

March 26, 1968

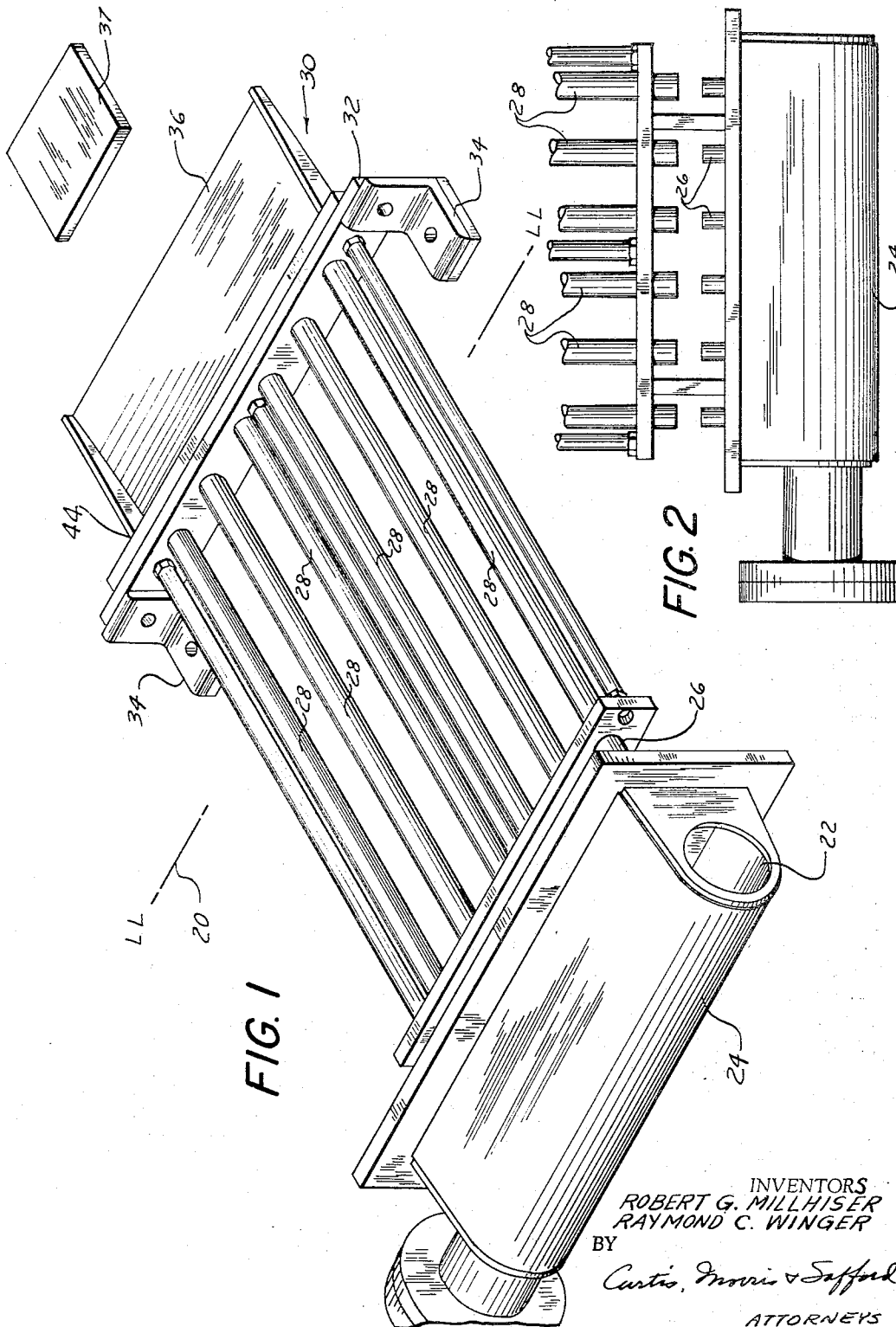
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3,374,581

