May 20, 1969 J. BARTON 3,444,802

FORCED AIR CURTAIN WALL FOR HOIST AND AUXILIARY EQUIPMENT

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FIG. 3

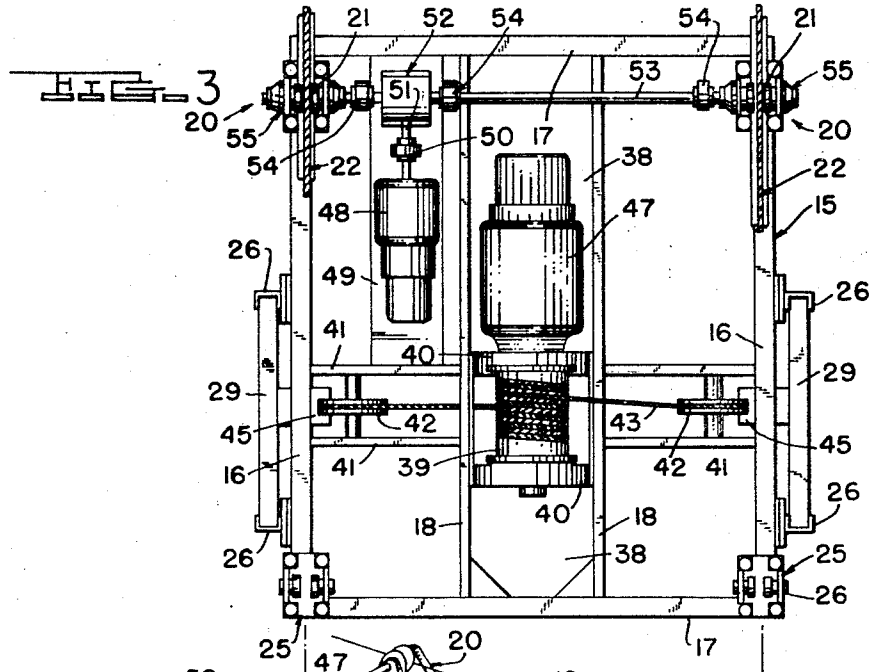
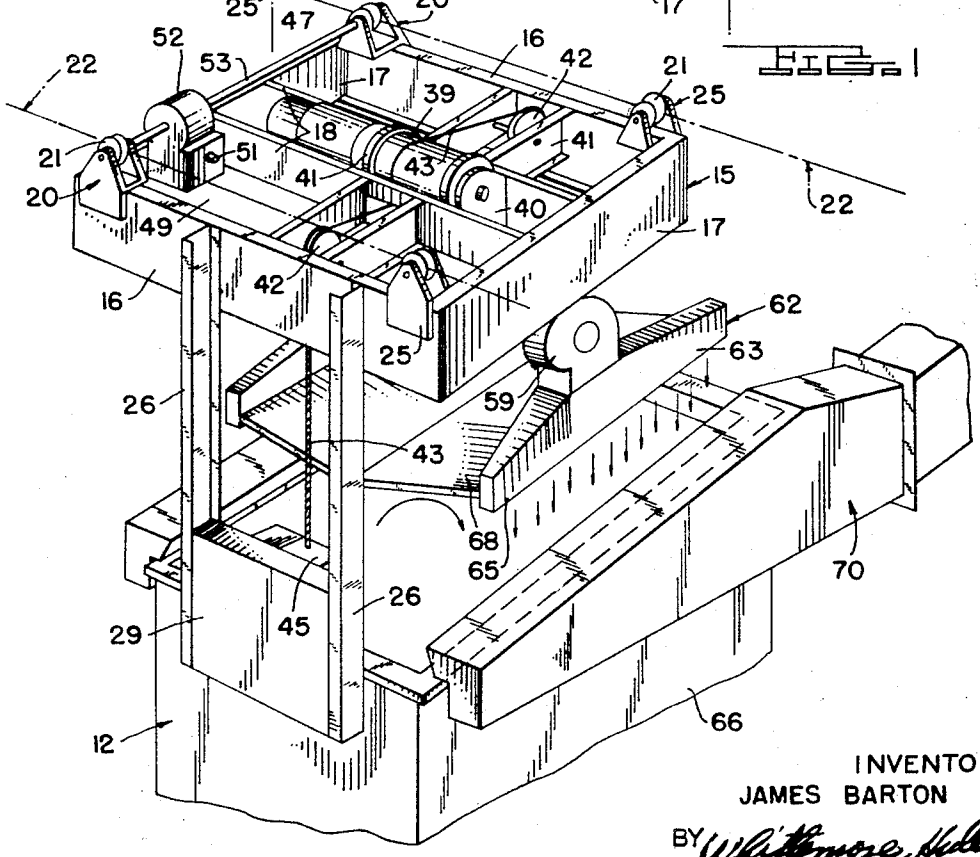


