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(54) **SPOT BLAST CLEANING AND CONTAINMENT SYSTEM**

(71) Applicant: **Phuong Taylor Nguyen**, Richmond, TX (US)

(72) Inventor: **Phuong Taylor Nguyen**, Richmond, TX (US)

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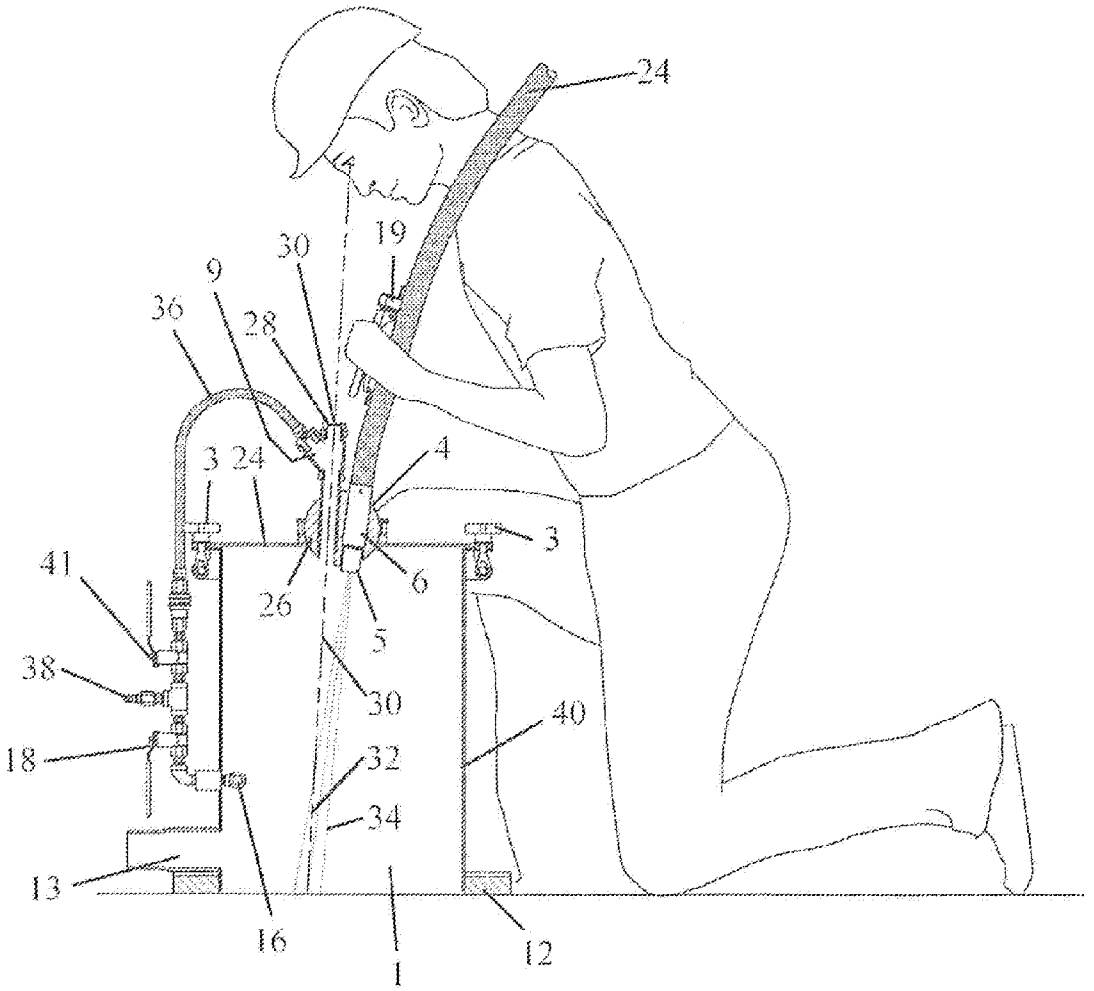
(57) **ABSTRACT**

A containment system for defining and containing a spot surface to be media blast treated includes a housing having walls, a closed top and an open bottom for defining a chamber. The system is mobile. The top has an opening for housing a movable assembly, typically a rotatable ball. A delivery tube is mounted in the movable assembly for delivering a media into the chamber. A view window is also mounted in the movable assembly for viewing the interior of the chamber. A purge line is provided for delivering a purging fluid into the area of the view window to purge the view window of any media in the chamber for keeping the view window free and clear of view blocking materials.



