Nov. 11 , 1924. 1,514,976

W. E. LEWIS

MEANS FOR PRODUCING AN AIR LINING WITHIN A NOZZLE CONSTRUCTION

Filed May 14 , 1921

FIG. 1

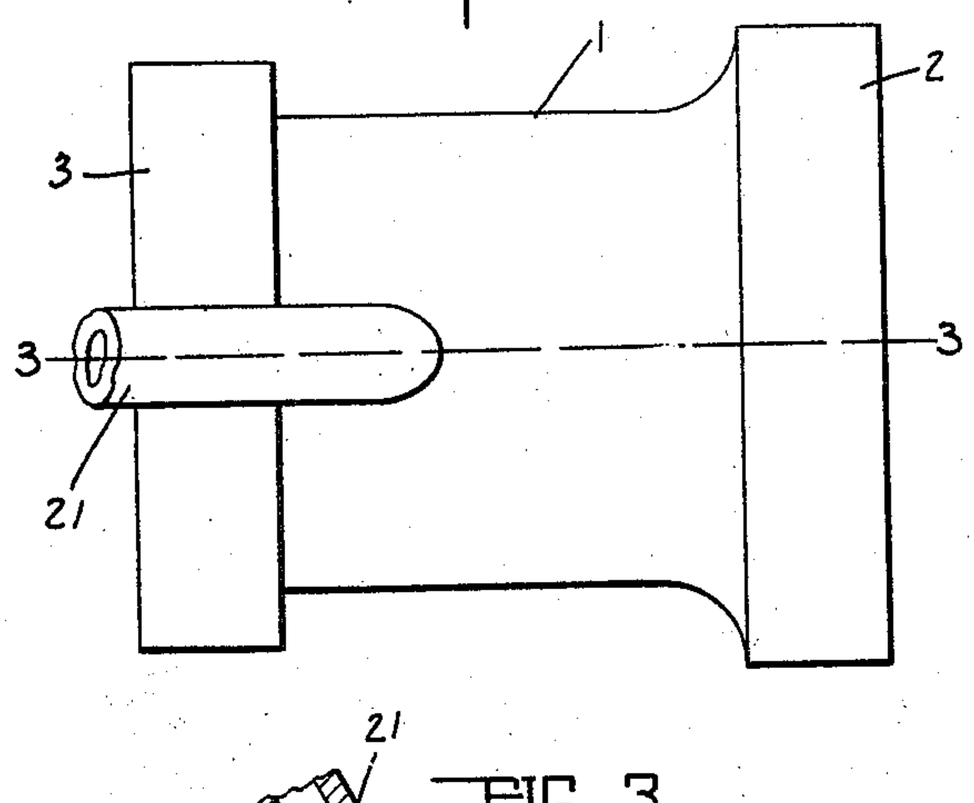


FIG. 2

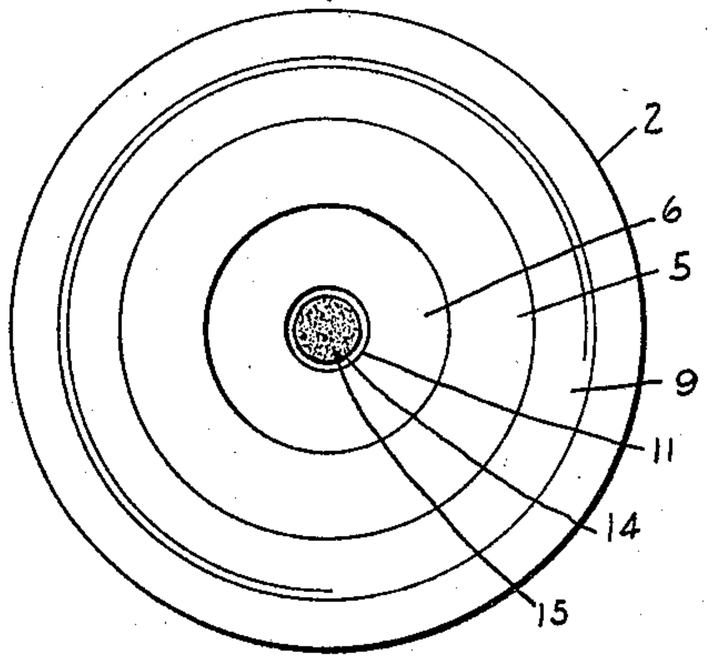


FIG. 3

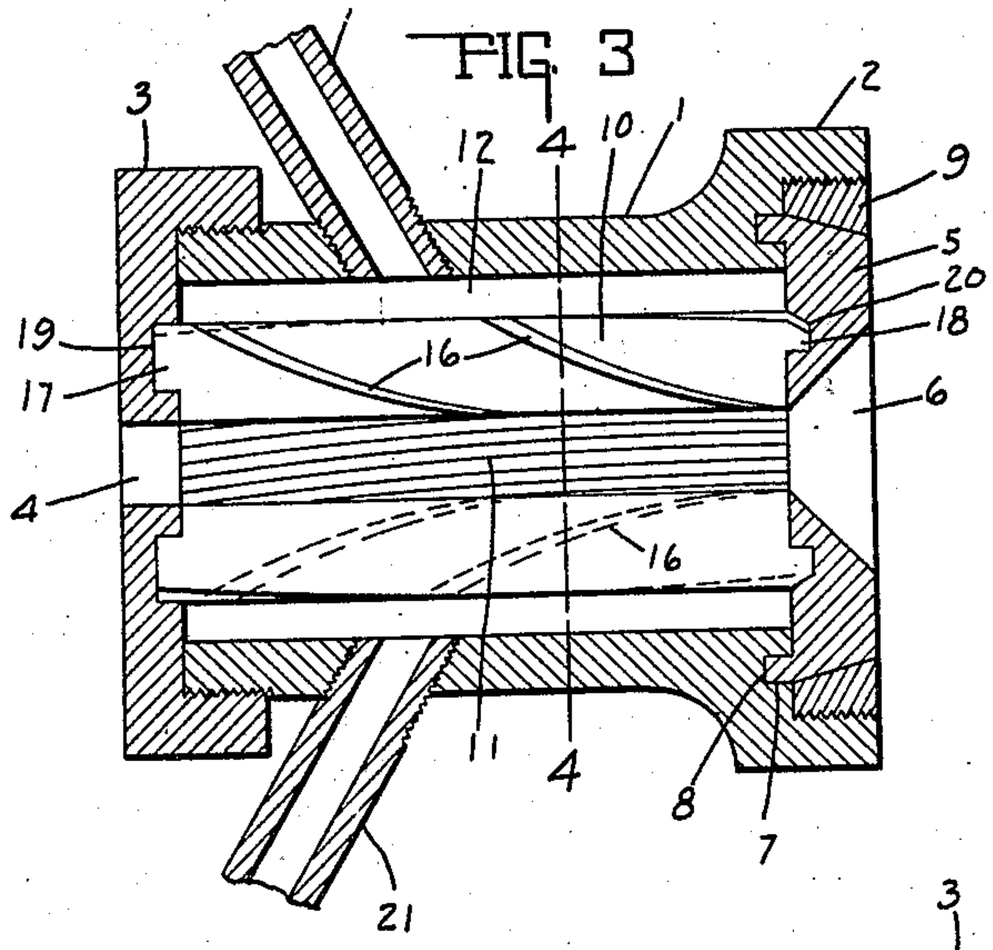


FIG. 4

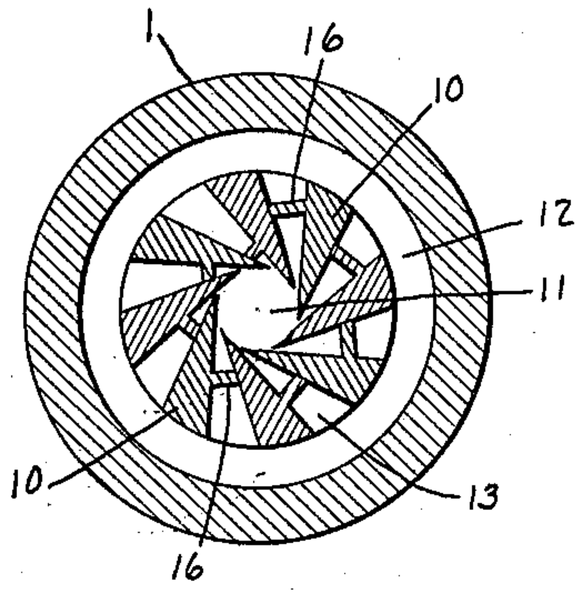
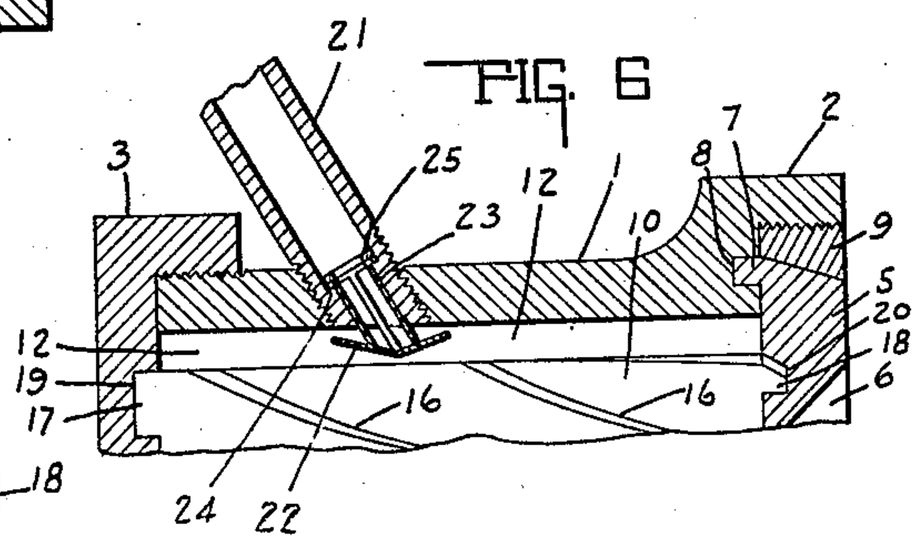


FIG. 5

FIG. 6



Inventor

WILLIAM E. LEWIS.

By E. W. Bradford

Attorney

Patented Nov. 11, 1924. 1,514,976

UNITED STATES PATENT OFFICE.

WILLIAM E. LEWIS, OF INDIANAPOLIS, INDIANA.

MEANS FOR PRODUCING AN AIR LINING WITHIN A NOZZLE CONSTRUCTION.

Application filed May 14, 1921. Serial No. 469,644.

To all whom it may concern:

Be it known that I, WILLIAM E. LEWIS, a citizen of the United States, residing at Indianapolis, in the county of Marion and State of Indiana, have invented certain new and useful Improvements in Means for Producing an Air Lining Within a Nozzle Construction, of which the following is a specification.