NON-CLOGGING TYPE BLAST DEVICE

Filed June 14, 1966

6 Sheets-Sheet 1



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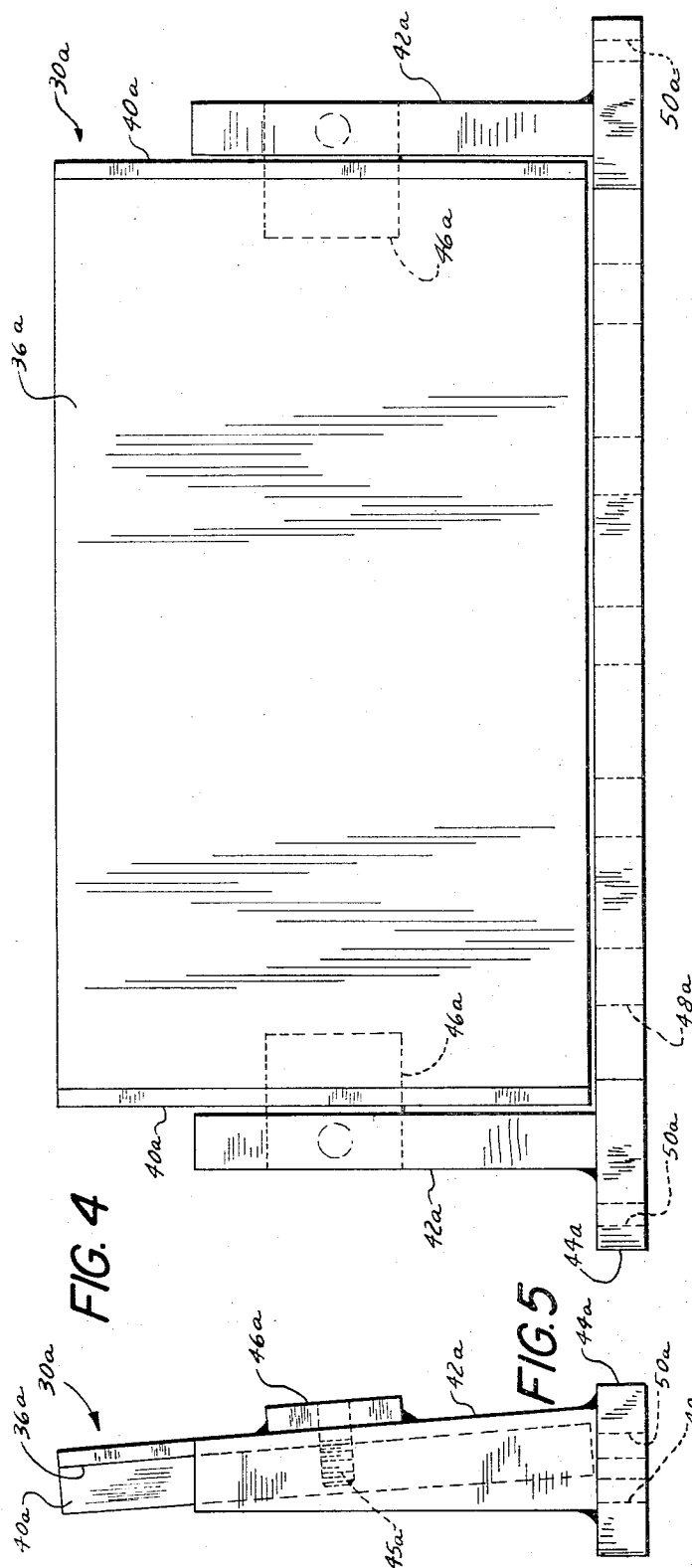
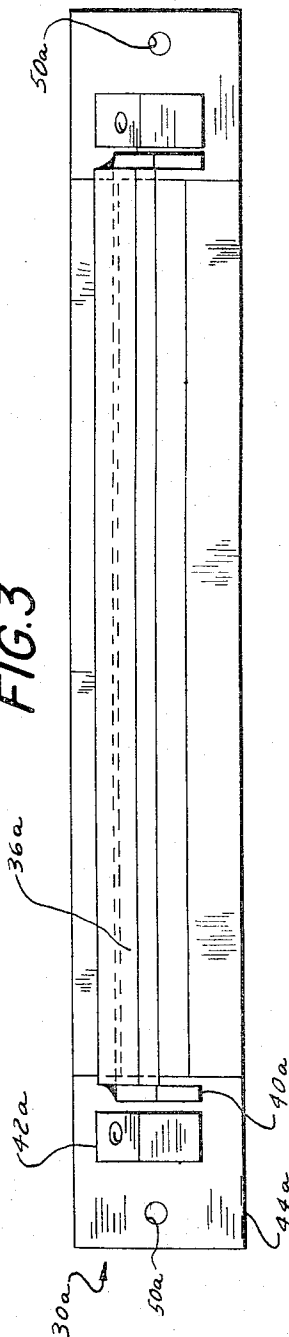