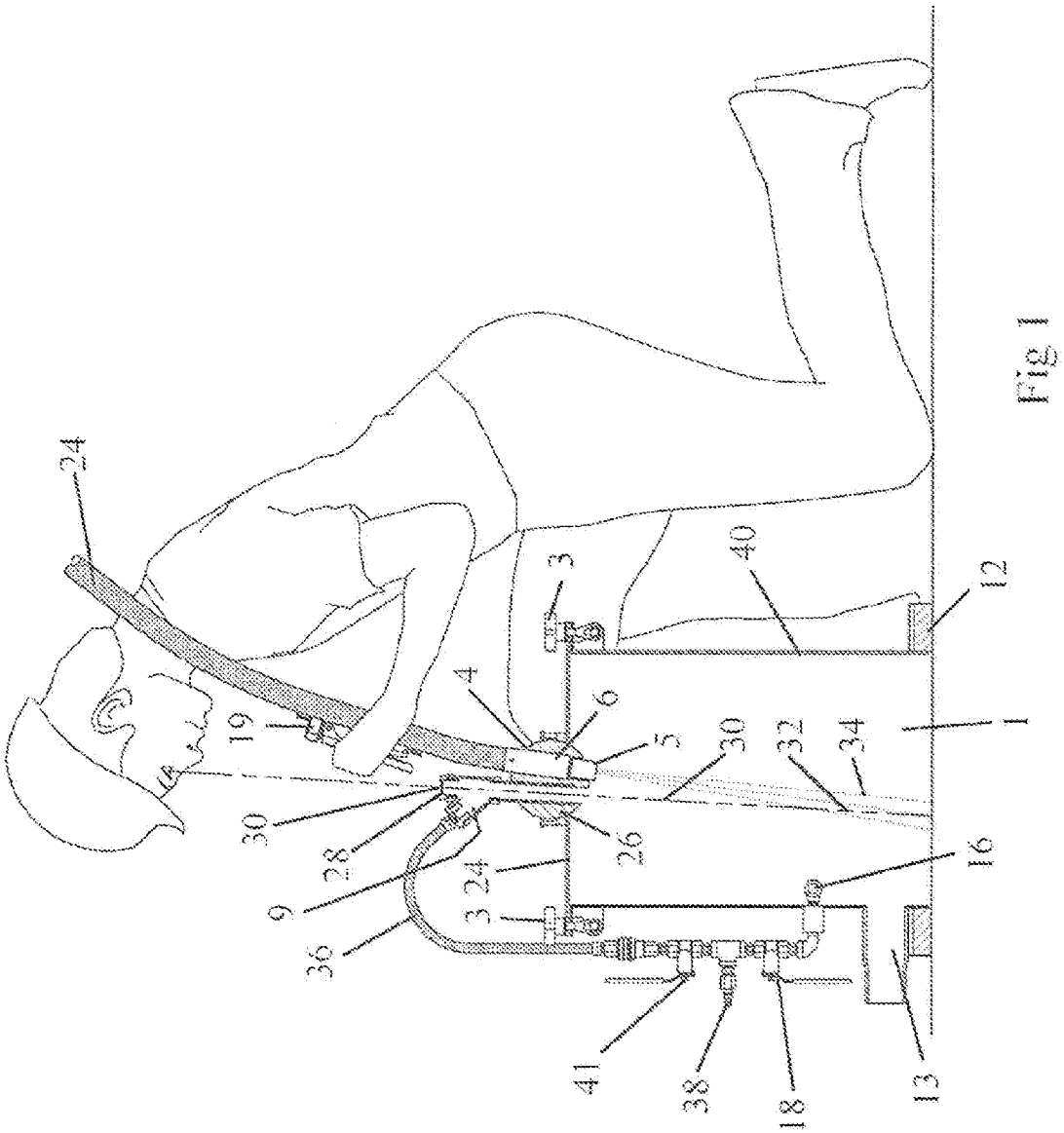


Fig 1

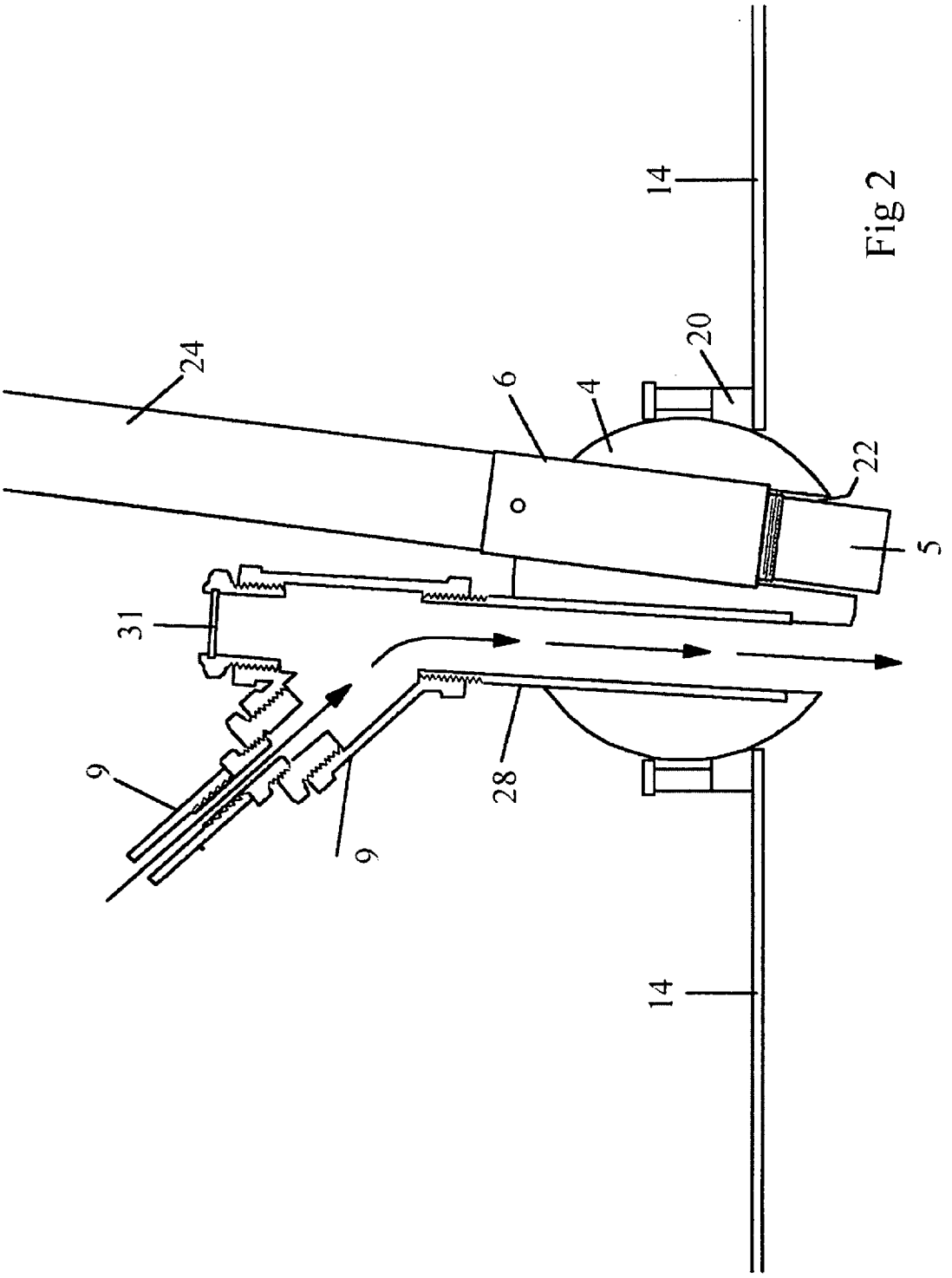


Fig 2

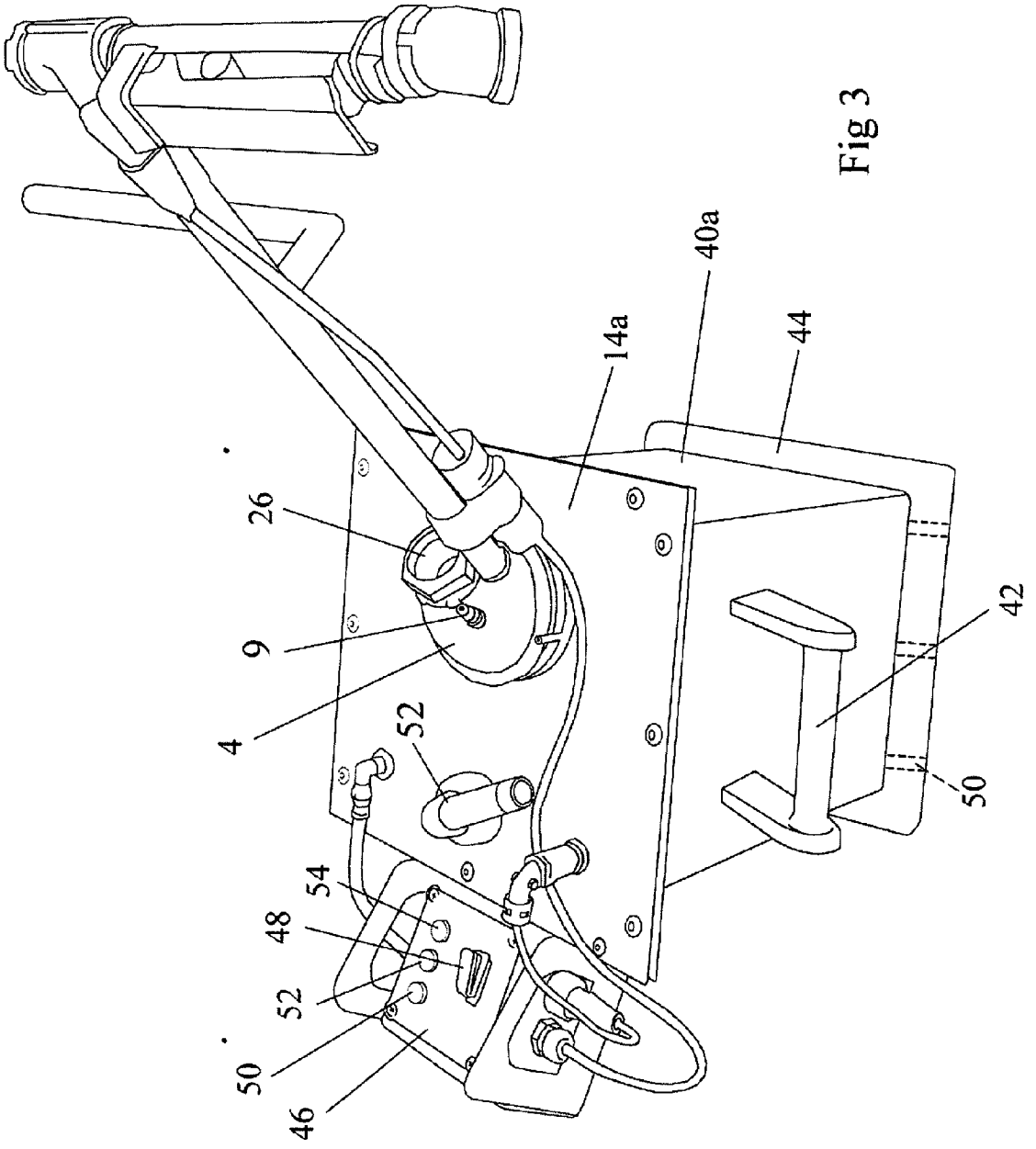


Fig 3

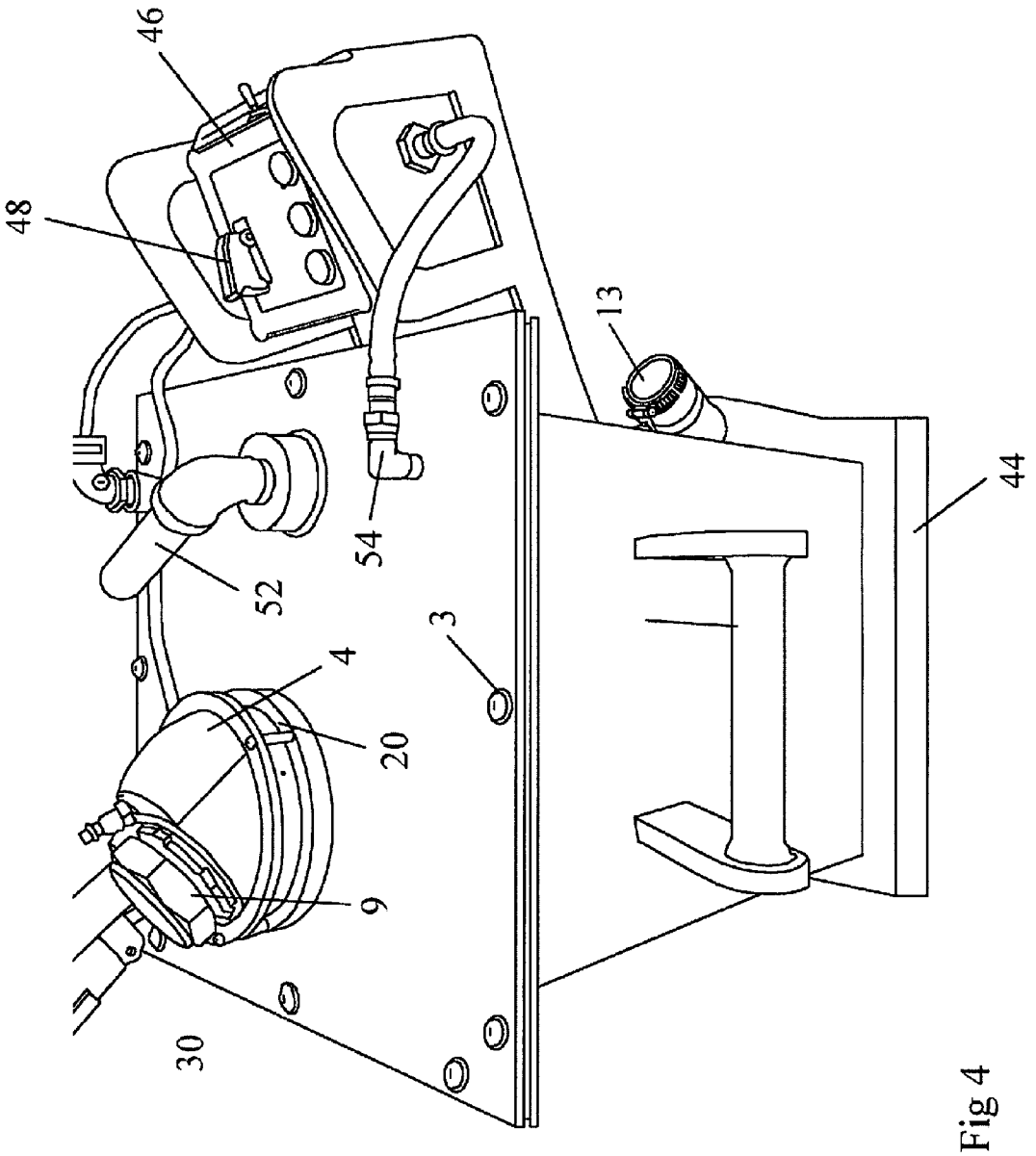


Fig 4

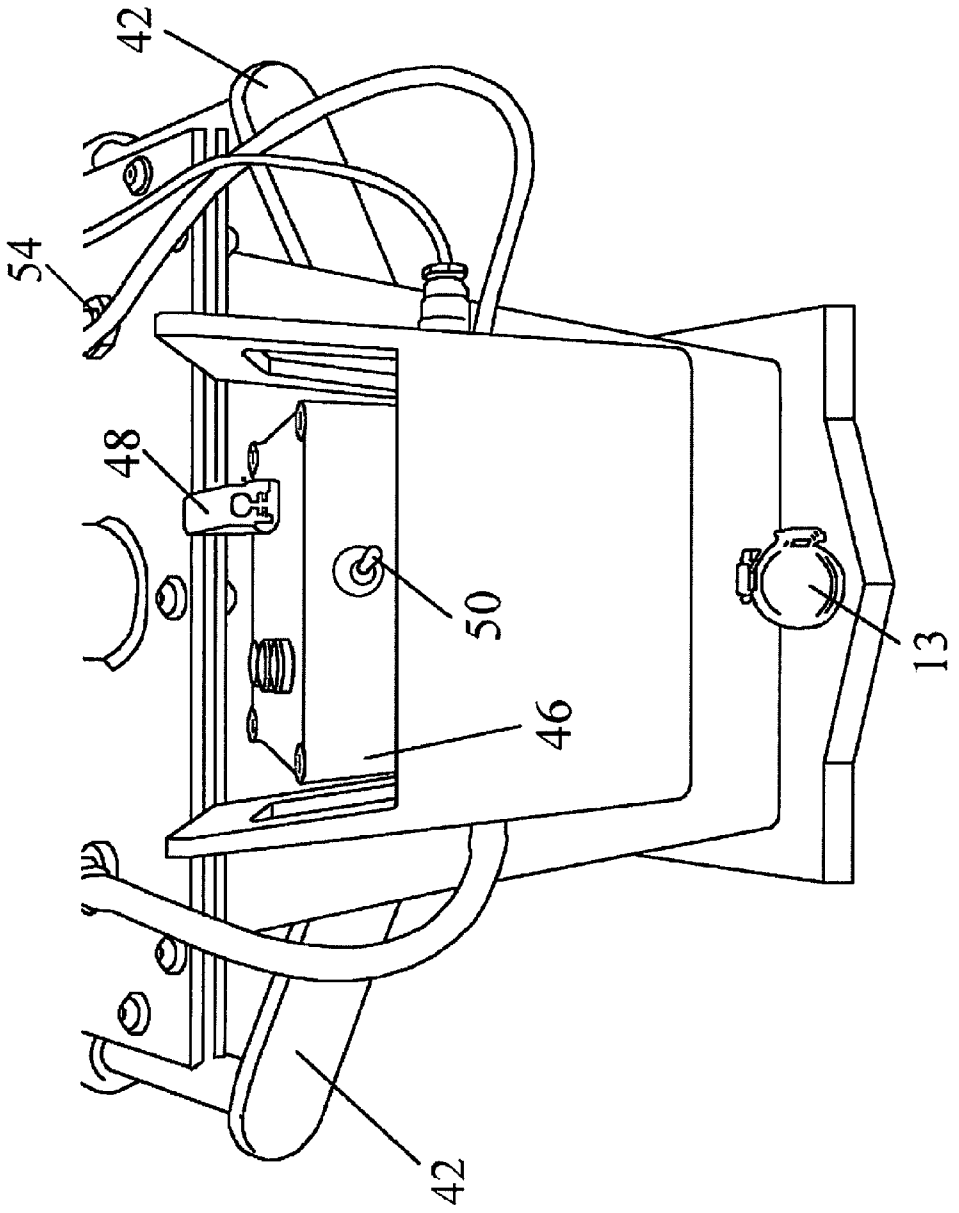


