Feb. 13, 1968 W. J. PHYSIOC III 3,368,308

CENTRIFUGAL BLASTING APPARATUS

Filed Nov. 3, 1964 2 Sheets-Sheet 1

Fig. 1.

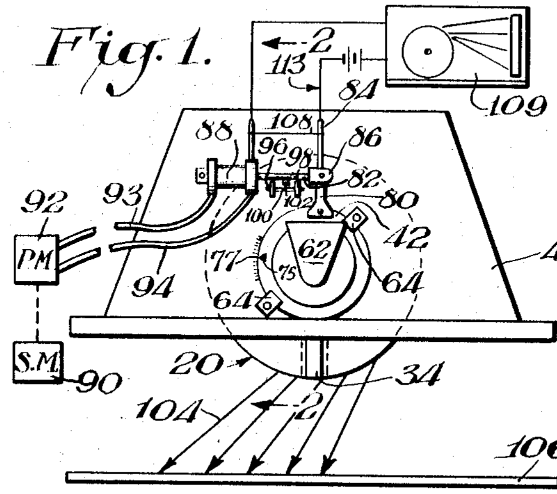

Fig. 4.

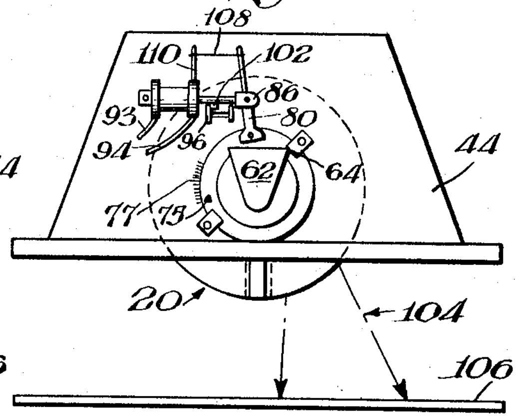

Fig. 2.