FIG. 3



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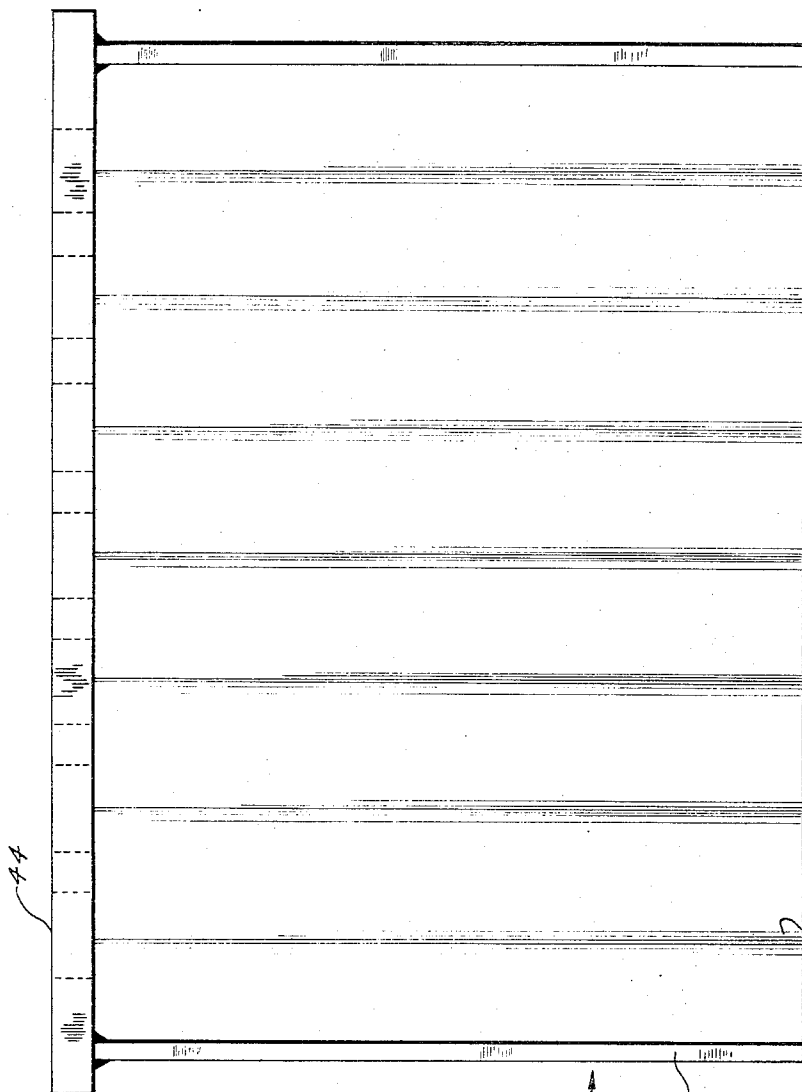