Fig 5

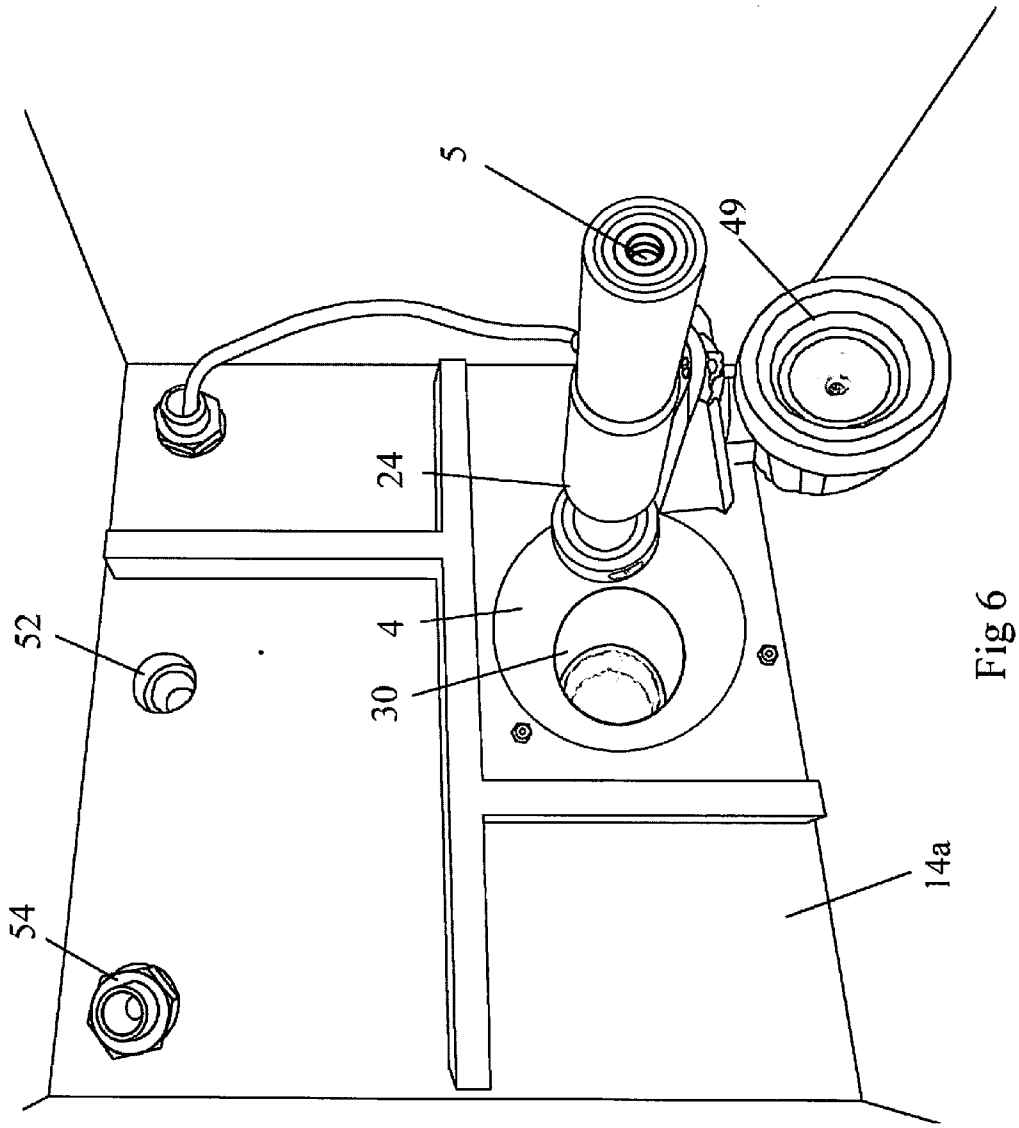


Fig 6

SPOT BLAST CLEANING AND CONTAINMENT SYSTEM

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application is a completion of the Provisional Application Ser. No. 61/889,176, filed on Oct. 10, 2013, entitled: "SPOT BLAST CLEANING AND CONTAINMENT SYSTEM", such provisional application being fully incorporated by reference herein. Full priority to Oct. 10, 2013 is claimed.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] The invention is generally related to airblasting various objects and is specifically directed to a containment system for airblasting contained and defined areas while containing the blasted portion in a confined and closed chamber.

