35).

6. Apparatus according to any one of the preceding claims characterised in that the pressure cap (37) is provided at the centre of the outer surface facing the support arm (25) with a spline shaft (38) engaged in a bearing (40) on the support arm (25), the spline shaft (38) having a central bore providing the feed water port (39).

7. Apparatus according to any one of the preceding claims characterised in that the pressure cap (37) is provided on the inner surface facing the discharge port (36) with a wear plate assembly (41,42,43).

8. Apparatus according to claim 7 characterised in that the wear plate assembly (41,42,43) comprises an inner disc-shaped wear plate (41) and two outer annular wear plates (42,43) extending around the inner wear plate (41).

9. Apparatus according to claim 9 characterised in that the wear plate (42) has a step portion (46) at the peripheral edge thereof adapted to co-operate with the discharge port (36).

10. Apparatus according to any one of claims 7 to 9 characterised in that the wear plate assembly (41,42,43) is detachably mounted on the pressure cap (37).

Revendications

1. Appareil pour laver du sable et analogue, comprenant:

- une partie principale cylindrique (1) ayant, à une extrémité, une ouverture d'entrée (8) et, à l'autre extrémité, une ouverture de sortie (36),
- un arbre principal tournant (10) monté à l'intérieur de la partie principale (1),

– des moyens de broyage à lames (15) montés sur l'arbre principal (10) et en saillie par rapport à celui-ci,

– une pale d'agitateur (16) montée à l'extrémité avant de l'arbre principal (10) et une fermeture par pression (37) montée vis à vis de l'ouverture de sortie (36),

caractérisé par le fait que la fermeture par pression (37) comprend une ouverture d'arrivée d'eau (39) et se trouve poussée vers l'ouverture de sortie (36) par des moyens à ressort (35) conçus pour agir entre un bras de support (25) monté à l'autre extrémité de la partie principale (1) et la fermeture par pression (37) supportée par le bras de support (25).

2. Appareil selon la revendication 1 caractérisé par le fait que la partie principale cylindrique (1) est constituée de deux coquilles semi-cylindriques (4, 5) et comprend un panneau intérieur (6) fixé sur sa surface intérieure.

3. Appareil selon la revendication 1 ou 2 caractérisé par le fait que l'arbre principal (10) est équipé d'un ensemble de manchons (13) sur lesquels sont montées des lames (15) de broyage en forme de spirale ou de circonférences multiples.

4. Appareil selon l'une quelconque des revendications précédentes caractérisé par le fait que la pale d'agitateur (16) comporte un ensemble d'ailettes d'agitateur (19) faisant saillie de la périphérie extérieure d'un plaque d'arbre (17) prévue à cet effet.

5. Appareil selon l'une quelconque des revendications précédentes caractérisé par le fait que le bras de support (25) fait partie intégrante d'un corps polygonal (31) pourvu à chaque angle d'un manchon fileté (32) à l'intérieur duquel vient en prise une tige filetée à pression (33) et par le fait que les moyens à ressort (35) comportent un ressort correspondant (35) agissant entre chaque tige à pression (33) et la fermeture par pression (37) pour solliciter la fermeture par pression (37) en direction de l'ouverture de la sortie (36), les tiges sous pression (33) comprenant chacune une poignée correspondante (34) pour ajuster la force de sollicitation créée par le ressort associé (35).

6. Appareil selon l'une quelconque des revendications précédentes caractérisé par le fait que la fermeture par pression (37) est équipée au centre de la surface extérieure placée vis à vis du bras de support (25) d'un arbre cannelé (38) engagé dans un coussinet (40) du bras de support (25), l'arbre cannelé (38) ayant un alésage central constituant l'ouverture d'arrivée d'eau (29).

7. Appareil selon l'une quelconque des revendications précédentes caractérisé par le fait que la fermeture par pression (37) comporte sur sa surface intérieure tournée vers l'ouverture de sortie (36) un ensemble de plaques d'usure (41, 42, 43).