FIG. 7

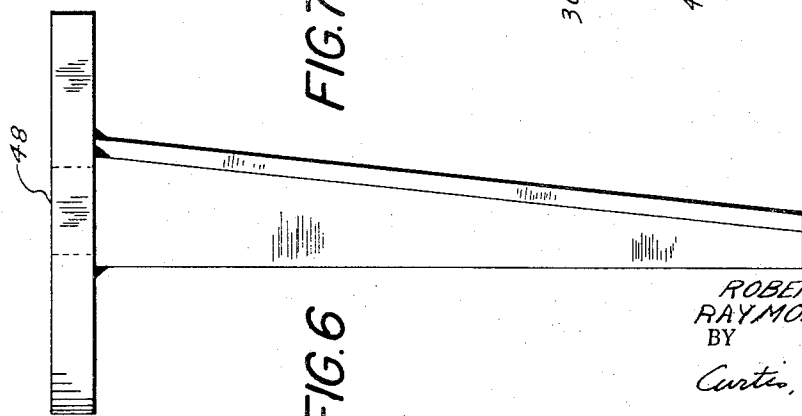


FIG. 6

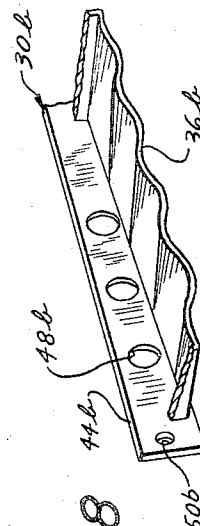


FIG. 8

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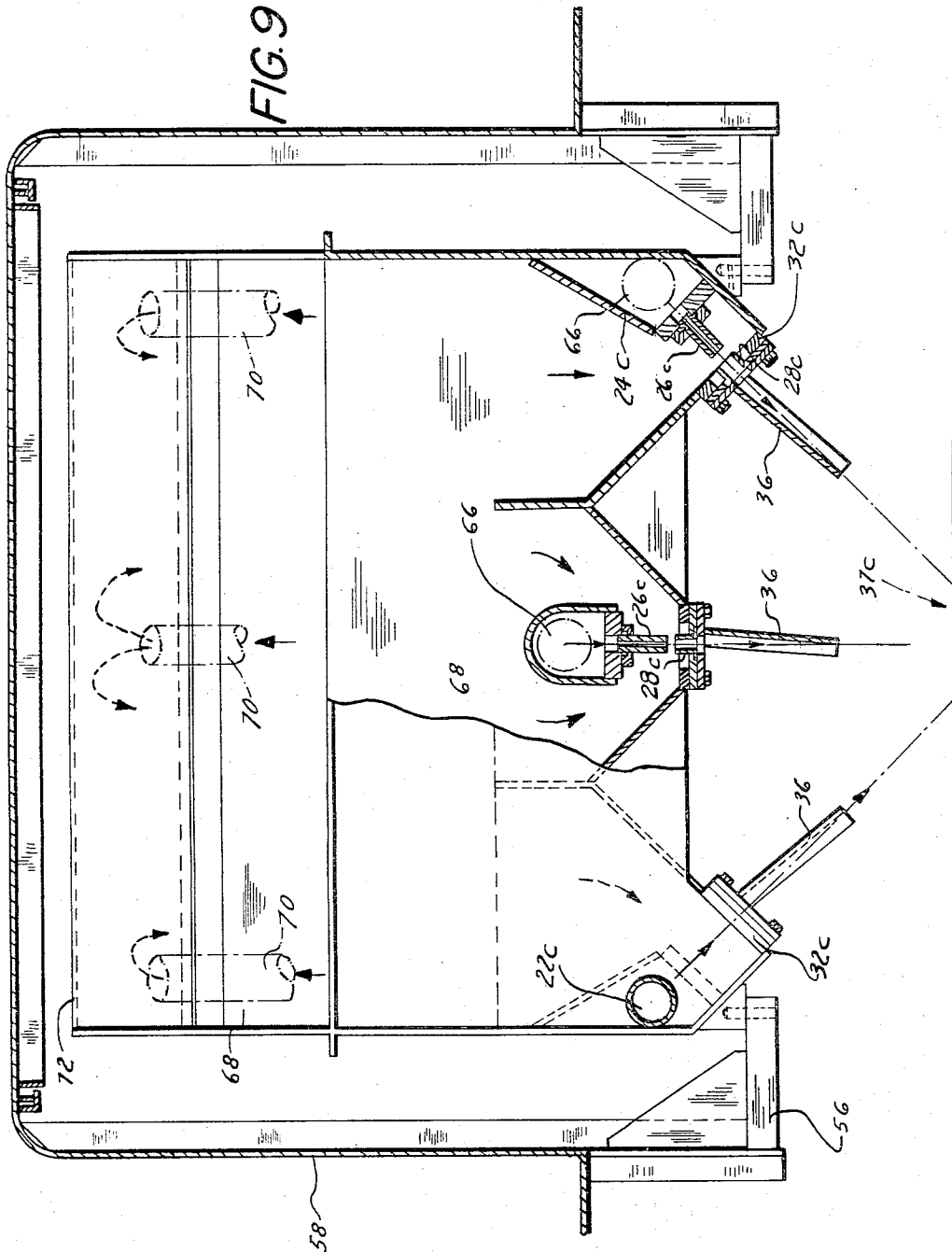
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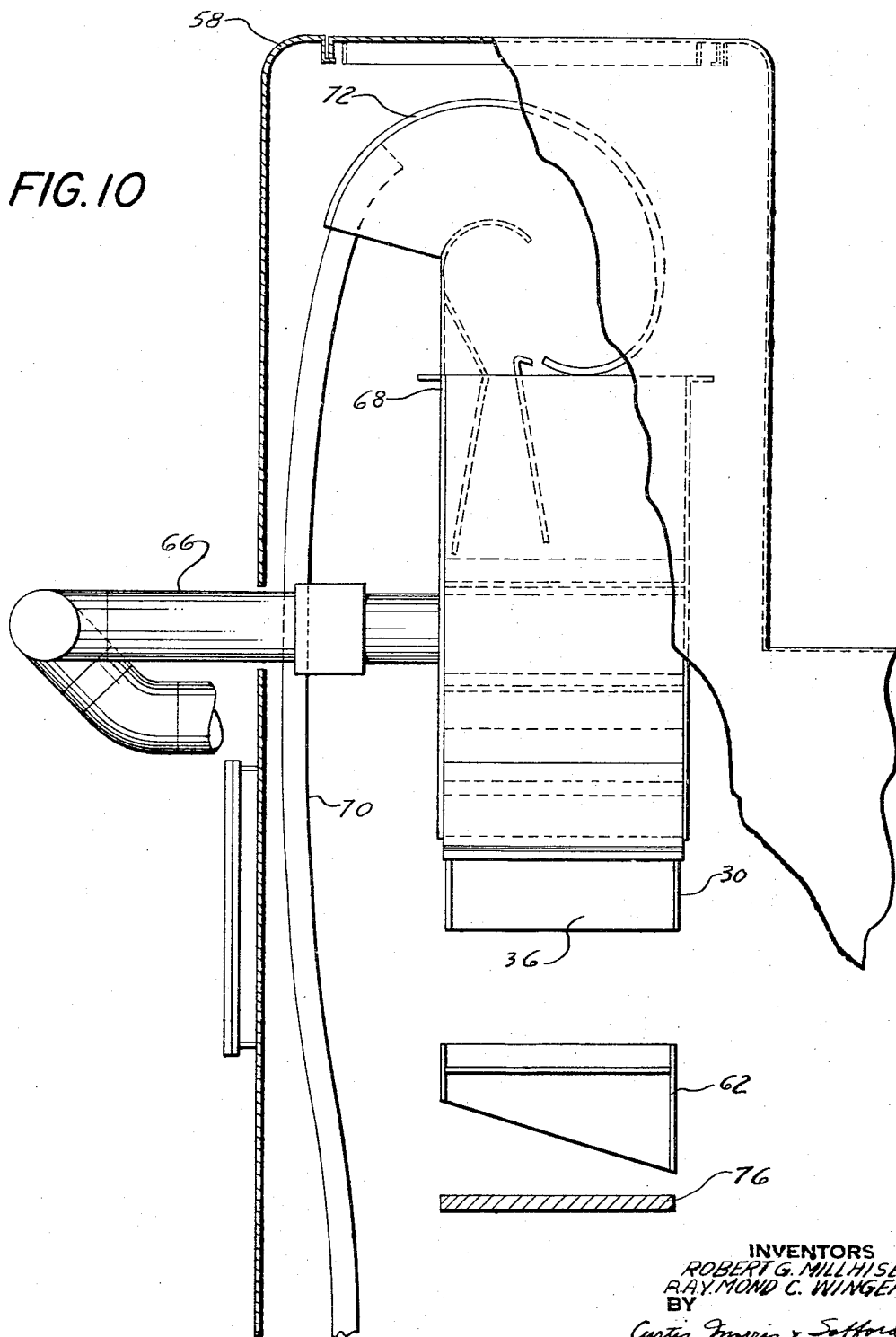
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FIG. 10