[0004] 2. Discussion of the Prior Art

[0005] It is known in the art to apply or propel various substances, materials and/or media, both abrasive and non-abrasive, against a desired surface in order to treat the surface, e.g., polish, clean, abrade, prepare a surface for painting, remove rust, grease or oil and the like. The blasting media may consist of dry or liquid material or a combination thereof with or without a variety of abrasive or non-abrasive constituents added thereto. In many applications, the blasting media is a composite media comprising a combination of two or more components which are mixed or blended together with one another, in the desired proportion, to achieve the desired surface treatment. Application of the blasting media by means of a pressurized applicator generally results in a substantial quantity of media and contaminants becoming airborne and rebounding off of the surface being treated.

[0006] The state of the art for blasting external surfaces is to "open blast". This is airblast in an open environment. This process creates many issues. First, the grit and dust are allowed into the open where they will be carried with the wind or fall onto the ground. If the paint or surface contains hazardous material, this may result in air or ground pollution or contamination. Also, the operator must wear protective equipment such as respirator for the dust and protective clothing to withstand the impact from rebounded grit or abrasives.

[0007] It is desirable that this rebounding media be adequately contained within an enclosed treatment area in order to prevent contamination to the surrounding environment with the media and/or removed contaminants and/or debris from the surface being treated. This is especially true if hazardous materials are being removed from the surface being treated. In order to protect the operator it is known to have contained nozzles that are automated and mechanized to blast exterior surfaces of pipe. It is also known to use handheld blast and vacuum heads to blast and treat the exterior surface of the object being treated. Such mechanized systems are generally heavier, very expensive, and slower to setup. The handheld blast and vacuum heads also generally have slow production and the nozzle is at a relatively fixed orientation. Also, handheld heads require exertion from the operator to maintain a seal while blasting. This makes them subject to operator error and subject to familiarity and experience. Neither of the aforementioned systems allows vision so the blaster (operator) is blind to the activity or progress. Vision is desired, if not required, in situations where the operator requires precise control of the area to be blasted.

[0008] There are also containment systems currently known in the art are which are used in the treatment of such objects. These systems contain the blasting media and other material, contaminant, debris and hazardous material in order to suppress the harmful effects to a confined area. However, to treat these objects or surfaces, generally an operator would be required to be inside the containment area and thus subjected to such hazardous conditions and do not eliminate the need for the operator to wear protective clothing and use protected, filtered breathing apparatus. These types of containment systems are relatively large and require much labor to set up.

[0009] U.S. Pat. No. 8,556,683 discloses a containment barrier for containing a blasting media during treatment of such objects, the containment barrier being defined by a peripheral housing having three or more body surfaces and two end surfaces, defining an enclosed treatment area. A viewing aperture is located within a first body surface, with a transparent member being placed within the viewing aperture to contain blasting media within the enclosed treatment area while enabling observation of the object being treated. An elongate access aperture is located within one of the body surfaces, and an elongate cylindrical access port body is rotatably fixed within the access aperture to allow restricted access to the enclosed treatment area for enabling insertion of one or more tools used during the treatment the object. The access port body has an elongate tool inlet and an opposed elongate tool outlet. The interior of the access port body includes a tool retainer slidable along the elongate port body for allowing directed treatment of the object along a first axis. The port body is rotatably fixed at opposed ends for enabling axial rotation of the port body allowing directed treatment of the object in a second axis. The tool inlet is substantially enclosed by a seal. A media evacuation system including one or more exhaust hoses is used to evacuate the spent media.

SUMMARY OF THE INVENTION

[0010] The subject invention is directed to a containment system for defining and containing a spot surface to be media blast treated. In the preferred embodiment the system includes a housing having walls, a closed top and an open bottom for defining a chamber. The system is mobile. The top has an opening for housing a movable assembly, typically a rotatable ball. A delivery tube is mounted in the movable assembly for delivering a media into the chamber. A view window is also mounted in the movable assembly for viewing the interior of the chamber. A purge line is provided for delivering a purging fluid into the area of the view window to purge the view window of any media in the chamber for keeping the view window free and clear of view blocking materials. The purging fluid may be air, or other than air.

[0011] The view window has a sight line that converges with the area being blast treated by the media delivered by the delivery tube. The view window may include a window covering which can be a plain window, a lens, a camera located exterior of the window or within the view tube housing the window, or other imaging capture device.

[0012] The purge system is provided for purging contaminants away from a view window when viewing a harsh environment. This includes an elongated housing or viewing tube having one end in a location permitting access for viewing and a second end terminating in a harsh environment remote from the viewing end. A purge line is located with an outlet

upstream of the second end and down stream from the viewing end. A purging fluid is released from the purge line and flows the location adjacent the first end and toward the second end and the harsh environment. Typically a window is located in communication with the first viewing end. The window may include a lens, a camera in front of or behind the window, or another image capture device. The purge system is typically used in connection with harsh environment having pressure than ambient pressure, creating a harsh pressure environment, with the purging fluid released in the housing at a pressure higher than the harsh pressure environment. There is also an exhaust port for removing media introduced into the chamber by the delivery tube.

