Aug. 16, 1938. A. B. STEUART 2,127,274

ROTARY PROJECTOR

Filed Dec. 18, 1937

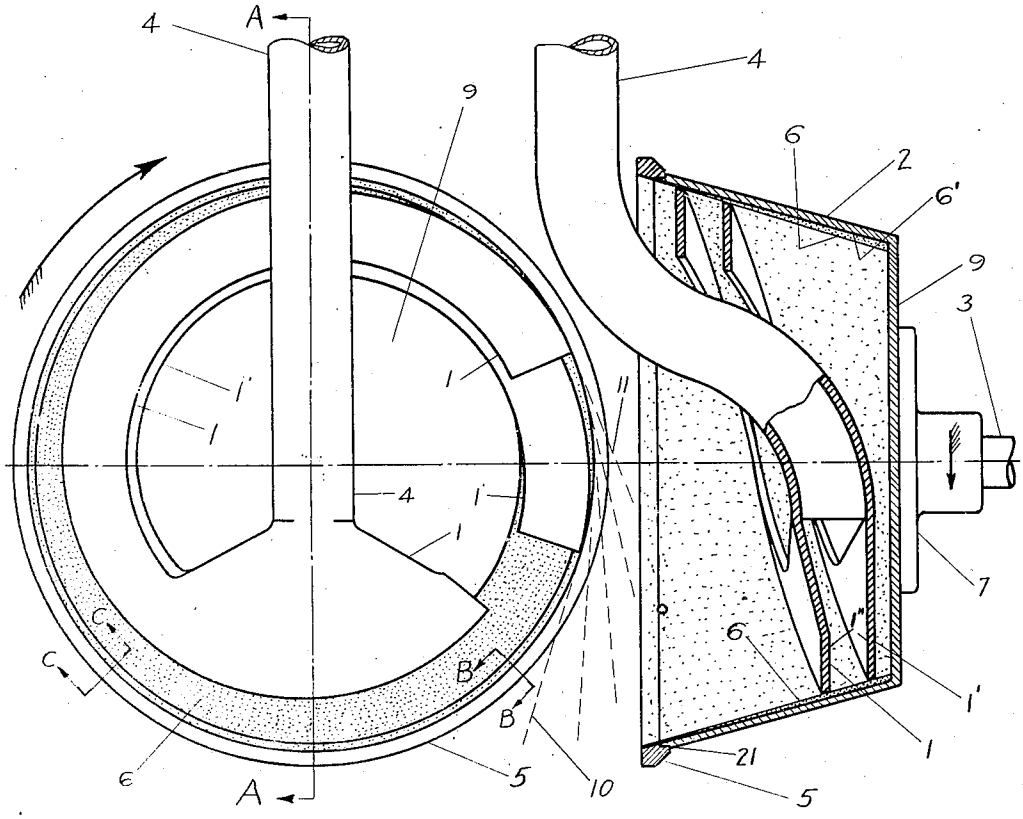


FIG. I.

FIG. II.

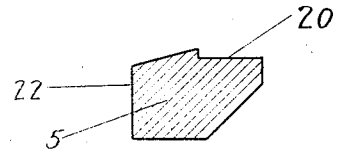


FIG. III.

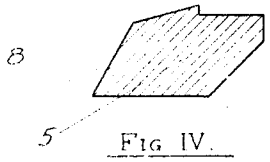


FIG. IV.

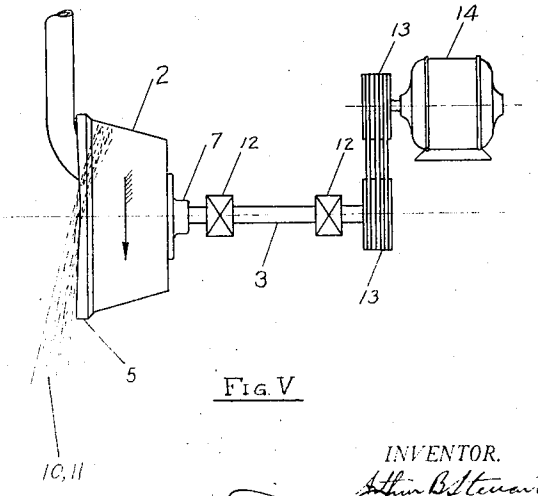


FIG. V

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ROTARY PROJECTOR

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Application December 18, 1937, Serial No. 180,536

6 Claims. (Cl. 51—9)

The abrasive projecting wheels now in commercial use have a relatively short life or high maintenance and are relatively intricate and therefore expensive. The short life or high maintenance being due to the action of the abrasive on the parts of such machines. This action is due to high velocities of abrasive over certain parts of such equipment and the high accelerations of the abrasive employed in their operation.

