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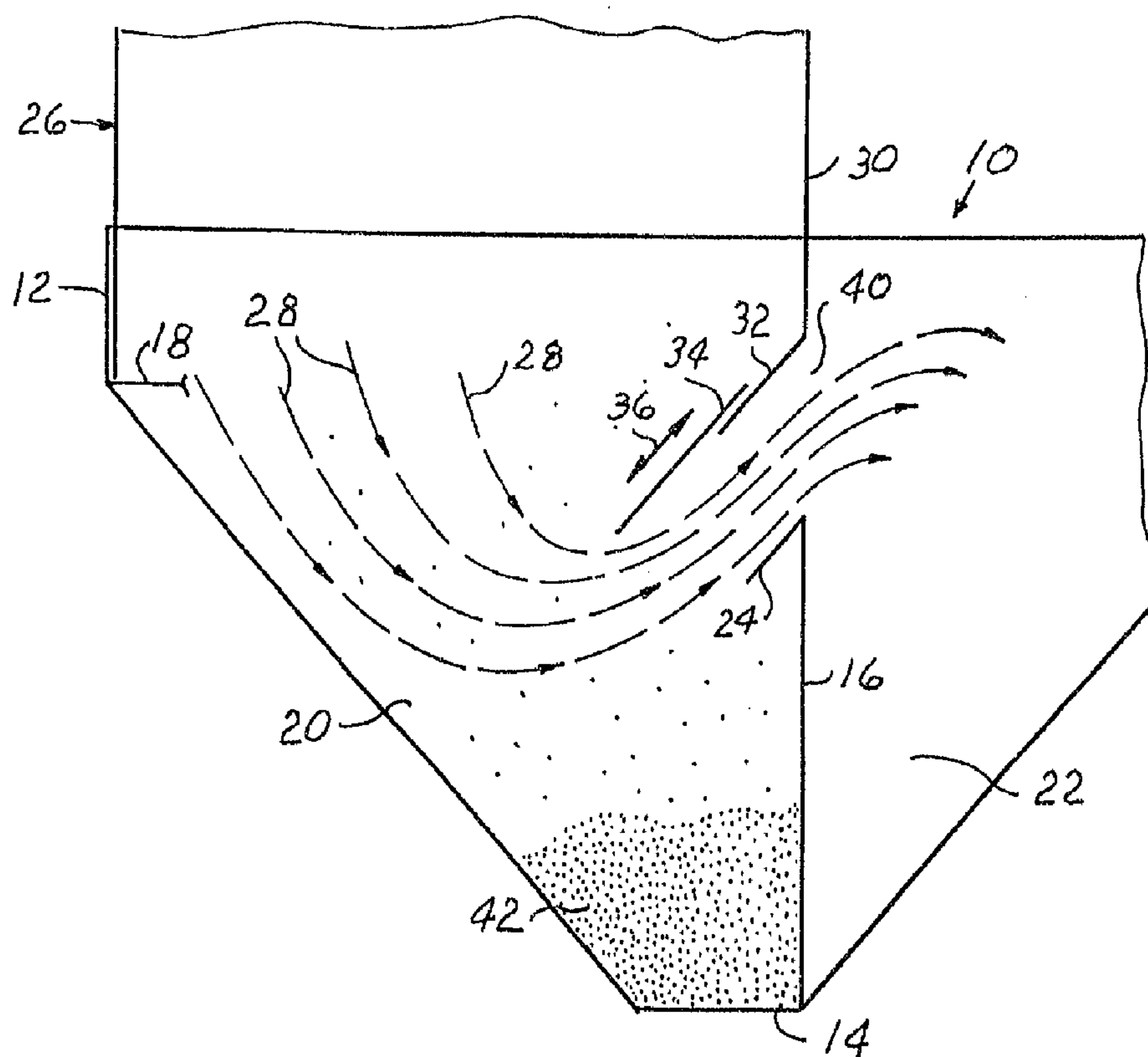
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(54) **DISPOSITIF DE TAMISAGE ET DE RECIRCULATION DE
SUSPENSION POUR PROCEDE DE DECAPAGE AU JET**

(54) **BLAST CLEANING WET MEDIA FEED AND SEPARATION
SYSTEM**



(57) A media particle size separating apparatus and method are disclosed for use with a slurry blast cabinet. The system is capable of continuous operation so that under sized blast media particles and fines can be separated out of the slurry along with debris from the blasting operation on a continuous basis. An upwardly open partition divided hopper receives spent slurry from the blasting cabinet to flow through at least two chambers in the hopper to a pump returning the slurry and sized media to the blasting cabinet and nozzles therein. Unusable fines collected in one chamber of the hopper are drawn off through a drain valve.