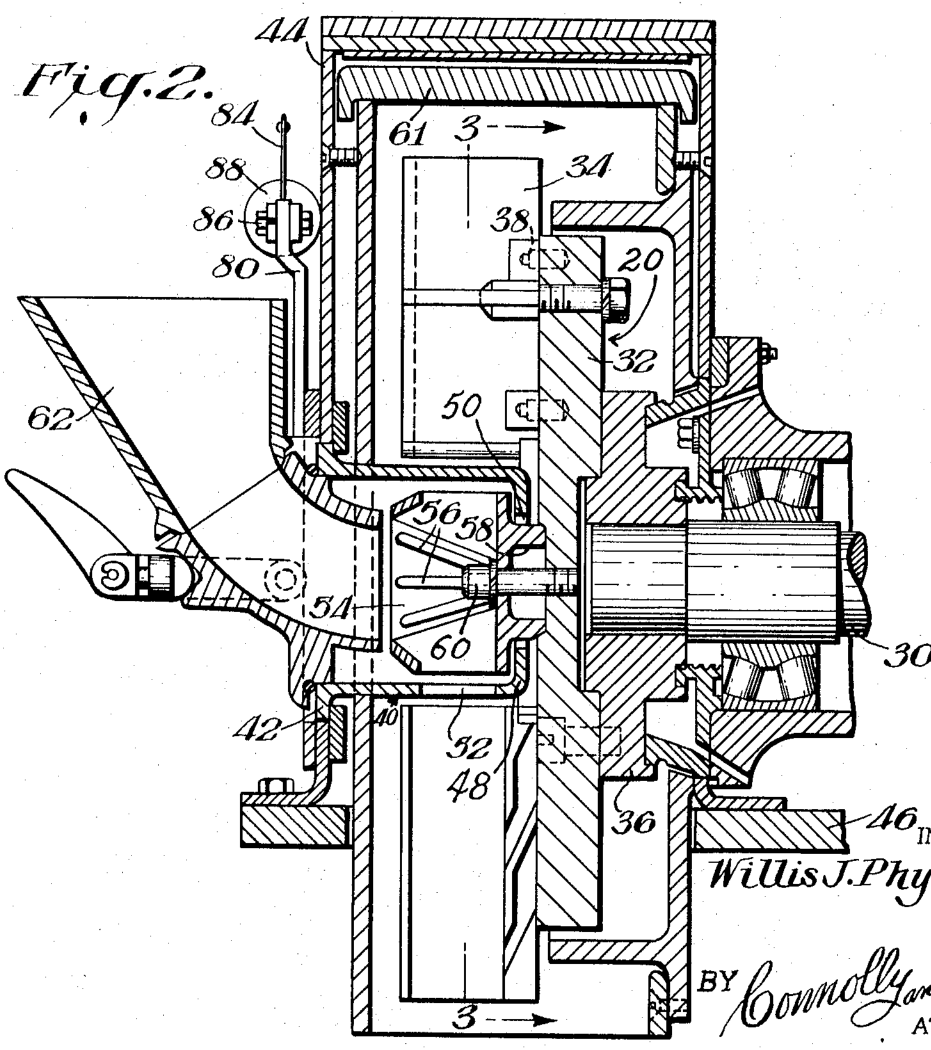

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Fig. 3.

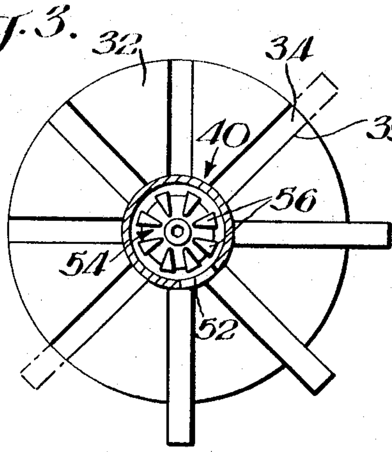


Fig. 5.

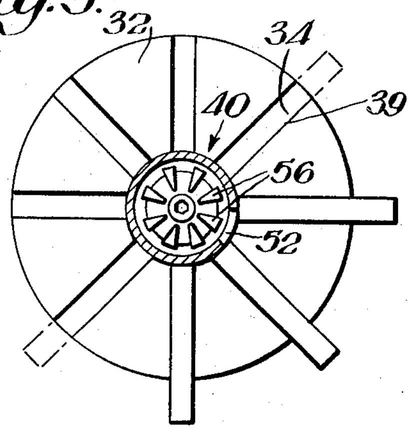


Fig. 6.

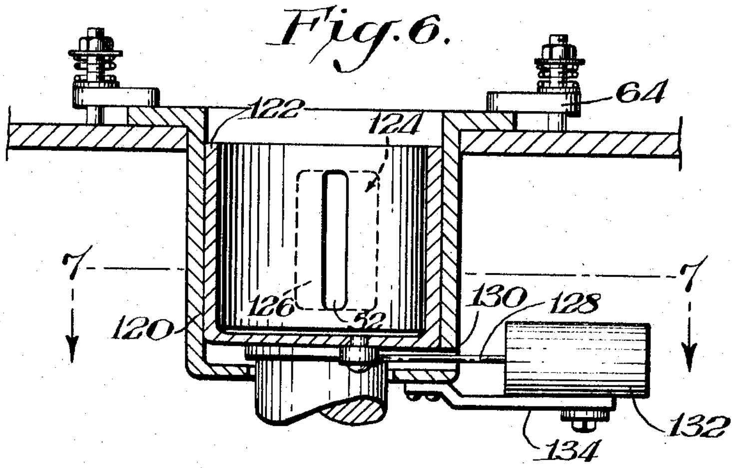
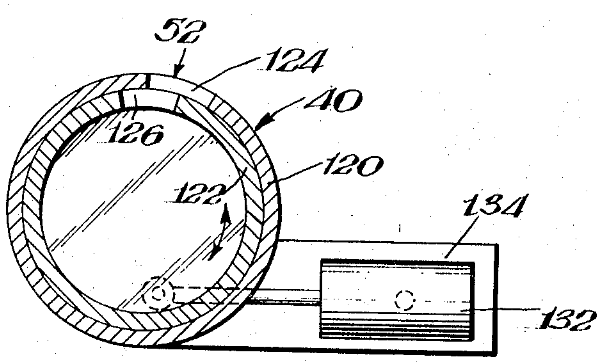


Fig. 7.