The object of the invention is to provide a means of projecting abrasive at required velocities by a means which will not wear rapidly or require excessive maintenance and be susceptible of control so as to project the abrasive in a desired direction and with a desired degree of spread or concentration of stream.

The acceleration of the abrasive to desired velocities is accomplished by introducing the abrasive into a rapidly rotating cuniform projecting wheel or rotating projector wherein it is picked up by friction and caused to travel with the inner surface of the wheel. The discharge of the abrasive is accomplished by permitting the abrasive to flow in a direction determined by the angle of the inner surface of the wheel and the speed of rotation. Preferably it is passed along a restricted channel fixedly located within the wheel and disposed substantially in the direction of natural flow, thus providing for the release of the abrasive when traveling in a desired direction. The angular spread of the stream in a plane normal to the axis of the wheel is controlled by the width of said channel. The axial spread of the stream is accomplished by the use of suitable deflecting portions added at the discharge end of the rim of the projecting wheel.

In the operation of the abrasive projecting wheel in its preferred form, abrasive is fed through a pipe onto the inner surface of the wheel where a part of the abrasive first entering the wheel remains, distributed over the inner surface of the wheel by centrifugal force forming a protective lining and acting as a cushion for the abrasive which follows. As more abrasive enters the wheel between the guides it is accelerated to the speed of the wheel by friction, with the abrasive lining rotating with the wheel and at the same time flows down the inclined surface of the abrasive lining rotating with the wheel to the outlet side of the wheel where it is discharged from the wheel.

In the accompanying drawing I have illustrated an abrasive projecting wheel embodying the features of the invention in the preferred form.

In the drawing:

Figure 1 is a front elevation of the wheel.

Figure 2 is a vertical section on the line A—A of Figure 1.

Figure 3 is a section of the wear ring on the line B—B.

Figure 4 is a section of the wear ring on the line C—C.

Figure 5 is a side elevation of the wheel showing diagrammatically a means of driving with a motor.

Referring to the drawing by numerals, each of which is used to indicate the same or similar parts in the different figures, the construction shown comprises a pair of spaced parallel spiral guides 1 and 1', a cuniform rimed wheel 2 with the integral supporting web 9 which closes its smaller end, a supporting and driving shaft 3, the feed pipe 4 and the wear ring 5. This wear ring is shown as shouldered peripherally at 20 on the inside to engage a corresponding shoulder 21 on the wheel or projector at the open end of the same. These wear rings are arranged to be replaceable and the outer face 22 is waived as to its angularity with the wheel axis to give the desired path of projection of the abrasive stream as illustrated. Figure 4 shows a ring 5' having its outer or forward face 8 inclined outwardly and forwardly to impart a corresponding greater deflection to the abrasive stream. The guides 1, 1' between them form a channel along which the projected abrasive is passed by rotation of the wheel 2, the guides being supported on the end of feed pipe 4.

When in operation a protective coating 6 of abrasive is retained on the inner surface of the wheel due to the slope of the conic inner surface 6' of the inside of the wheel 2 which is slightly less than the angle of repose of the abrasive on the inner surface of the wheel.

A supporting flange connection for attaching the wheel to its driving shaft 3 is indicated at 7.

In Figure 1 and Figure 5 the abrasive discharge stream is indicated by the dotted lines 10 and 11 and those included between them.

In Figure 5 the shaft 3 is shown supported by the diagrammatically indicated bearings 12. It being understood that any suitable bearing support and driving means may be substituted for those indicated. A multi-belt sheave and driving motor are indicated by 13 and 14 respectively. Any drive giving and maintaining suitable speeds will be satisfactory and the details shown being mainly illustrative and capable of wide variation.

An important feature of the invention is that the angle of the conic divergence of the inside surface 6' of the wheel 2 is such that a coating 6 of abrasive will remain within the wheel when in operation, to serve both as a protection for the wheel to prevent wear from the sliding of the incoming abrasive before being picked up by the wheel and also to cushion the incoming

abrasive to reduce "break-down" of the abrasive by reducing shock.

A further feature of importance is the path or the guide channel 1'' formed between the spiral guides 1 and 1'. If the abrasives were run into the wheel, while running, without the guides, it will be found that the abrasive will follow a spiral path within the wheel, but the stream will be broad, thinned at its sides and heavier toward its center. The path followed by the channel between the guides is intended to conform in a general way approximately and preferably with exactness to the mean or center of the path followed by the abrasive without the guides. This is important because if any other path be followed there will be a definite tendency for the abrasive to pass under the guides, which would wear them excessively.

It will further be noted that the distance between the guides 1 and 1' determines the angle of spread of the abrasive discharge stream 10, 11 in the plane normal to the axis of the wheel, or referring to Figure 1, the angle between lines 10 and 11.