8. Appareil selon la revendication 7 caractérisé par le fait que l'ensemble des plaques d'usure (41, 42, 43) comporte une plaque d'usure intérieure sous forme de disque (41) et deux plaques d'usure annulaires extérieures (42, 43) placées autour de la plaque d'usure intérieure (41).

9. Appareil selon la revendication 9 caractérisé par le fait que la plaque d'usure (42) comporte une portion en échelon (46) sur sa périphérie extérieure

conçue pour coopérer avec l'ouverture de sortie (36).

10. Appareil selon l'une quelconque des revendications 7 à 9 caractérisé par le fait que l'ensemble des plaques d'usure (41, 42, 43) est monté de manière amovible sur la fermeture par pression (37).

Patentansprüche

1. Vorrichtung zum Waschen von Sand und ähnlichen Substanzen mit einem zylindrischen Gehäuse (1), welches eine Einlaßöffnung (8) an einem Ende und eine Auslaßöffnung (36) am anderen Ende aufweist, wobei eine drehbare Hauptwelle (10) in dem Gehäuse (1) angeordnet ist, und auf der Hauptwelle (10) Mahlschaufeln (15) von dieser vorstehend befestigt sind, wobei ferner an dem Vorderende der Hauptwelle (10) ein Rührflügel (16) montiert ist, und wobei eine Druckkappe (37) der Auslaßöffnung (36) gegenüberliegend angeordnet ist, dadurch gekennzeichnet, daß die Druckkappe (37) einen Speisewassereinlaß (39) aufweist und durch Federeinrichtungen (35) in Richtung der Auslaßöffnung (36) vorgespannt ist, welche zwischen einem Stützarm (25), der am anderen Ende des Gehäuses (1) montiert ist und der Druckkappe (37), welche von dem Stützarm (25) getragen ist, wirksam ist.

2. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß das zylindrische Gehäuse (1) aus zwei halbzyklindrischen Schalen (4, 5) besteht und eine auf seiner Innenoberfläche befestigte Innenwandung (6) aufweist.

3. Vorrichtung nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß die Hauptwelle (10) mit einer Vielzahl von Hülse (13) versehen ist, auf welchen die Mahlschaufeln (15) in einer spiralförmigen Gestalt oder in einer sich um den Umfang wiederholenden Form montiert sind.

4. Vorrichtung nach einem der vorstehenden Ansprüche, dadurch gekennzeichnet, daß der Rührflügel (16) durch eine Vielzahl von Rührblättern (19) gebildet ist, welche von dem Außenumfang einer Wellenplatte (17) vorstehen.

5. Vorrichtung nach einem der vorstehenden Ansprüche, dadurch gekennzeichnet, daß der Stützarm (25) einstückig mit einem winkelförmigen Körper (31) versehen ist, welcher an jeder seiner Ecken eine Gewindehülse (32) aufweist, in die je eine mit Gewinde versehene Druckstange (13) eingesetzt ist, und daß die Federeinrichtung (35) je eine entsprechende Feder (35) aufweist, die zwischen jeder Druckstange (33) und der Druckkappe (37) wirksam ist, um die Druckkappe (37) in Richtung der Auslaßöffnung (36) zu drücken, wobei jede der Druckstangen (33) einen entsprechenden Handgriff (34) aufweist, um die Federkraft der dazugehörigen Feder (35) zu verstellen.

6. Vorrichtung nach einem der vorstehenden Ansprüche, dadurch gekennzeichnet, daß die Druckkappe (37) in der Mitte der dem Stützarm (25) gegenüberliegenden Außenfläche eine Keilwelle (38) aufweist, die in ein Lager (40) an dem Stützarm (25) eingreift, und daß die Keilwelle (38) mit einer mittigen Bohrung versehen ist, welche die Speisewasseröffnung (39) bildet.

7. Vorrichtung nach einem der vorstehenden Ansprüche, dadurch gekennzeichnet, daß die Druckkappe (37) auf der inneren Oberfläche, welche der Auslaßöffnung (36) gegenüberliegt, mit einer Verschleißplattenanordnung (41, 42, 43) versehen ist.