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Abstract of the Disclosure

2 A media particle size separating apparatus and method
3 are disclosed for use with a slurry blast cabinet. The
4 system is capable of continuous operation so that under
5 sized blast media particles and fines can be separated out
6 of the slurry along with debris from the blasting opera-
7 tion on a continuous basis. An upwardly open partition
8 divided hopper receives spent slurry from the blasting
9 cabinet to flow through at least two chambers in the
10 hopper to a pump returning the slurry and sized media to
11 the blasting cabinet and nozzles therein. Unusable fines
12 collected in one chamber of the hopper are drawn off
13 through a drain valve.

1 This invention relates to slurries used in blast
2 cleaning, honing, vibratory finishing, and machining and
3 more particularly to a system and apparatus for separating
4 unwanted fine particles from liquid suspended particulate
5 solids.

6 Wet media blast apparatus is used for deburring,
7 abrading smoothing or surface coating of manufactured
8 parts accomplished by a stream of high velocity liquid
9 containing hard particles. These hard particles are gen-
10 erally referred to in the trade as "grit".

11 The blasting apparatus utilizes high pressure liquid
12 jets to drive the grit against the surfaces being treated
13 and for washing away residual grit from the parts and the
14 apparatus.

15 It is necessary to separate excess liquid before
16 reusing the grit and since this blasting treatment with
17 grit removes and scraps off, from the treated part, small
18 pieces, particles of metal, mold, core sands, dirt and so
19 forth, such contaminates are in the liquid and hard core
20 particles which drain from the blasting chamber.

21 Returning liquid containing the blasting grit also
22 contains oils, colloidal particles, detergents, surface
23 coating material of various kinds which are washed away in
24 the drainback of the wet media.

25 Such contaminates complicate the separation problem
26 since some of the contaminates have floatation effects
27 which tend to carry oil in foam with valuable grit which
28 desired for reuse.

29 Accordingly it is desirable that the wet media be

1 collected as it falls from the article being treated for
2 reconditioning and returning to the blasting pump which is
3 accomplished by this invention.

4 This invention concentrates the usable grit in the
5 bottom of the hopper where it can be regulated for a de-
6 sired concentration in the liquid and return to the clean-
7 ing area so that the fines may be removed and not take up
8 the space of larger effective cleaning grit.

9 In the drawings which illustrate embodiments of the
10 invention:

11 Figures 1 and 2 are mechanical diagrams of blast
12 system media hoppers illustrating standard and precise
13 separation, respectively, of media particle sizes,

14 Figure 3 is a perspective diagram illustrating exact
15 separation of media particle sizes, and,

16 Figure 4 is a mechanical diagram.

17 Depending upon the desired finish to be produced on a
18 workpiece by a wet media blasting system, three hopper
19 media separating designs may be used including a fourth
20 modified version providing a media wash system for using
21 some of the removed soils which enhances a workpiece
22 cleaning process.

23 Standard Separation

24 Referring to Figure 1, the numeral 10 indicates a
25 media supply blast system hopper comprising an upwardly
26 open container having the uppermost edge portion 12 of its
27 side walls vertically disposed and converging downwardly
28 therefrom to the respective edges of a relatively small
29 horizontal flat bottom wall 14.

1 The hopper 10 is transversely divided by a partition
2 16 secured to the bottom 14 and opposite sloping walls of
3 the hopper and terminates horizontally in downward spaced
4 relation with respect to the horizontal plane, defined by
5 the lower limit of the vertical walls 12 indicated by the
6 line 18, thus forming a pair of media chambers 20 and 22.

7 The upper limit of the partition is provided with a
8 downwardly inclined baffle 24 projecting a selected dis-
9 tance into the chamber 20.

10 A portion of the hopper 10 is disposed below and
11 nests the depending wall edge portion of the workpiece
12 blasting chamber 26 so that wet media utilized in cleaning
13 a workpiece, not shown, in the blasting chamber 26 falls
14 by gravity into the hopper 20 as indicated by the series
15 of direction flow arrows 28.

16 The depending end portion of the blasting chamber
17 wall 30 terminates in spaced vertically aligned relation
18 above the hopper partition 16 and a portion thereof is
19 inclined downwardly toward and into the hopper chamber 20,
20 parallel with the partition baffle 24, to form a baffle 32
21 of selected width.

22 Additionally, a movable baffle 34 is disposed in
23 partial overlapping relation with respect to the blast
24 chamber wall baffle 32 for movement in the direction of
25 the arrow 36 to lengthen or decrease the throat 40 formed
26 between the baffles 32, 34 and 24, through which the wet
27 media must flow to enter the hopper chamber 22.

28 The hopper 10 is intended for use with a limited size
29 range and type of media in workpiece blast cleaning pro-

1 cesses where only general cleaning of the workpiece is re-
2 quired.