The axial dimension of the wheel is of importance, because this and the diameter thereof determine the length of the path followed by the abrasive within the wheel, which must be long enough for the incoming abrasive to be accelerated to the lineal velocity of the inner surface of the wheel in order to obtain maximum efficiency.

In order that the wheel may be self balancing and avoid the possibility of the local collection of abrasive becoming progressive it is further planned that the shaft of the wheel be designed for a relatively low critical speed of the rotating system as—R. P. M. By this means the wheel is made to rotate about its center of gravity instead of its geometric center. When local collection of abrasive takes place the center of gravity of the rotating system moves toward said collection which causes said collection to move in against the underside of the guide, thereby removing the collection and causing the center of gravity to move back toward the geometric center.

What I claim as new and wish to secure by Letters Patent is:—

1. An abrasive projecting wheel having an inner projecting surface in form of the frustum of a cone, means for rotating the wheel, a substantially stationary guide within said frustum conforming substantially to the direction of natural flow of the abrasive to restrain the spread of abrasive, a feed pipe for leading the abrasive to the guide near the small end of the frustum, the length of the frustum being sufficient to enable abrasive poured into the wheel at the smaller end thereof to attain a lineal velocity approaching that of the periphery of the wheel whereby it is projected from the larger end of the frustum, which is open for this purpose.

2. An abrasive projecting wheel having a rim with an inner surface in the form of a frustum of a cone, a supporting web at the smaller extremity of the frustum, the slope of the cone being somewhat less than the angle of repose of the abrasive used, replaceable wear ring at the larger end of frustum, a substantially stationary spiral guide within said frustum to restrain the spread of abrasive when poured into the frustum, a suitable feed pipe or spout to carry abrasive to said guide, the length of the frustum being sufficient to enable abrasive poured into the wheel at the smaller end to attain a lineal velocity approximately that of the wheel rim before flowing from the larger end of frustum, the stationary spiral guide being axially or rotatively adjustable in order to adjust the direction of discharge of abrasive about axis of the wheel.

3. An abrasive projecting wheel with a rim in form of the frustum of a cone, a supporting web at the smaller extremity of the frustum, the slope of the cone being somewhat less than angle of repose of the abrasive used, a replaceable wear ring at the larger end of the frustum, a stationary or effectively stationary spiral guide within said frustum to restrain the spread of the abrasive when poured into the frustum, a suitable feed pipe or spout to carry abrasive into the frustum, the length of the frustum being sufficient to enable abrasive poured into the wheel at the smaller end thereof to nearly attain the lineal velocity of the wheel rim before flowing from the larger end, the frustum having deflecting portions at the discharge end thereof in order to produce an axial distribution of the discharged abrasive stream.

4. An abrasive projecting wheel with a rim in the form of the frustum of a cone, the slope of the cone approaching the angle of repose of the abrasive used, a replaceable wear ring at the larger end of the frustum, a substantially stationary spiral guide within said frustum to restrain the spread of the abrasive when poured into frustum and to direct it to the point of discharge, a suitable feed pipe for abrasive leading to the end of said guide near the small end of the frustum, the length of the frustum being sufficient to enable abrasive poured into the wheel at the smaller end to attain a lineal velocity approaching that of the wheel rim before flowing from the larger end of the frustum, the distance between the spiral guides being sufficient to provide the desired angular spread of the discharge stream in a plane at right angles to the axis of the wheel.

5. An abrasive projecting wheel with a rim in form of the frustum of a cone, a supporting web at the smaller extremity of the frustum, the slope of the cone being somewhat less than the angle of repose of the abrasive used, a replaceable wear ring at the larger end of the frustum, a stationary or effectively stationary guide within said frustum to restrain the spread of the abrasive the same being disposed in the direction of natural travel of the abrasive, a suitable feed pipe or spout to carry abrasive into the frustum, the length of the frustum being sufficient to enable abrasive poured into the wheel at the smaller end to nearly attain the lineal velocity of the wheel rim before flowing from the larger end of the frustum, in which the mean free path of the flowing abrasive within the frustum is utilized as that of the operating path of the abrasive being accelerated.

6. An abrasive projecting wheel having a rim with an inner surface substantially in the form of a frustum of a cone, an effectively stationary spiral guide within said frustum to restrain the spread of the abrasive, a feed pipe to carry abrasive to the guide near the small end of the cone, the length of the frustum being sufficient to enable the abrasive to attain the desired lineal velocity before flowing from larger end of frustum, the force employed to produce the desired acceleration being the friction between a body of abrasive retained on the inner surface of the rim by the action of the wheel and the abrasive to be accelerated.

ARTHUR B. STEUART.