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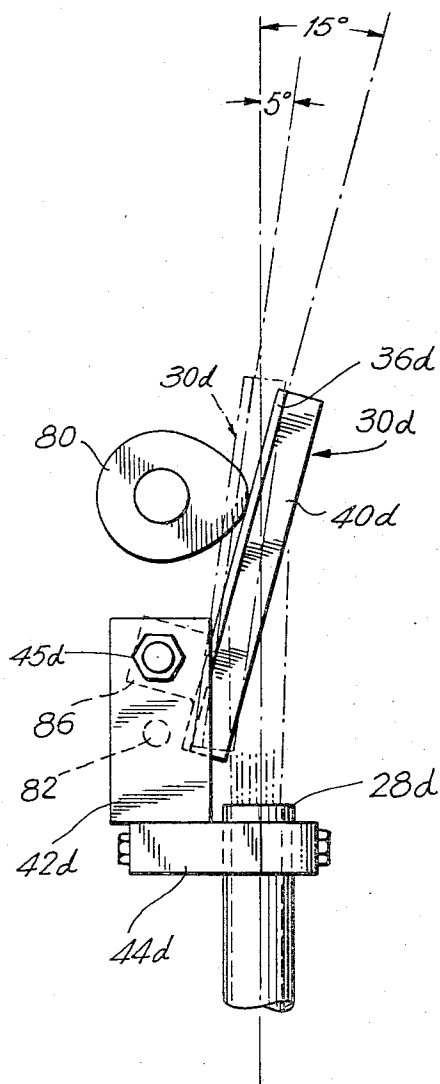