3 Media is added to the blast of liquid to remove
4 tightly adhering contaminates from a workpiece. For
5 efficient cleaning most of the removed contaminates and
6 media fines should be separated from the reusable media
7 before reuse.

8 The standard approach has been the hopper 10 which
9 has an adjustable baffle, as stated above, which can
10 lengthen or shorten the flow path over the separator par-
11 tition 16 into the hopper chamber 22 to collect in or re-
12 move a greater range of sizes of the media in the storage
13 area or chamber 20.

14 In the standard separation version illustrated by the
15 hopper 10, the reusable media 42 falls out of the media
16 stream 28 by gravity and collects in the bottom of the
17 chamber 20 while the fines and unusable media flows with
18 the media stream through the throat 40 into the chamber
19 22.

20 Precise Separation

21 Some wet blast finishes on workpieces require that
22 all of the contaminates and fines be removed from the
23 media.

24 Some applications of wet blasting may also require
25 the use of different sizes or types of media in the same
26 equipment.

27 A precise media separator is a unit separate from the
28 blast finishing enclosure and comprises a similar upwardly
29 open hopper 10' similarly having an upstanding rectangular

1 top edge portion wall 12' converging downwardly to a flat
2 bottom wall 14'.

3 The hopper 10' is similarly provided with an upstand-
4 ing partition 16' terminating downwardly with respect to
5 the plane of the lower limit of the vertical walls 12', as
6 indicated by the line 18', thus defining a pair of hopper
7 chambers 20' and 22'.

8 The upper limit of the partition 16' is similarly
9 provided with a baffle 24' projecting downwardly and into
10 the chamber 20'.

11 The spent media or slurry is fed into a feed box 44
12 by a tube 46. At least one wall of the feed box 44 con-
13 verges downwardly to form a relatively narrow exit opening
14 of the feed box at its depending end 48 and form a narrow
15 flow curtain 28' of the wet media as it leaves the feed
16 box.

17 The wet media 28' flows in the direction of the flow
18 stream arrows 28' through the chamber 20' and into the
19 chamber 22'.

20 The separator 10' functions not only by changing the
21 direction of flow from downward-to-laterally-to-upwardly
22 for dropping out, by gravity, larger media particles 42'
23 in the chamber 20', but also utilizes the distance between
24 the feed box 42 and the separating partition 16' by move-
25 ment of the feed box 44 in either direction (toward or a-
26 way from the partition 16'), as indicated by the direction
27 arrows 50 which controls the flow rate of the stream 28'
28 and the size of particles carried over the baffle 24' to
29 the fines chamber 22'.

1 Exact Separation

2 Some workpiece blast cleaning processes require de-
3 finitive media sizing which necessitates the use of wet
4 screens.

5 Referring now to Figure 3, an upwardly open hopper
6 60, similarly includes vertical end wall portions 62 and
7 63 and side walls 64 and 65 with the respective hopper
8 walls, 62', 63', 64' and 65' converging downwardly from
9 the respective vertically disposed wall portion toward the
10 hopper bottom.

11 The partition/end wall 62" transversely substantially
12 bisects the hopper medially the length of the upstanding
13 side wall 64 and is vertically disposed, secured at its
14 depending edges in water-tight relation with the converg-
15 ing side wall 64' and 65', respectively, with the end edge
16 portion of the partition/end wall 62" terminating verti-
17 cally in selected spaced relation with respect to the
18 hopper upstanding side wall 65 for the reason presently
19 explained.

20 Similarly, the hopper side wall 65" substantially
21 longitudinally bisects the length of the hopper end wall
22 62 and has one downwardly converging edge rigidly joined
23 to the converging end wall 63' with its opposite or verti-
24 cally disposed edge secured in water-tight relation to the
25 partition end wall 62".

26 At its juncture with the partition end wall 62', the
27 edge portion of the side wall 65" is provided with a rec-
28 tangular screened opening 66 for the purposes presently
29 explained.

1 Similarly, the depending edge portion of the parti-
2 tion end wall 62" adjacent the side wall 65" is provided
3 with a screened chamber 74 outlet or opening 68 for the
4 reasons presently explained.

5 Similar to the hopper 10, a partition 70 and down-
6 wardly inclined attached baffle 72 divides the hopper
7 walls 62' and 62" to define adjacent media chambers 74 and
8 76. The end portion of the partition end wall 62" extend-
9 ing beyond the vertical plane of the wall 65" toward the
10 side wall 65 and inclined wall 65' similarly forms a fines
11 chamber 78.

12 An elongated rectangular upright container 80 is dis-
13 posed in the right angular corner formed by the partition
14 end wall 62" and side wall 65" which communicates at its
15 depending end with the media chamber 74 through the
16 screened opening 68 and adjacent its upper limit with the
17 fines media chamber 78 through the screen 66.