8. Vorrichtung nach Anspruch 7, dadurch gekennzeichnet, daß die Verschleißplattenanordnung (41, 42, 43) eine innere scheibenförmige Verschleißplatte (41) und zwei äußere ringförmige Verschleißplatten (42, 43) aufweist, welche die innere Verschleißplatte (41) umgeben.

9. Vorrichtung nach Anspruch 9, dadurch gekennzeichnet, daß die Verschleißplatte (42) einen abgestuften Abschnitt (46) in ihrer Umfangsante aufweist, welcher mit der Auslaßöffnung (36) zusammenarbeitet.

10. Vorrichtung nach einem der Ansprüche 7 bis 9, dadurch gekennzeichnet, daß die Verschleißplattenanordnung (41, 42, 43) an der Druckkappe (37) abnehmbar montiert ist.

Fig. 1.

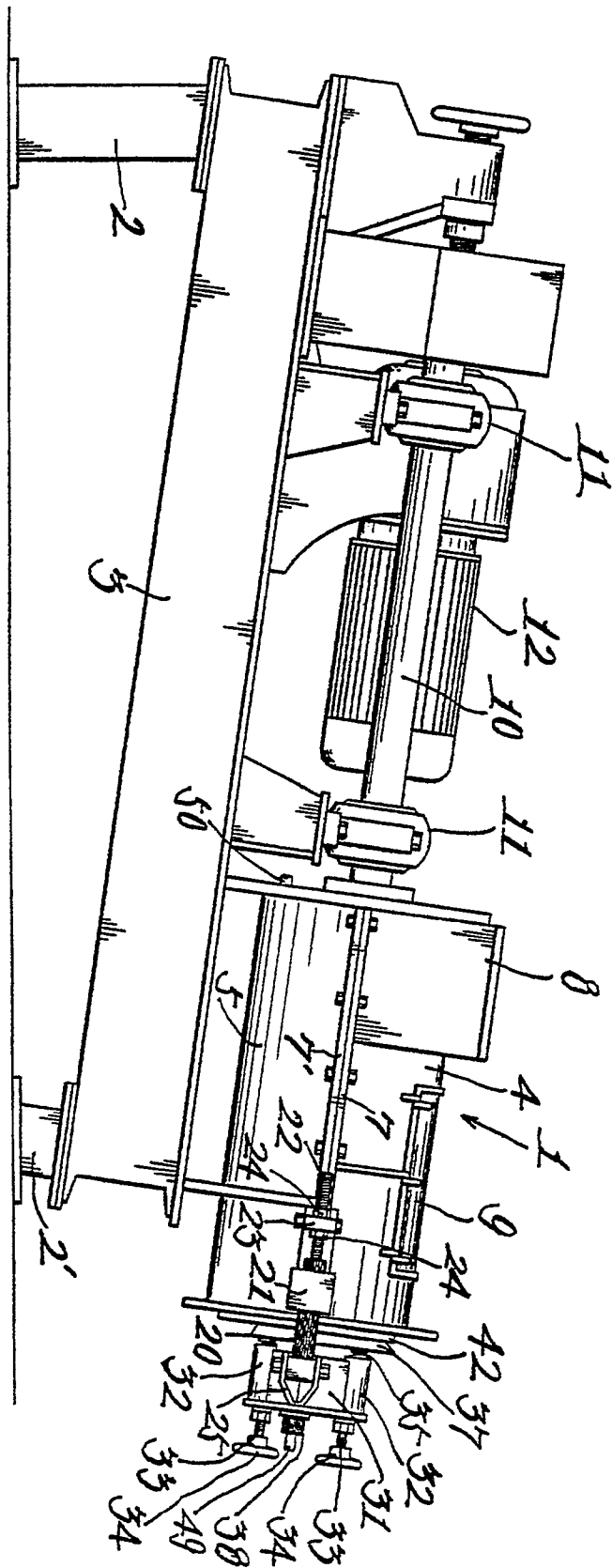
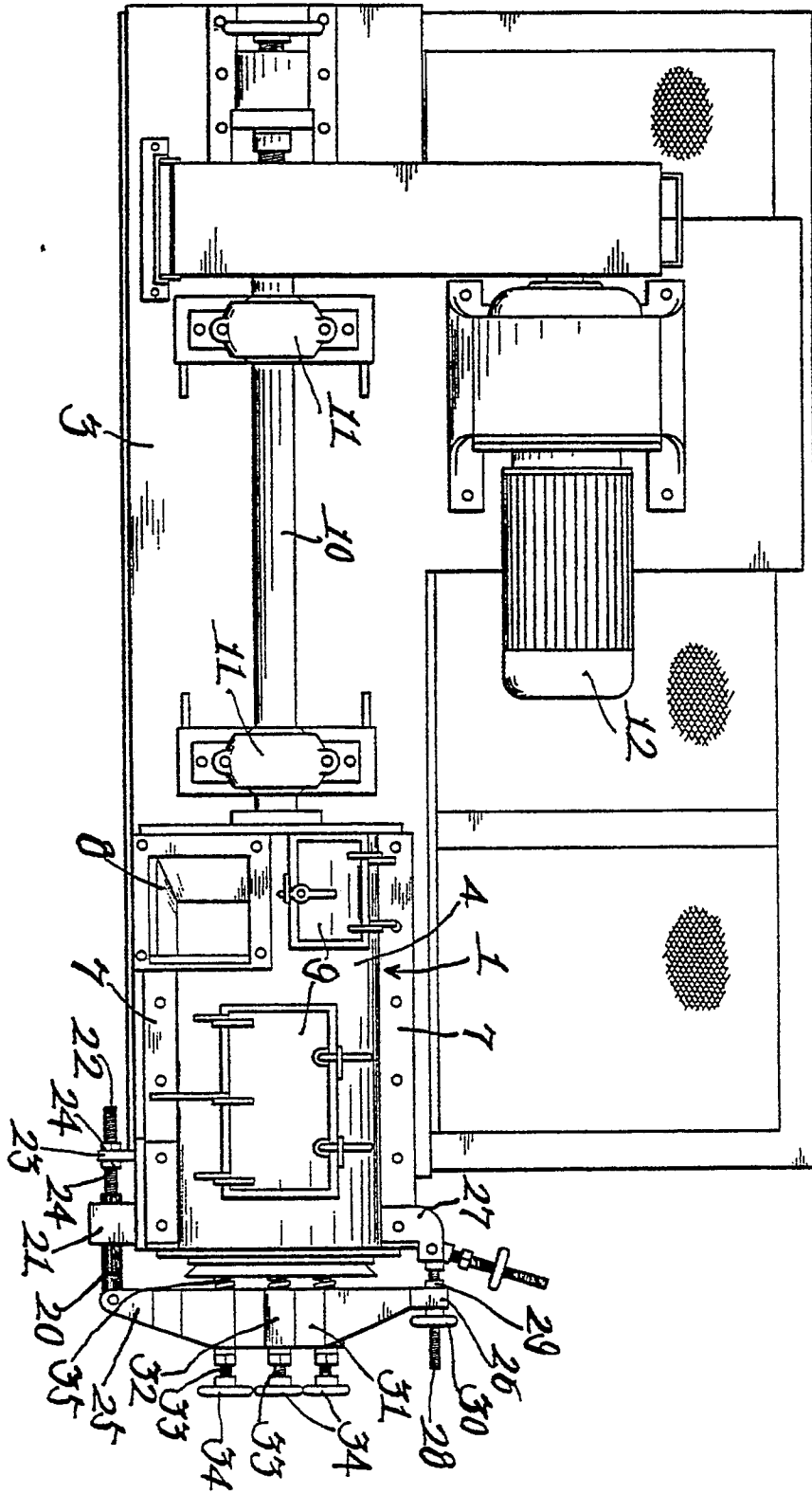
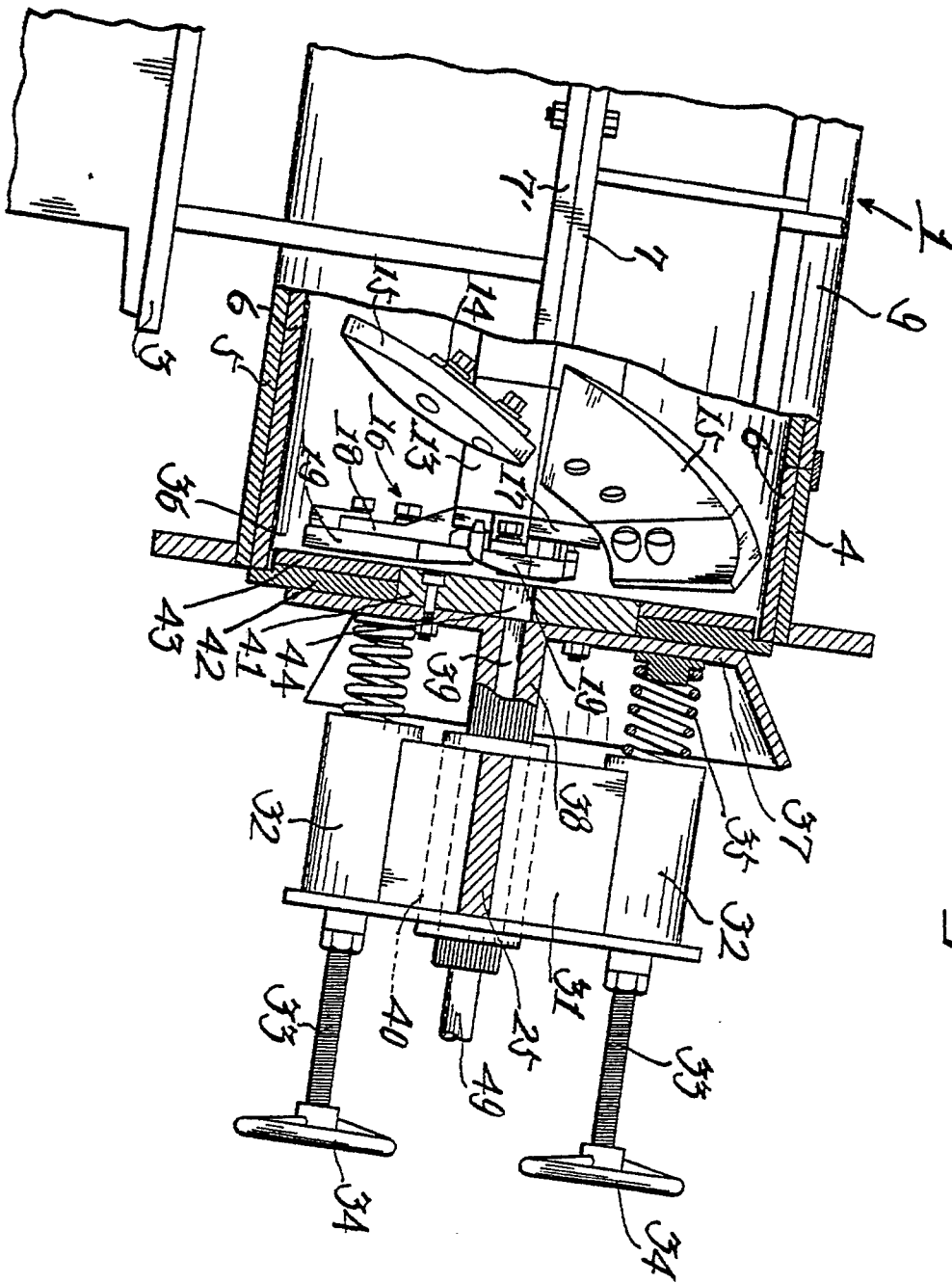