FIG. II

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3,374,581

NON-CLOGGING TYPE BLAST DEVICE

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Continuation-in-part of application Ser. No. 394,198, Sept. 3, 1964. This application June 14, 1966, Ser. No. 562,420

6 Claims. (Cl. 51—8)

ABSTRACT OF THE DISCLOSURE

A non-clogging nozzle for liquid grit blasting useful for making minor adjustments in direction of blasts from fixed grit blasting devices and also in converting a spaced series of blasts into a continuous ribbon blast. In place of the old enclosed nozzles, this novel non-clogging nozzle uses an open deflector plate mounted to intersect the liquid grit blast, preferably encroaching on the blast slightly and at an angle of 5° to 15°.

This application is a continuation-in-part of our copending application Ser. No. 394,198, filed Sept. 3, 1964, now abandoned; which in turn was a continuation-in-part application of Ser. No. 296,133, now issued as Patent No. 3,257,759, dated June 28, 1966.

This invention relates to a liquid blasting device assembly useful in handling fluids having particulate matter entrained therein. More particularly, this invention relates to an improved liquid blast means especially useful in handling abrasive slurries because of its non-clogging operational characteristics.

The utility of abrasive blasting as a method of conditioning the surface of metal parts is well established in the industrial arts. Commonly owned, copending applications Ser. No. 296,133, filed July 18, 1963, by Millhiser et al., now issued as Patent No. 3,257,759, dated June 28, 1966; and Ser. No. 117,444, filed June 15, 1961, by Millhiser, now issued as Patent No. 3,237,351, dated Mar. 1, 1966, also disclose especially advantageous surface reforming apparatus and processes utilizing liquid grit blasting therefor.

One problem which has existed in the prior art is recurrent clogging of nozzles used for abrasive blasting. Another problem is the abrasive effect of the slurry on the nozzle surfaces. These problems have heretofore made necessary a considerable amount of maintenance and diminished the benefits derived from abrasive blasting operation.

Another problem is in adjusting the direction of a fixed blasting device relative to a fixed holder when these are out of alignment, most commonly due to the machine being used for treating a different part than for that which it was originally designed. This often happens when a part is redesigned for a model change or the part becomes obsolete. In the past, the resulting alignment requirements often involved extensive refabrication often accompanied by costly drafting and engineering study.

It is an object of the present invention to provide a blast assembly useful in handling slurries which assembly is relatively free from clogging.

It is another object of the invention to provide a blast assembly that is easily maintained.

It is a further object of the invention to provide a

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vomitory wherein abrasive damage is substantially limited to a single replaceable part.

It is still a further object of this invention to enable the direction of impingement from the fixed blasting device to be varied easily over a significant range by a simple adjustment, replacement, or addition to the blasting device capable of being performed by any service mechanic, thereby greatly increasing the flexibility and adaptability of the blasting device.

Applicants have met the foregoing objects by providing a unique blast assembly wherein an abrasive slurry is directed by a single, open tube at a glancing angle against a deflecting surface rather than through a nozzle which is subject to clogging.

If one of the inclined sides is removed, and the other positioned so that, near the tip of the inclined plate, a portion of the liquid stream is engaged, a powerful ribbon shaped liquid flow results. The size and angle of the remaining side walls are such that this deflector extends over the line of the projected axis of the blast tube area meeting at the top. The resultant effect is a very excellent ribbon of abrasive and liquid travelling at a slight angle from the axis of the blast tube proper.