18 The chamber or container 80 houses a pump P having
19 its inlet 82 adjacent the bottom 81 of the container 80
20 and its outlet 84 disposed in an upward direction.

21 A pair of vertically spaced superposed screens 86 and
22 88 are angularly disposed over the media chambers 74 and
23 76 in downwardly inclined parallel relation toward the
24 chamber 74.

25 The screens 86 and 88 are of selected mesh and are
26 vibrated in the direction of the arrows 91.

27 Oversized particles falling with the liquid, the
28 latter's volume being substantially reduced in this sepa-
29 ration process, falls in the direction of the arrow 90 on

1 the top screen 86 and are removed from the screen in the
2 direction of the arrow 92.

3 Usable size media 93 passing through the screen mesh
4 86 falls on the lowermost screen 88 and into the hopper 74
5 in the direction of the arrows 94 and collects in the bot-
6 tom of the chamber 74.

7 Liquid and unusable particles or fines passing
8 through the screen 88 are deflected at respective ends of
9 the screen by plates 96 inclined downward toward the media
10 chamber 76 and fall with the liquid in the direction of
11 the fines and liquid arrows 98 into the hopper 76 where
12 they flow around the end of the partition end wall 62" in
13 the throat area 100 formed by the adjacent end of the par-
14 tition 62" and the hopper side wall 65'.

15 The small sized particles flow, with the liquid, in
16 the particles and liquid arrow path 99 through the screen
17 66 into the pump chamber 80. The liquid suspended fines
18 move in a slower path, indicated by the looped arrows 102,
19 so that the fines 104 settle out in the bottom of the
20 chamber 78 and are removed in the manner described herein-
21 after in reference to Figure 4.

22 The sized particles falling into the media chamber 74
23 enter the pump chamber 80 through the screen 68 to be
24 picked up and discharged with the liquid and small parti-
25 cles in the flow stream 98 through the pump discharge 84.

26 Wet Media Feed and Separation

27 Referring now to Figure 4, a hopper 160 having legs
28 161 is constructed similar to the hopper 60 of Figure 3
29 including upstanding wall edge portions 164 and 165.

1 A partition 170 with a top baffle 172 extending down-
2 ward to the left, as viewed in Fig. 4, divides the hopper
3 to define media chambers 174 and 176. The depending edge
4 of the partition 170 is disposed in vertically spaced re-
5 lation with respect to the hopper bottom.

6 The chamber 174 opening formed between the depending
7 edge 171 of the partition 170 and the hopper bottom 114 is
8 opened and closed by a vertically adjustable partition
9 door for the purposes presently explained.

10 The hopper 160 is further provided with a relatively
11 low transverse partition 180 terminating upwardly substan-
12 tially medially the height of the partition 170 and paral-
13 lel therewith forming an upwardly open pump chamber 182.

14 A second partition baffle 184 extends downwardly and
15 toward the hopper chamber 176 from the upper limit of the
16 partition 170 and intersects at its free edge portion 186
17 the vertical plane defined by the short partition 180 for
18 the reasons believed presently apparent.

19 A pump P is disposed in the pump chamber 182 with its
20 outlet tube 188 disposed in selected spaced relation at
21 its depending end with the hopper bottom 114 and its out-
22 let tube 190 projecting upwardly through the baffle 184 to
23 the blasting nozzles, not show.

24 The hopper wall 165 is provided with a liquid level
25 outlet tube 192 and the depending end portion of the cham-
26 ber 176 is provided with a valve equipped outlet tube 194.

27 The workpiece blasting chamber 126 has the depending
28 edge portions of its walls nested adjacent the inner sur-
29 face of the hopper walls 164 and 165 with one wall of the

1 blasting chamber having a downwardly inclined baffle 132
2 projecting into the media chamber 174 and similarly, an
3 adjustable baffle 136 overlies the baffle 132.

4 The spent media in the form of a slurry falls by
5 gravity into the hopper chamber 174 and flows in the di-
6 rection of the arrows 128 through the hopper chamber 174
7 and upwardly through the throat area defined by the parti-
8 tion baffle 172 and the fixed and sliding baffles 132 and
9 136 into the hopper chamber 176.

10 Heavy particulate 142 falls by gravity out of the
11 stream 128 and collects in the depending portion of the
12 hopper chamber 174.

13 This separation is accomplished by a combination of
14 gravity and the up flow of the stream through the throat.
15 Any floatable contaminates are skimmed off the liquid lev-
16 el 175 through the hopper drain tube 192.

17 The abrasives in the flow stream pass through the
18 hopper chamber 176 and into the pump chamber 182.

19 The fines 196 gravitate out of the stream and collect
20 in the bottom of the chamber 176. The fines are periodi-
21 cally drawn off through the valve equipped drain 194.