[0013] The chamber may be of cylindrical or rectangular cross-section. In the cylindrical cross-section, the purge line in the chamber adapted for generating a centrifugal flow of media in the chamber as it is exhausted therefrom through the exhaust port. In the rectangular cross-section the chamber includes a manifold about its perimeter, the manifold having slots around the perimeter of the chamber, said slots being in communication with the exhaust port. In the preferred embodiment the slots are at the corners of the rectangle.

[0014] In one embodiment of the invention a purge line is associated with the chamber for directing a purge fluid into the chamber after operation for voiding the chamber of media.

[0015] The containment system of the subject invention permits the operator to contain, see, blast, and reclaim the grit or abrasives used to strip a defined surface area. The system will permit the operator to blast a surface that is horizontal, or at an angle. The grit reclamation or recovery system of the invention is operable to recapture and reuse or properly dispose of grit resulting from in the operation. Nozzle control and access as well as vision access are provided to allow the operator to control where the surface is blasted and the intensity of the blast.

[0016] The containment system of the subject invention allows operators to quickly blast, contain, reclaim, and clean a defined surface area, such as, by way of example, a defined spot on a larger surface. One or more vision ports in permit visual observation of the cleaning action in the chamber of the system. A purge line is in communication with each vision port to deflect rebounding abrasives and prevent from striking the glass and from "frosting" the inside surface. This reduces the likelihood of causing diminishing visibility during the operation.

[0017] In order to address the frosting problem caused by impacts from rebounded blast grit, A reduced vision port area is used and forced air purge is introduced within a tube to create a duct of constant air flow which serves as resistance and deflector to particles that enter the vision tube. This constant compressed air flow is significantly stronger than vacuum induced flow and will slow down or reject any particles that find their way into the vision tube. Increasing the length of the tube also increases improves the protection of a glass window, lens or camera orifice in the vision port.

[0018] The vision tube and nozzle are oriented such that the vision tube center is aimed at the center of the nozzle blast pattern. This is useful in that the operator is blasting where he or she is looking. Standard handheld blasting does not allow this and the operator can only roughly guess where the nozzle is blasting and the area being cleaned to trace where their work. The configured aimed blast scope or port is useful for more accurate or intricate blast cleaning requirements. Aiming marks similar to scopes on rifles or other equipment may be employed to further fine tune the aiming feature.

[0019] The blasting chamber may include a removable containment lid and a centrifugal containment purge or exhaust port. In the preferred embodiment the centrifugal purge is adapted for containment in the vertical position. It may also be configured to work on vertical surfaces.

[0020] The system of the invention is adapted to be used in connection an airblast system, which is well known by those of ordinary skill in the art, for media blasting the object surface. A companion or integral vacuum system is used to reclaim the dust and grit through the exhaust port. In addition, the vacuum system will complement the containment housing by maintaining the treatment chamber under vacuum pressure.

[0021] The visual component includes a viewing device such as sealed window, lens, or camera for transmitting the view to a remote location and for recording. The purge system is in communication with the lens or camera for maintaining an unobstructed view during operation.

[0022] During operation the vision port is constantly purged to enhance viewing and to protect the vision panel or lens. By utilizing a purged vision panel, it is possible to employ a camera through or in the port without damaging the camera lens during operation.

[0023] The chamber housing interior is generally sealed around the surface area to be blasted. The vacuum exhaust system draws and transports the dust, grit and other loose contaminant particles through an outlet exhaust port provided in the containment chamber for recycling or proper disposal.

BRIEF DESCRIPTION OF THE DRAWINGS

[0024] FIG. **1** is a side cross-sectional view of the containment system of the subject invention, and is generally of a cylindrical configuration.

[0025] FIG. **2** is an enlarged view looking in the same direction as FIG. **1**, showing the chamber top, the ball assembly, the viewing window or port, the purge line and the delivery wand.

[0026] FIG. **3** is a perspective view of an alternative embodiment of the containment system and is generally of a square or rectangular configuration.

[0027] FIG. **4** is a view rotated 180° from FIG. **3**.

[0028] FIG. **5** shows a side view of the control panel.

[0029] FIG. **6** is a view of the interior of the chamber looking from the bottom toward the top and showing the location of the various components in the top.

DETAILED DESCRIPTION

[0030] As shown in FIGS. **1** and **2**, the chamber **1** has an closed top **14**, which is removable and may be secured to the chamber housing **40** via suitable means such as, by way of example the nut and bolt systems **3**. The top supports the vision rotatable ball **4** in a channeled port **20** which permits rotation of the ball in any direction. The ball contains a delivery port **22** for supporting the blast nozzle holder **6**. The nozzle **5** is mounted on the end of the nozzle holder **6**, inside the chamber. The opposite end of the nozzle holder is connected to a media delivery line **24**. In the preferred embodiment a deadman switch or on-off switch **19** is provided in the delivery line for controlling the flow of media to the nozzle **5**.

[0031] The ball **4** also includes a view fitting port or channel **26** for supporting the vision window assembly **28** and defines

a vision tube. The view window **30** may include a clear window, a lens, or an opening support a camera or other image capture device. It should be noted that the fitting **26** is directed along a view line **32** that converges with the center of the media blast flow **34** at the point of contact, giving a good view of the cleaning action and enhancing aiming of the wand or nozzle holder **6**. The ball **4** can be rotated in any direction to direct the flow anywhere in the chamber **1**.