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CENTRIFUGAL BLASTING APPARATUS

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6 Claims. (Cl. 51—9)

This invention relates to a centrifugal blasting apparatus. More particularly to such an apparatus as that shown in U.S. Patent No. 2,582,702, granted Jan. 15, 1952, and U.S. Patent No. 2,869,289, granted Jan. 20, 1959, which apparatus projects a directional stream of blastant particles.

Among the objects of the present invention is the provision of novel centrifugal blasting apparatus for use in substantially any orientation to provide the ability to remotely control the range of blasting pattern, heretofore, not done.

Further objects of the present invention include a novel means for angularly adjusting and controlling the size of the feed slot of the impeller cage.

The above, as well as still further objects of the present invention will be more clearly understood from the following description and drawings wherein:

FIG. 1 is a side view of one embodiment of the invention in one phase of operation;

FIG. 2 is a section taken along line 2—2 of FIG. 1;

FIG. 3 is a section taken along line 3—3 of FIG. 2;

FIG. 4 is a view similar to FIG. 1 showing another phase of operation;

FIG. 5 is a section similar to FIG. 2 showing a phase of operation of FIG. 4;

FIG. 6 is a section of another embodiment of this invention; and

FIG. 7 is a section taken along line 7—7 of FIG. 6.

According to the present invention a centrifugal throwing wheel assembly includes a throwing wheel carried on one end of a rotatable shaft for rotation to project tangentially particles fed to the central portion of the wheel from an impeller cage. The impeller cage directs the abrasive particles through its feed slot against the rotating vanes positioned radially along the periphery of the wheel. The abrasive blast pattern is shifted in a longitudinal manner through a remote controlling of an adjustable actuating mechanism which is connected to the impeller cage to regulate the orientation of the impeller cage feed slot with respect to the work piece. Advantageously, the cage retaining fasteners which mount the impeller cage to the throwing wheel housing are spring loaded to assure that the rotating joint between the cage and housing is sealed.

The remote actuating mechanism includes a small drive unit or a hydraulic cylinder-piston assembly connected to the impeller cage to move its feed slot along an arc. The movement of the feed slot may also be controlled by means of a servo-unit and by manually adjustable stops and can be set in a predetermined manner such that the cage and its feed slot are oscillated at a preset frequency or, if desired, the remote control mechanism can be set to position the feed slot at a predetermined angle with respect to the work piece to accurately control disposition of the blast pattern from the feed slot.

In accordance with another aspect of this invention, the size of the feed slot of the impeller cage is also remotely controlled as follows: The impeller cage is formed of a pair of concentric cylindrical rings, each with a slot. One of the rings is relatively stationary and the other is rotatable by means of a remote control actuating mechanism. When the slots of both rings are aligned, the effective size of the feed slot is at a maximum and is gradually reduced as the slots move out of alignment.

Referring to the drawings, the apparatus in FIG. 2 includes a throwing wheel 20 and a shaft 30 rotatably mounted on suitable journals and carrying a runner head 32 upon which throwing blades or vanes 34 are mounted. The shaft 30 is provided at one end with an enlarged flange 36 to which head 32 can be firmly secured as by means of bolts penetrating through the flange and runner head from either side. The runner head is desirably of massive construction so that unsymmetric errosion of the throwing blades will not significantly unbalance the unit dynamically.

The blades or vanes 34 are equally spaced around the runner head 32 as shown in FIG. 3 and can be held in any suitable manner such as by use of an enlarged dove-tailed edge on one side of the vane snugly engaging with a corresponding dove-tailed slot 39 in the face of the runner head 32. At their central ends the vanes are spaced apart to leave room for a feed assembly. Each blade is shown as held in place by a pin 38 (FIG. 2) which is fitted into suitable aligned sockets in both the enlarged dove-tailed edge of vane 34 and the face of the runner head 32. In the openings provided at the center of the runner head there is positioned a discharge directing feed cage 40 which is generally cylindrical or cup-shaped in form having an outwardly marginal flange 42 which is suitably secured to an external housing 44. The housing in turn is anchored to a frame 46 as shown in FIG. 2 that forms part of the journals for shaft 30 and serves to securely hold the assembled parts together.