22 The intake of the pump P receives liquid and media
23 from the chamber 174 in accordance with the adjustment of
24 the partition door 178.

25 Soil Utilization

26 In a workpiece spray washing or cleaning operation
27 some of the dirt that is washed off the workpiece can be
28 reused to enhance the washing operation by recycling the
29 dirt with the wash water to generate a mechanical scrub-

1 bing action.

2 It is preferable in a workpiece washing operation to
3 recirculate the wash water for cleaning the parts, however
4 the fines should be removed from the reused dirt in the
5 wash water for the reason the fines are generally of
6 micron size and are too small to effectively enhance the
7 cleaning of a workpiece. Further they occupy the space of
8 the reusable soil.

9 Further, the fines also reduce the flowability of us-
10 able soil, resulting in difficulties with the flow control
11 of the wash water.

12 The hopper 160 can be utilized in such a washing op-
13 eration in which the height of the dividing partition 170
14 is reduced so that any excess of the reusable dirt or
15 soils can follow the flow path 128 into the fines chamber
16 176 to be removed through the draw-off or fines drain
17 valve line 194.

1 The embodiments of the invention in which are exclu-
2 sive property or privilege is claimed are defined as
3 follows:

1 1. A particle size separating apparatus for use with
2 wet slurry blasting at a blasting location where the used
3 slurry containing some usable and some unusable particles
4 processed adjacent the blasting operation and returned to
5 the blasting location, comprising: an upwardly open hop-
6 per having downwardly converging side walls joined to a
7 horizontal bottom wall, transverse partition means extend-
8 ing upwardly from said bottom wall at least one half the
9 height of said hopper for dividing said hopper and forming
10 a plurality of slurry containing chambers, one said cham-
11 ber being disposed below the blasting location for receiv-
12 ing used slurry by gravity, and, superposed baffle means
13 coextensive between hopper opposing side walls and in-
14 clined downwardly from the vertical plane defined by said
15 partition means into said one chamber for forming an up-
16 wardly directed slurry flow path from said one chamber to
17 an adjacent chamber, thereby retarding the slurry flow
18 rate through the baffle area flow path and allowing heavi-
19 er reusable slurry particles to settle-out by gravity in
20 said one chamber.