Fig. 2.





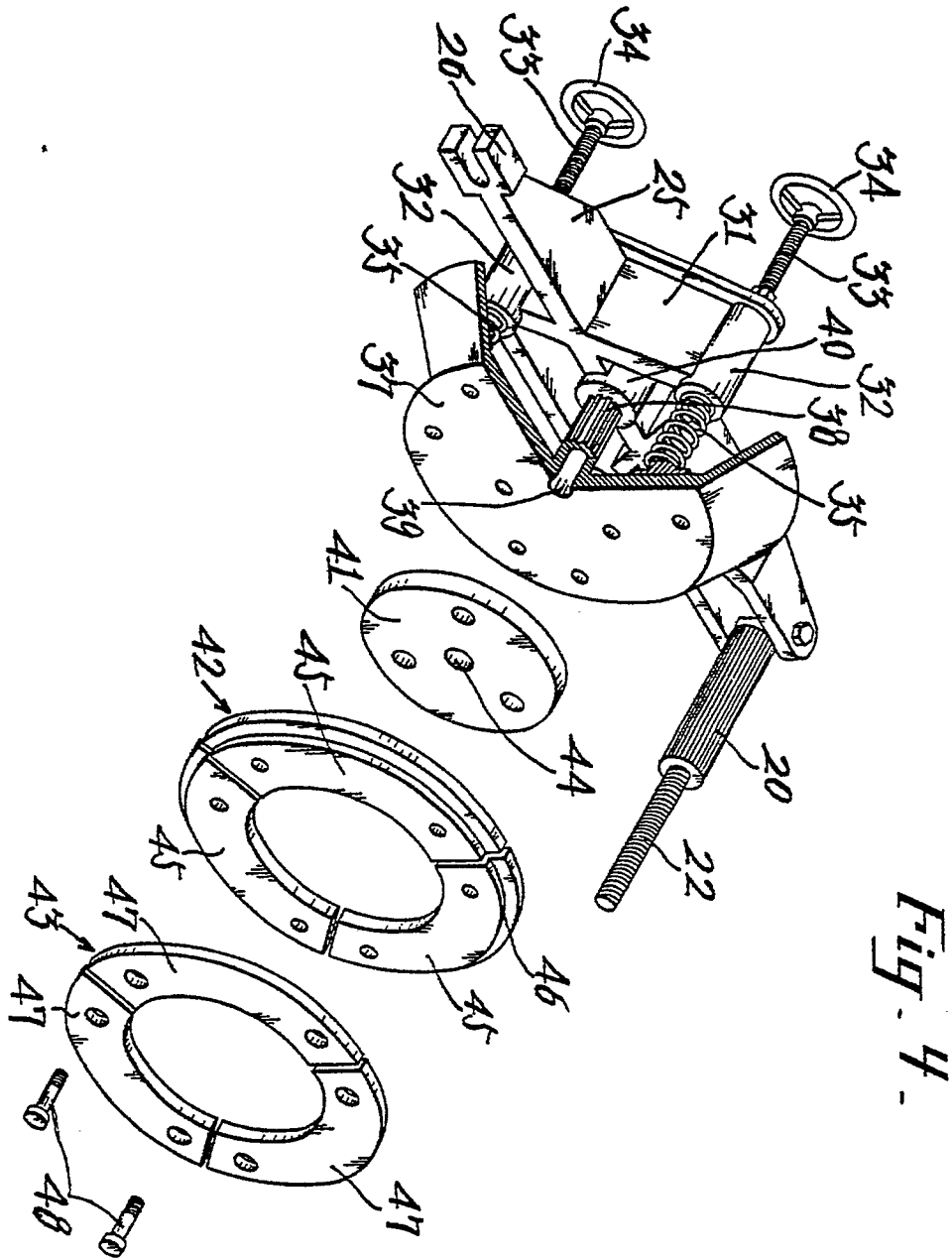


Fig. 4

Fig. 5.