The bottom 48 of the cup-shaped cage 40 has a central aperture 50 and its side is provided with a feed slot 52. Within the cage there is mounted an impeller 54 that includes a plurality of vanes 56 carrying at one end, a cylindrical boss 58 which fits through cage opening 50 and by means of which it is fastened to the runner head. A central bolt 60, as shown in FIG. 2, serves as a threaded fastener. The interior of the impeller 54 is hollow and is supplied with blastant particles as by means of the spout 62 which can be fastened to the housing and which extends well into the cage 40 and close to the front opening of the impeller. A wear plate structure 61 is mounted internally of housing 44. Feed cage 40 is rotatably secured to housing 44 as will later be described in detail. Cage retaining fasteners 64 (shown in FIG. 1) which secure cage 40 to housing 44 are spring loaded to effectively seal the rotating joint. Additionally, the point is lubricated with, for example, molydisulfide (Mos_2) to prevent galling of the rotating members.

The cage also carries a mark 75 which cooperates with scale 77 that is secured to housing 44 as shown in FIG. 1 and FIG. 4. The position of mark 75 on scale 77 from a distance indicates the relative position of feed slot 52, as will later be described.

As also shown in FIGS. 1 and 4, a lever arm 80 is connected to cage 40. Arm 80 is pivotably mounted to one end of piston rod 82 with an extension 84 of arm 80 projecting above the clevis 86. The opposite end of piston rod 82 reciprocates in hydraulic cylinder 88. This reciprocal motion is remotely controlled by servo motor 90 through pump 92 which has a pair of lines 93 and 94 leading to each end of cylinder 88.

A pair of adjustable stops 96 and 98 are mounted on rod 100 under piston rod 82. Stops 96 and 98 cooperate with projection 102 on piston rod 82 to define or limit the amplitude of the stroke of piston 82. The stroke may accordingly be controlled by manually adjusting the relative position of stops 96 and 98 on rod 100.

FIG. 1 shows the blast pattern 104 against workpiece 106 in an intermediate position of piston rod 82 when projection 102 is between stops 96 and 98. This blast pattern results from the position of feed slot 52 as shown in FIG. 3. The position of slot 52 can easily be seen or indicated by marker 75 and scale 77.

When it is desired, for example, to move blast pattern 104 more to the right on workpiece 106, the operator actuates servo-unit 90 to retract or shift piston rod 82 to the left. FIG. 4 shows piston rod 82 moved to the left in its most extreme position with the projection 102 against stop 96. An elastic electrical resistor unit 108, secured to extension 84 on piston rod 82 and to post 110 on hydraulic cylinder 88, is used to sense, through changes in resistance, the position of the cage. These changes in resistance, due to changes in length, are used to show graphically on gauge 109, the angular positions of cage 40 and slot 52. This occurs because resistor 108 changes voltage in the electrical circuit 113, thereby changing the position of an armature in small galvanometer type gauge 109 which is calibrated to indicate the change in angular orientation of cage 40.

As piston rod 82 is moved to the position shown in FIG. 4, cage 40 is rotated counter-clockwise by arm 80 and accordingly feed slot 52 is rotated in an arc to the position shown in FIG. 5. When feed slot 52 is moved to this position blast pattern 104 is also shifted to the right as shown in FIG. 4.

Servo-unit 90 can be operated to adjust blast pattern 104 to any desired fixed position. Alternatively, the operator can permit piston rod 82 to continue to reciprocate between its extreme positions so that feed slot 52 is rotated back and forth in a preset arc for uniform blast coverage of workpiece 106 by blast pattern 104. The frequency of oscillation can be controlled by servo-unit 90 through pump 92 while the amplitude of oscillation can be adjusted by shifting stops 96 and/or 98. Additionally, the entire range of movement of blast pattern 104 can be shifted by moving both stops 96 and 98 to the right or to the left as desired.