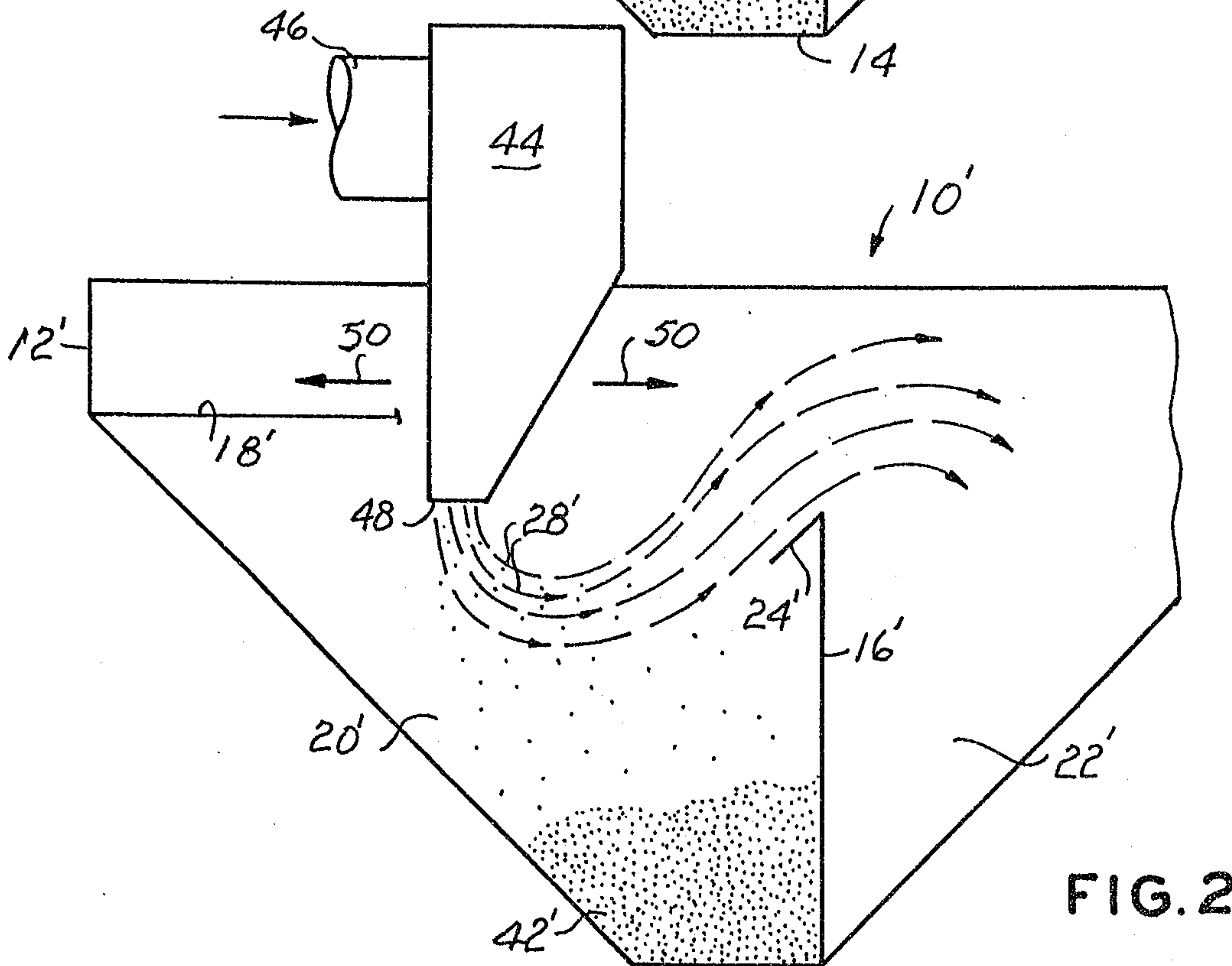
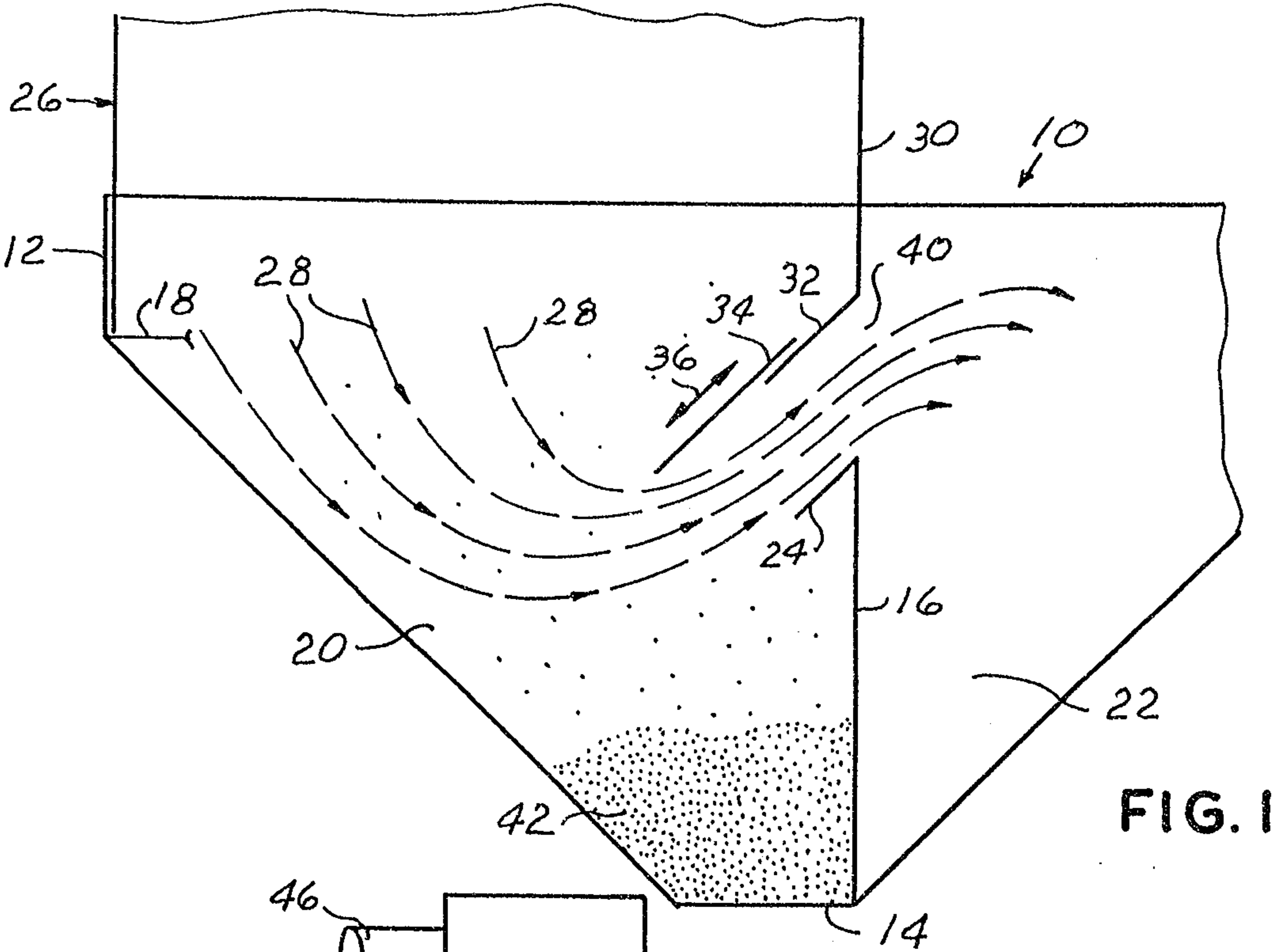
1 2. The apparatus according to claim 1 in which one
2 baffle of said baffle means is adjustable relative to the
3 remaining baffle means toward and away from said one cham-
4 ber for lengthening or shortening the slurry flow path be-
5 tween the baffle means.