Another advantageous feature of the instant invention is one whereby parts of the vomitory subjected to wear may be independently removed from, and rapidly replaced in, the blasting assembly. Some embodiments of the invention, because of low abrasive nature of the slurries being handled therewith, will not require the removable-part feature.

Advantageously the deflecting surface is at a 5 to 15 degree angle in relation to axial flow of blasting media through the blast tubes. The plate forming the deflecting surface may conveniently be fixed in a manner so as to be not only demountable, but also be adjustable between the 5° and 15° limits as is required for the particular use, which further demonstrates its flexibility. Where the deflecting plate is used with a single blast, the plate can also conveniently be rotated about the axis of the blast. In some applications it is desirable to have an oscillating blast sweep back and forth over or pulse on an area of treatment. This invention readily lends itself to such a use by oscillating the deflecting plate back and forth in the blast stream. This could be accomplished by eccentric cams or the like.

In this application and accompanying drawings, we have shown and described a preferred embodiment of our invention and have suggested various alternatives and modifications thereof, but it is to be understood that these are not intended to be exhaustive and that other changes and modifications can be made within the scope of the invention. These are selected and included for purposes of illustration in order that others skilled in the art will more fully understand the invention and the principles thereof and will be enabled to modify it and embody it in a variety of forms, each as may be best suited to the conditions of a particular case.

FIGURE 1 is a perspective view showing an abrasive-slurry-blasting assembly with the device of the instant invention embodied therein.

FIGURE 2 is a fragmentary elevational view of the apparatus of FIGURE 1, showing the relationship between blast tubes and manifold.

FIGURE 3 is a front end elevational view of a blasting

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device of the instant invention. Holding clips for the inclined plate are not shown, for clarity.

FIGURE 4 is a plan view of a blast device of FIGURE 3.

FIGURE 5 is a side elevational view of the blast device of FIGURE 3.

FIGURE 6 is a side elevational view of the blast device shown attached to the assembly of FIGURE 1.

FIGURE 7 is a front elevational view of the blast device shown in FIGURE 6.

FIGURE 8 is a perspective view of a device embodying a non-planar plate.

FIGURE 9 is an elevational view, partially in section of a jet-blasting apparatus utilizing three of the improved devices of the invention.

FIGURE 10 is an elevational view from the side of the apparatus shown in FIGURE 9, showing additional detail of the slurry recirculation system.

FIGURE 11 is a side elevational view similar to FIGURE 5 of an abrasive blast deflecting device adjustable between 5° and 15° and also capable of being oscillated therebetween.

Referring to FIGURES 1 and 2, the apparatus shown therein is partially submerged, e.g., up to liquid level 20 in a reservoir of liquid containing suspended abrasive grit. A driving liquid under high pressure is led in through port 22 into and through manifold 24 and ejected through round jet orifices 26 at a high velocity. Orifices 26 are spaced about one inch from blast tubes 28 of larger internal diameter, into which the driving liquid passes, entraining a considerable quantity of the grit-laden liquid by its passage therethrough between the orifices 26 and the tubes 28.

As seen in FIGURES 1 and 2, the outer ends of tubes 28 pass through plate 32 and the foot 44 of deflector assembly 30, mounted on a frame (not otherwise shown in the drawing) by angle brackets 34. The liquid abrasive blast emerges from blast tubes 28, at very high velocity, directed against the part to be treated, diagrammatically represented at 37. A deflecting surface 36 beyond the ends of blast tubes 28 is interposed at a glancing angle so that the grit blast is deflected slightly and concentrated, but with minimal reduction of velocity and minimal abrasion of the deflecting director 36.

Because this device uses a single glancing director plate, i.e., surface 36, with no opposite side, large pieces of grit, grit agglomeration, or contaminating solids cannot clog it. In the respective embodiments discussed below, like elements are identified by the same reference numbers plus the letter *a*, *b*, *c*, or *d*, respectively. For clarity, many of these elements are indicated in the drawings of one embodiment but may not be specifically mentioned in the discussion of each embodiment.

Another embodiment is shown in FIGURES 3-5.

This embodiment of the invention is so constructed that glancing plate 36a may be removed easily and replaced, e.g., when it is desired to have a plate of a different configuration, for example a deflector assembly 30b with a curvilinear detector plate 36b as illustrated in FIGURE 8 and also fully described in aforementioned Patent No. 3,257,759.