[0032] The view purge line fitting **9** is in communication with the view port fitting **26** and is connected to a pressurized view purge line **36**. This is connected to a pressure inlet port **38** via an on-off vision purge valve **41**. When in the on position, valve **41** directs pressurized air into the view fitting **9** to deflect any media or grit which could enter the view fitting **9** from the chamber **1** and cloud or even damage window, lens, camera or other imaging device. The purge system is provided for purging contaminants away from a view window when viewing a harsh environment. This includes an elongated housing or viewing tube having one end in a location permitting access for viewing and a second end terminating in a harsh environment remote from the viewing end. A purge line is located with an outlet upstream of the second end and down stream from the viewing end. A purging fluid is released from the purge line and flows the location adjacent the first end and toward the second end and the harsh environment. Typically a window is located in communication with the first viewing end. The window may include a lens, a camera in front of or behind the window, or another image capture device. The purge system is typically used in connection with harsh environment having pressure than ambient pressure, creating a harsh pressure environment, with the purging fluid released in the housing at a pressure higher than the harsh pressure environment.

[0033] In the preferred embodiment the system includes a centrifugal containment purge fitting or port **16**. This directs the media and/or grit in a circular, downward motion to exhaust port **13** through which the exhausted media and grit may be recycled or properly collected and disposed of. The containment purge port **16** is connected to the pressure inlet **38** through the on-off valve **18**.

[0034] A containment substrate gasket **12** is typically mounted on the bottom of the chamber walls to seal the blast area from the environment. The ball **4** permits direct blasting and a clear view of the entire contained surface within the chamber **1**.

[0035] FIGS. **3-6** depict an alternative embodiment of the system of the subject invention wherein the housing **40** is of a rectangular cross-section. The top or lid **14***a* is identical in function to the top **14** of the first embodiment, but is sized to close the rectangular chamber of housing **40***a*. The remaining like numbered components operate in the same manner and function in the same as the embodiment of FIGS. **1** and **2**.

[0036] The embodiment of FIGS. **2-6** also includes several additional enhancements. Firstly, the chamber housing **40***a* is rectangular which facilitates spot blasting in corners, for example. Handles **42** are provided to facilitate manipulation of the system. The lower gasket assembly is housed in a flange **44** with a manifold seal (not shown) that is perforated on its underside with slots **50** to serve as an exhaust system which is connected to exhaust port **13**.

[0037] The control system module **46** controls the flow into the system and can be set to media, air and vacuum setting by switch **48**. An in chamber light **49** is provided and may be switched on and off at switch **50**. A clean air connector **52** is provided to facilitate complete purging of the system at the end of an operation. A vacuum safety switch **54** is provided to assure the system is properly under negative pressure during operation.

[0038] While certain features and embodiments of the invention have been described in detail herein, it should be understood that the invention encompasses all modifications and enhancements within the scope and spirit of the following claims.

What is claimed is:

1. A containment system for defining containing a spot surface to be media blast treated, comprising:

a. A housing having walls, a closed top and an open bottom for defining a chamber;

b. A movable assembly;

c. An opening in the closed top for supporting a movable assembly;

d. A delivery tube mounted in the movable assembly for delivering a media into the chamber;

e. A view window mounted in the movable assembly for viewing the interior of the chamber.

f. A purge line for delivering a purging fluid into the area of the view window to purge the view window of any media in the chamber for keeping the view window free and clear of view blocking materials.

2. The containment system of claim **1**, including an exhaust port for removing media introduced into the chamber by the delivery tube.

3. The containment system of claim **1**, wherein the movable assembly is a rotatable sphere or ball.

4. The containment system of claim **1**, wherein the view window has a sight line that converges with the area being blast treated by the media delivered by the delivery tube.

5. The containment system of claim **1**, wherein the view window includes a window covering.

6. The containment system of claim **1**, wherein the view window contains a lens.

7. The containment system claim **1**, wherein the view window contains a camera.

8. The containment system of claim **6**, wherein the camera is outside the view window.

9. The containment system of claim **6**, wherein the camera is inside the view window.

10. The containment system of claim **1**, wherein the view window includes an image capture device.

11. The containment system of claim **1**, wherein the purging fluid is air.

12. The containment system of claim **1**, wherein the purging fluid is other than air.

13. The containment system of claim **1**, wherein the chamber is of a substantially cylindrical cross-section.

14. The containment system of claim **13**, including a purge line in the chamber, the purge line adapted for generating a centrifugal flow of media in the chamber as it is exhausted therefrom through the exhaust port.

15. The containment system of claim **2**, wherein the open bottom of the chamber includes a manifold about its perimeter, the manifold having slots around the perimeter of the chamber, said slots being in communication with the exhaust port.

16. The containment system of claim **15**, wherein the chamber is of a substantially rectangular cross-section and the slots are at the corners of the rectangle.

17. The containment system of claim **1**, wherein the chamber is of a substantially rectangular cross-section.

18. The system of claim **1**, further including a purge line associated with the chamber for directing a purge fluid into the chamber after operation for voiding the chamber of media.

19. A purge system for purging contaminants away from a view window when viewing a harsh environment, the purge system comprising:

a. A elongated housing having two ends, a first end in a location permitting access for viewing and a second end terminating in a harsh environment;

b. A purge line upstream of the second end;

c. A purging fluid in the purge line and releasing a purging fluid into the housing flowing from a location adjacent the first end and toward the second end and the harsh environment.

20. The purge system of claim **19**, wherein a window is located in communication with the first viewing end

21. The purge system of claim **19**, wherein a lens is located in communication with the first viewing end.

22. The purge system of claim **19**, wherein a camera is located in communication with the first viewing end.

23. The purge system of claim **19** wherein the harsh environment is in a pressure zone higher than ambient pressure creating a harsh pressure environment and wherein the purging fluid released in the housing is released at a pressure higher than the harsh pressure environment.

24. The purge system of claim **19**, wherein an image capture device is located in the first viewing end.

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