This invention relates to means for producing an air lining within a nozzle construction, the nozzle being used primarily as a concentrator and separator for metal ores, although it will be understood that the device can be used as a sand blast nozzle, or for separating and grading particles of matter according to their specific gravity, and especially particles of an abrasive nature, and the prime feature of the invention is the provision of means for introducing an air bank or lining around the wall of the bore through the nozzle so as to prevent the particles that are passing through the bore of the nozzle coming in contact with the wall thereof, thereby reducing the wear and deterioration of the parts of the nozzle to a minimum.

A further feature of the invention is the provision of means for conducting the air forming the lining into the bore of the nozzle in such manner as not to choke or retard the force and movement of the particles being carried through the nozzle under either air, steam or hydraulic pressure.

A further feature of the invention is the provision of means for utilizing the air forming the lining of the interior of the nozzle for adding momentum to the particles passing through the nozzle and assisting in propelling the particles towards the discharge end of the nozzle, thereby eliminating any possibility of the particles congesting or leaving the nozzle in compact or uneven formation.

Other objects and advantages will be hereinafter more fully set forth and pointed out in the accompanying specification.

In the accompanying drawings,

Figure 1 is a side elevation of a nozzle,

Figure 2 is a front end elevation thereof,

Figure 3 is a longitudinal central sectional view as seen on line 3—3, Figure 1,

Figure 4 is a transverse sectional view as seen on line 4—4, Figure 3,

Figure 5 is a side elevation of one of the air controlling members, and

Figure 6 is a detail sectional view showing means for controlling the passage of the air utilized for forming the cushion into the nozzle.