1 3. The apparatus according to claim 1 and further
2 including: screen means having a selected mesh interposed
3 between the blasting location and the upwardly open hopper
4 for exact size screening and separating the slurry parti-
5 cles.

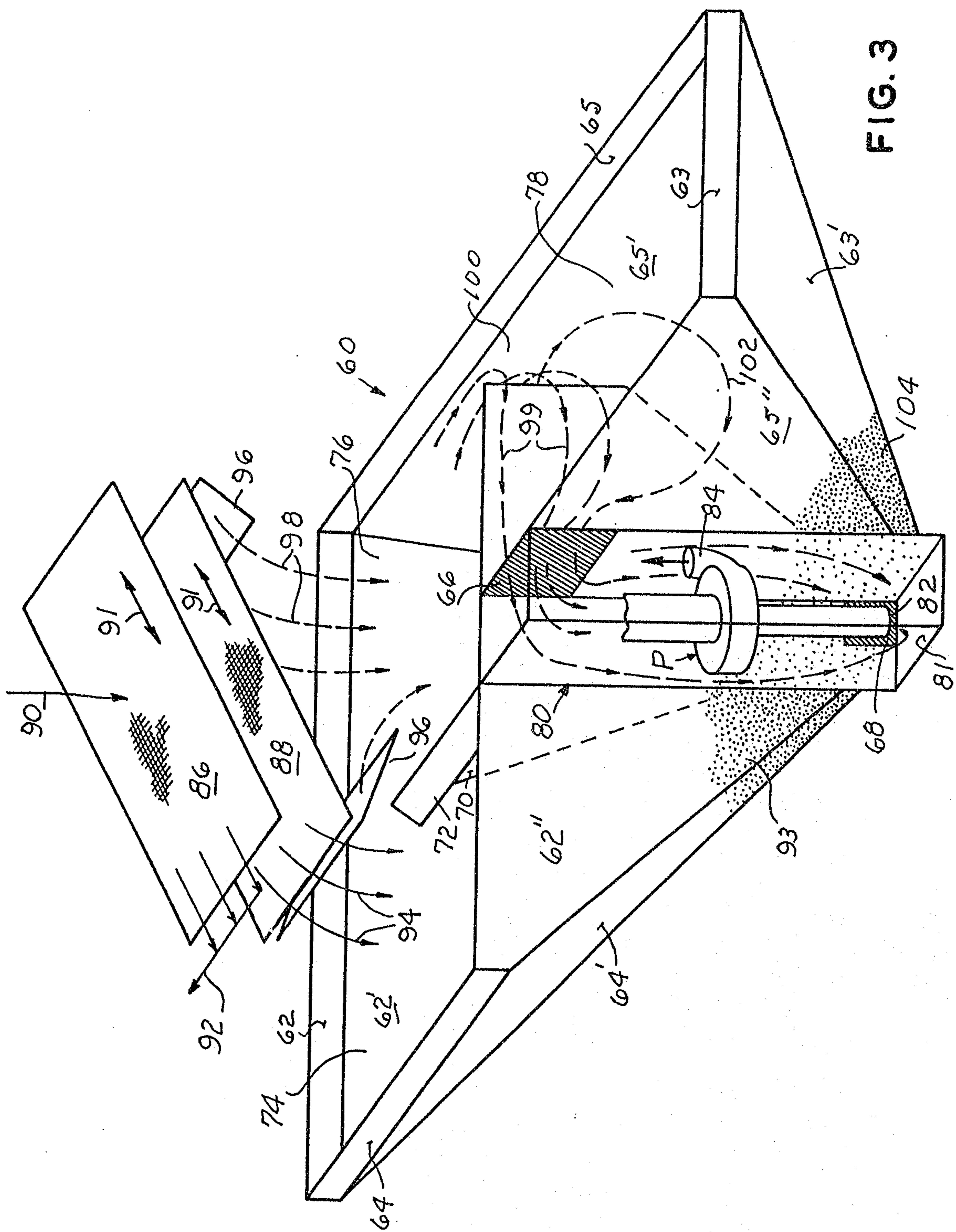
1 4. The apparatus according to claim 2 and further
2 including: screen means having a selected mesh interposed
3 between the blasting location and the upwardly open hopper
4 for exact size screening and separating the slurry parti-
5 cles.