Referring to FIGURES 3-5, plate 36a has welded thereon end members 40a and locating clips 46a, which are bolted to uprights 42a on base 44a by bolts 45a so as to securely position the plate 36a between uprights 42a.

FIGURES 6 and 7 show an enlarged view of the deflector plate 30 including its base 44, ends 40, and the plate itself 36.

FIGURES 9 and 10 show apparatus mounted on a mounting frame 56 and enclosed in a housing 58 wherein the aforementioned blast devices are advantageously utilized.

When the devices of the instant invention are used in combination with a rotary table 62 on which the part to be blasted is carried, they are advantageously mounted, as seen in FIGURE 9, with a part 37c placed so that the part

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is simultaneously cleaned from a variety of angles. The part 37c is carried on rotating table 62 best seen in FIGURE 10. When the blasts are directed downward, as shown in FIGURE 9, the glancing plate 36 may advantageously be positioned on the upper side of the blast.

Short jet tubes 26c are utilized in conveying the blasting media to the blast tubes 28c from feed manifolds 22c. The longer blast tubes shown in FIGURE 1 are normally not required for the apparatus of FIGURES 9 and 10 with its closer proximity of the manifolds 22c to the article being treated.

As seen in FIGURE 10, abrasive slurry is collected below table 62 and returned to a feed hopper 68 from which it is supplied to blast tubes 28c and entrained by jets from the nozzles 26c. Return pipe 70 is used in conducting the slurry from a collector sump (not shown) beneath the parts 37c to the hoppers 68 via slurry guide baffle 72.

Below table 62 in FIGURE 10 is a screen 76 which is used to prevent over-sized particles from being recirculated in the blast system. Prior art equipment required screening having one-quarter inch-square apertures, because larger apertures would allow clogging of the prior art nozzles, and terminate, or destroy the efficacy of, the blasting treatment. Consequently, the build-up of foreign matter in the prior art apparatus became a problem and a considerable amount of downtime was required for cleaning the screens. With the present apparatus, much larger screen apertures are successfully used; yet clogging is markedly reduced and emphasis may be placed on screening out contaminants which would damage the part being treated, as opposed to those which would have merely clogged older type nozzles.

Blast tubes such as shown in FIGURE 1 at 28 conduct the grit-containing liquid to ports 48a. Tapped holes 50a provide means for bolting the deflector assembly 30a to the blast tube assembly, for example, as seen in FIGURE 1.

In the modification illustrated in FIGURE 11 the deflecting plate 36d of the deflector assembly 30d is made adjustable so that it can be set at any desired angle, preferably between 5° and 15°. The deflector plate 36d can be set at any desired angle by setting down the bolts 45d so as to bring the locating bar 86 (which is welded to the back of plate 36d) hard up against each respective upright 42d. Alternatively, the deflector plate 36d can oscillate back and forth over a small angle to give an oscillating blast sweep. This can be accomplished by using the bolts 45d as pivots and an eccentric cam 80 (rotated by any conventional means) which bears on the back of the deflector plate 36d. The force of the blast issuing from the blast tube 28d is normally sufficient to keep the deflector plate 36d against cam 80; however, a biasing means may be employed if desired. Also, a stop 82 may be used to position the deflector plate 36d (if no biasing means is employed) to locate the plate 36d when no blast is issuing from the blast tube 28d. Any device which might occur to those skilled in the art may be used to achieve oscillation of the deflector plate 36d in place of the cam 80.

We claim:

1. A liquid grit blast device comprising a blast tube for channeling an open liquid grit blast therethrough, a deflecting plate positioned at a glancing angle to any blast issuing from said blast tube to deflect and direct said blast, and mounting means to position said plate relative to said blast tube.

2. A device as claimed in claim 1 further comprising a row of blast tubes including said blast tube, which tubes are similar and are substantially aligned in parallel relationship, and said plate being positioned at a glancing angle to any blasts issuing from said blast tubes.

3. A device as claimed in claim 1 wherein said plate is at an angle of from 5 to 15 degrees in relation to any blast issuing from said blast tube.

4. A device as claimed in claim 2 wherein said plate has a curvilinear form in transverse section relative to said blasts.

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5. A device as claimed in claim 1 further including end members on either side of said plate extending out from the deflecting surface of said plate to contain the deflected blast from undue lateral spread.

6. A device as claimed in claim 1 wherein said mounting means detachably positions said plate.

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LESTER M. SWINGLE, *Primary Examiner.*