Referring to the drawings, 1 indicates a housing which is preferably cylindrical and having a flange 2 at one end thereof, while the opposite end of the housing is threaded into a cap 3 at the axis of which is formed an entrance opening 4, while the opposite end of the housing is provided with a plate 5 having at its axis a discharge opening 6, preferably flared outwardly so that the particles discharging therefrom will not come in contact with the wall of the plate. The plate 5 is preferably provided with an inwardly extending bead 7 which enters a recess 8 in the end of the housing 1, said plate being held in engagement with the end of the housing by threading a lock ring 9 into the flange 2, the peripheral edge of the plate 5 and the inner edge of the locking ring 9 being so tapered that the wall of the ring will overhang the peripheral wall of the plate 5 and exert wedging action thereagainst when the ring is turned into the flange.

In nozzles of this class a stream of air, steam or hydraulic pressure, is employed for carrying substances through the nozzle and with sufficient force that the particles will be separated in accordance with their specific gravity upon discharge from the nozzle, or may be used for carrying sand or the like for discharging the same for polishing different surfaces, and owing to the force with which the particles are carried through the nozzle rapid deterioration of the nozzle has prevailed, especially when abrasive substances are carried through the nozzle.

To overcome this objectionable feature, and thereby greatly prolong the life of the nozzle, air is entered through the wall of the housing and so discharged or entered into the bore of the nozzle through which the particles are being forced, as to form a complete lining or cushion, thereby preventing the particles coming in direct contact with the walls of the nozzle, and to this end a plurality of bars 10 are extended longitudinally of the housing 1, the inner edges of which are so terminated as to form a cen-

tral bore 11 lengthwise of and through the axial center of the housing while the outer edges of the bars are spaced from the interior wall of the housing to form an air passage 12 entirely around the series of bars.

In cross section, the bars 10 are substantially wedge shape and so positioned that their inner edges will be tangential to the bore 11 and are spaced apart to form radial passages 13 between the bars, said passages also being substantially wedge shape and tangential to the bore 11. Conequently, the air entering the bore 11 through the radial air passages 13 will circulate around the wall of the bore 11 and form a blanket or cushion of air between the inner edges of the bars 10 and the particles passing lengthwise through the bore, this feature being more clearly shown in Figure 2 of the drawings, 14 representing the air cushion and 15 the particles being forced through the bore of the nozzle. To more evenly distribute the air forming the cushion within the bore of the nozzle, and limit the twisting action thereof, the bars 10 are arranged substantially clockwise longitudinally and rifled counter clockwise so that the air when discharging into the bore 11 from the air passages 13 will be uniformly distributed and thereby maintain a constant pressure substantially the full length of the nozzle.

To prevent the air employed for forming the air cushion from traveling directly from the air passage 12 through the air passages 13 into the bore 11, one face of each bar 10 is provided with one or more ribs 16 which are curved from their outer to their lower ends and are inclined towards the discharge end of the nozzle, the ribs on one bar being in staggered relation with or out of alignment with the ribs of the next succeeding bar, consequently the air will be distributed or discharged into the bore at various points throughout the length of the bore, and by inclining the ribs towards the discharge end of the nozzle the force of the air, when discharged from the ribs, will tend to add momentum to the particles passing through the nozzle and will also tend to adhere to the wall of the bore 11 and will not congest the particles passing through the bore, consequently, the particles will leave the nozzle at a uniform flow and will not become bunched and discharge intermittently.

The ribs 16 also serve to space the bars 10 a uniform distance apart and to hold them in rigid spaced relation.