1 5. The apparatus according to claim 4 and further
2 including: pump means having an inlet disposed within the
3 depending portion of said hopper and communicating with at
4 least one chamber for returning slurry to the blasting lo-
5 cation.

1 6. The apparatus according to claim 5 and further
2 including: an opening formed in the depending limit of
3 said partition means adjacent the upper surface of the
4 hopper bottom wall, and, partition door means for permit-
5 ting or occluding passage of slurry particles from said
6 one chamber to the pump inlet.



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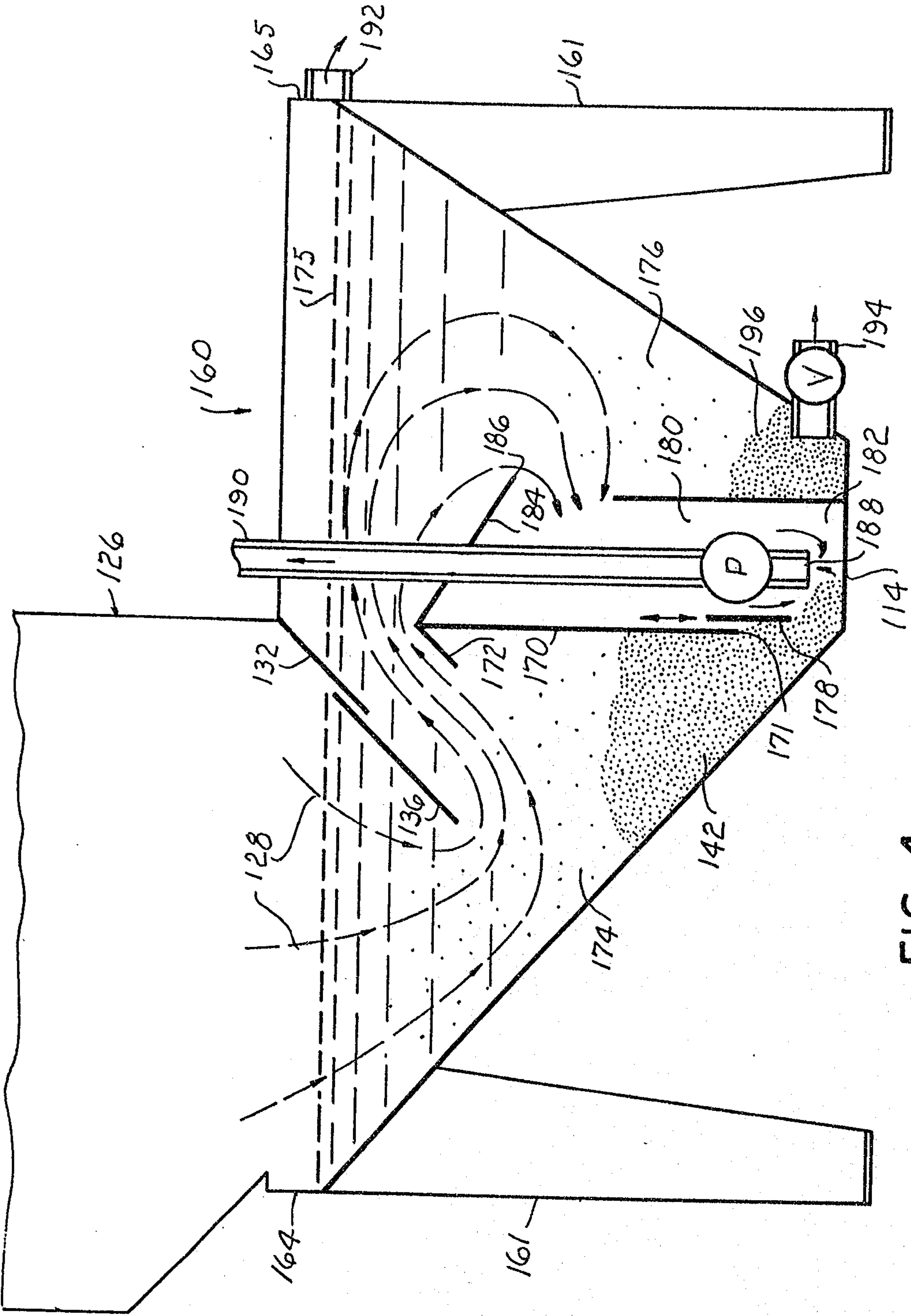


FIG. 4

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