In accordance to another aspect of this invention, the blast pattern is also controlled by adjusting the size of the feed slot 52. As shown in FIGS. 6–7, feed cage 40 is in the form of a pair of concentric cylindrical rings or sleeves 120 and 122, each of which contain slots 124 and 126, respectively. Both ring 120 and ring 122 are mounted to rotate together by arm 80 of the aforedescribed remote control mechanism. However, additionally, inner ring 122 is mounted to rotate independently of outer ring 120. This independent rotatable movement can be accomplished by using a small actuator or power cylinder mounted on ring 120. For example, piston shaft 128 extends through an opening 130 in cylinder 120 is pivotally secured to cylinder 122. Piston shaft 128 also reciprocates in hydraulic cylinder 122 which is mounted pivotably on bracket 134 connected to outer cylinder 120. A servo-unit, such as unit 90 operates the cylinder-piston assembly 128, 132. The cylinder piston assembly may also include manual stops and may otherwise be similar to the cylinder-piston assembly shown in FIG. 1.

As shown in FIGS. 6–7, the size of feed slot 52 is determined by the degree of alignment of slots 124 and 126. When cylinder 122 is rotated so that slots 124 and 126 are completely aligned, the size of feed slot 52 is at a maximum, and its size is reduced as cylinder 122 is rotated to move slots 124 and 126 more out of alignment with each other.

Obviously, many modifications and variations of the present invention are possible in the light of the above teachings. It is, therefore, to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

What is claimed is:

1. A centrifugal blasting apparatus comprising a housing open at one end, a rotatable blasting wheel mounted in said housing, a plurality of radial vanes on said blasting wheel with their innermost ends spaced from the center of said wheel, an impeller cage on said blasting wheel disposed between said innermost ends of said vanes, a feed slot in said impeller cage, remote controlled actuating means connected to said impeller cage for adjusting the angular orientation of said feed slot, and said actuating means including a cylinder and piston assembly and including an operating unit disposed remotely from said impeller cage and mounted externally on said housing for operating the reciprocation of said piston in said cylinder and including remote means for visually noting the angular orientation of said impeller cage.

2. The apparatus of claim 1 wherein said remote means for visually noting the angular orientation of said impeller cage includes an elastic electrical resistor unit connected to said cylinder and piston assembly.

3. The apparatus of claim 2 wherein an electrical indicating guage is connected to said resistor unit and is disposed remotely therefrom.

4. The apparatus of claim 3 wherein said impeller cage comprises a pair of concentric cylindrical rings, a slot being in each of said rings and disposed to align with each other to create said feed slot, means for moving one of said rings with respect to the other of said rings whereby the effective size of said feed slot may be varied in accordance with the degree of alignment of said slots in said rings, said means for moving one of said concentric cylinders including a driving assembly having a driving member and said driving member being connected to the inner most said concentric cylindrical rings, and said means for moving of said concentric rings being actuated by remote control means.

5. A centrifugal blasting apparatus comprising a housing open at one end, a rotatable blasting wheel mounted in said housing, a plurality of radial vanes on said blasting wheel with their innermost ends spaced from the center of said wheel, an impeller cage on said blasting wheel disposed between said innermost ends of said vanes, a feed slot in said impeller cage, remote controlled actuating means connected to said impeller cage for adjusting the angular orientation of said feed slot, said impeller cage comprising a pair of concentric cylindrical rings, a slot being in each of said rings and disposed to align with each other to create said feed slot, means for moving one of said rings with respect to the other of said rings whereby the effective size of said feed slot may be varied in accordance with the degree of alignment of said slots in said rings, and said means for moving one of said concentric rings being actuated by remote control means.

6. An impeller cage for use in a rotatable blasting wheel comprising a pair of concentric cylindrical rings, each of said rings having a slot, said slots being disposed in the path of motion of each other whereby a feed slot is created when said slots are aligned, means for moving one of said rings with respect to the other of said rings whereby the effective size of said feed slot may be varied in accordance with the degree of alignment of said slots in each of said concentric rings, said means for moving one of said cylindrical rings including a driving assembly having a drive connected to the inner most of said concentric cylindrical rings, and said driving assembly including piston-cylinder means.

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