Any suitable means may be employed for anchoring the ends of the bars 10, but in the present instance the ends of the bars are provided with projections 17 and 18, which enter pockets 19 and 20 in the inner faces of the cap 3 and plate 5 respectively. The air for forming the cushion within the bore 11 preferably enters the air passage 12 through tubes 21, any desirable number of which may be employed, and these tubes are preferably so inclined that the air will trend towards the discharge end of the nozzle when discharged therefrom. If it is found desirable to more uniformly scatter the air as it enters the air passage 12, substantially inverted cone shape shields 22 may be entered in the air passage 12 and in line with the discharge end of the tubes 21, said shields having spring arms 23 which engage shoulders 24 formed in the interior of the tubes 21, said spring arms holding the shields in fixed alignment with the ends of the tubes, consequently, when the air discharging from the tubes strikes the shields it will be diffused and will enter the passages 13 at a uniform pressure. A washer 25 may be forced into the tubes 21 and onto the ends of the arms 23 for holding said arms in engagement with the shoulders 24. The air passages 13 extend longitudinally of the axis of the nozzle and may be varied in length, although under most circumstances they will extend substantially the full length of the nozzle. The bore 11 may also be arranged flaring toward the discharge end of the nozzle, if desired. It will also be understood that the bars 10 may be formed in the manner of a cage instead of being formed in separate elements.

Having thus fully described my said invention, what I claim as new and desire to secure by Letters Patent, is:

1. In a nozzle construction a hollow housing, a plurality of spaced bars forming a bore longitudinally of said housing through which particles are conveyed at high velocity, and means for directing air into the space between said housing and bars for forming a bank or cushion of air between the particles passing through the nozzle and the wall of the bore of the nozzle.

2. A nozzle having an axial bore, means for introducing particles into said bore, and a plurality of spiral air passages in overlapping relation for introducing a rotating forwardly moving film of air into the bore of the nozzle between the particles and the wall of the bore, substantially as set forth.

3. In a nozzle construction, a nozzle proper having a bore through which particles are conveyed under high velocity, means for conveying air into the nozzle, means for discharging the air into the bore of the nozzle in a manner for causing the air to form a cushion or lining between the wall of the bore and the particles being conveyed therethrough, means for controlling the action of the air to prevent the same from congesting or restricting the particles passing through the bore, and means for causing the air to assist in propelling the

particles uniformly towards the discharge end of the nozzle.

4. The combination with a nozzle structure having a bore therethrough, of means for conveying air into said nozzle construction, and means for causing said air to enter said bore in a plurality of substantially thin sheets and tangentially to the axis of the bore.

5. In a nozzle construction, a housing, bars within said housing arranged to form a bore longitudinally of the nozzle, said bars being arranged tangentially to the axis of the bore and spaced apart to form air passages, and means for conveying air into said housing and through said air passages between the bars whereby a bank or cushion of air will be formed around the wall of the bore.

6. In a nozzle construction, a housing, a plurality of bars arranged longitudinally within said housing and spaced therefrom to form a circumferential passage, said bars being arranged to form a bore longitudinally of the nozzle and spaced apart to form passages tangentially to the axis of the bore and means for conveying air into said housing and through said passages for forming an air cushion within said bore.

7. In a nozzle construction, a housing, a plurality of bars arranged longitudinally within the housing and spaced therefrom to form a circumferential passage, said bars being arranged to form a bore longitudinally of the nozzle and spaced apart to form passages tangentially to the axis of the bore, inlet tubes communicating with said circumferential passage and means for holding the bars in spaced relation.

8. In a nozzle construction, a cylindrical housing, a plurality of bars extending longitudinally of the housing and arranged to form a central bore through the nozzle, said bars being spaced from the housing to form a circumferential air passage and spaced apart to form radial air passages, said radial air passages lying tangentially to the axis of the bore, and a plurality of ribs for controlling the travel and discharge of the air passing through the radial air passages into the bore for causing the air to collect and form a lining around the wall of the bore, said ribs forming spacing members for the bars.

9. A nozzle construction comprising a housing having a bore through which particles are conveyed at high velocity, means for conveying air into said housing for forming an air cushion within said bore, and means for diffusing the air as it enters said housing.

10. A nozzle construction comprising a housing, a plurality of bars within and spaced from the walls of said housing, said bars having air passages therebetween extending longitudinally of the axis of said nozzle, said bars being arranged to form a bore and means for conveying air into said housing and through said air passages.

In witness whereof, I have hereunto set my hand and seal at Indianapolis, Indiana, this 11th day of May, A. D. nineteen hundred and twenty-one.

WILLIAM E. LEWIS. [L. S.]

Witnesses:
CAREY S. FRYE,
M. L. SHUBER.