FIG. 1



INVENTOR
JAMES BARTON
BY White, Moore, Hallett & Baldwin
ATTORNEYS

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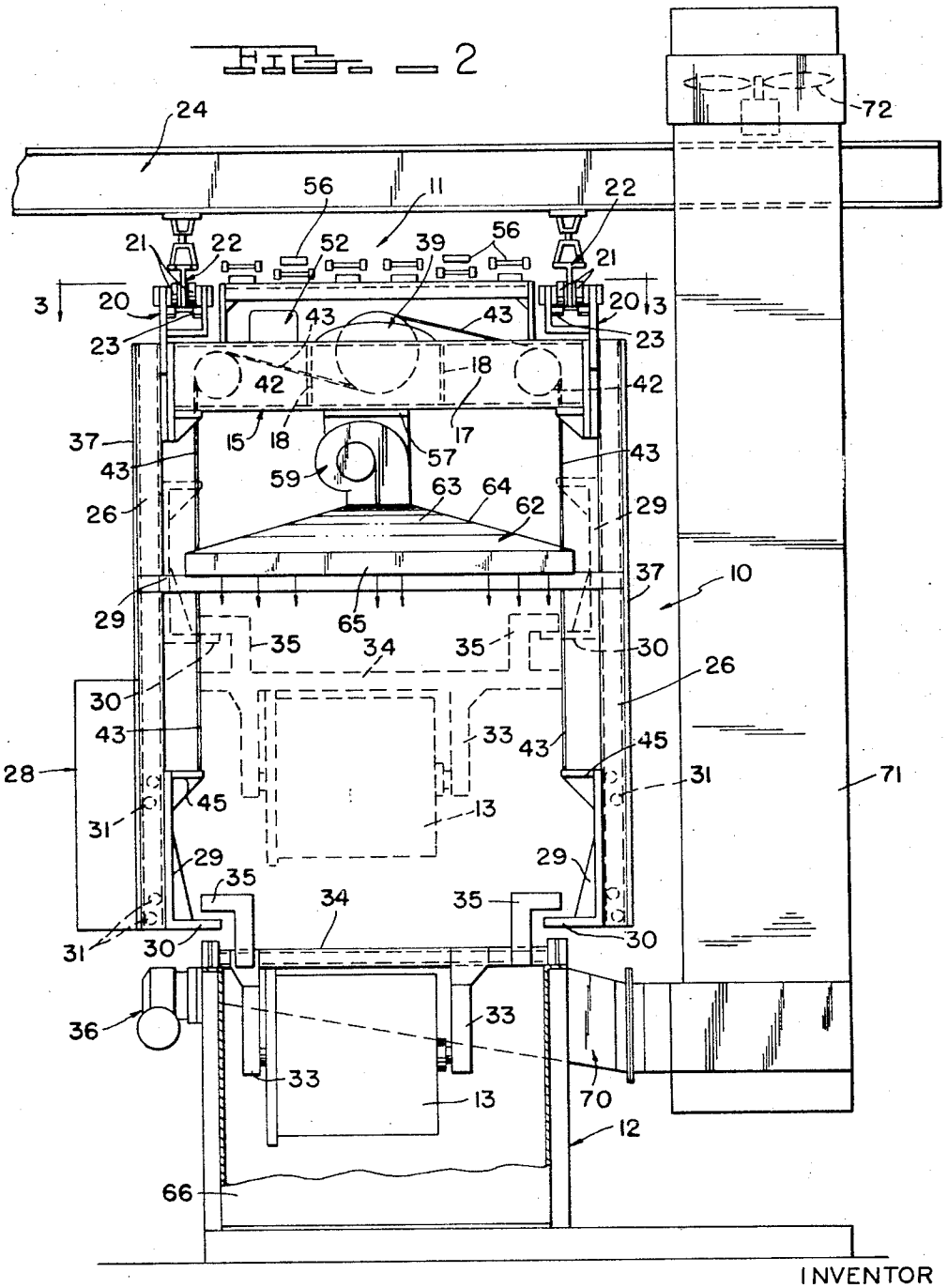
FIG. 2



INVENTOR
JAMES BARTON

BY Whittemore, Hulbert & Belknap
ATTORNEYS

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FIG. 4

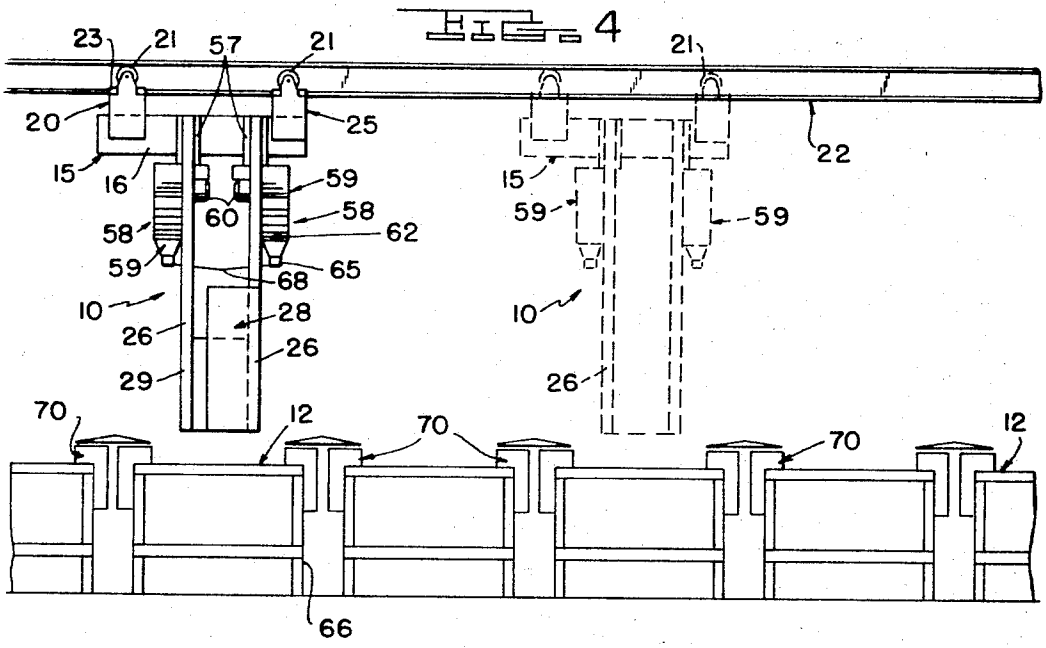
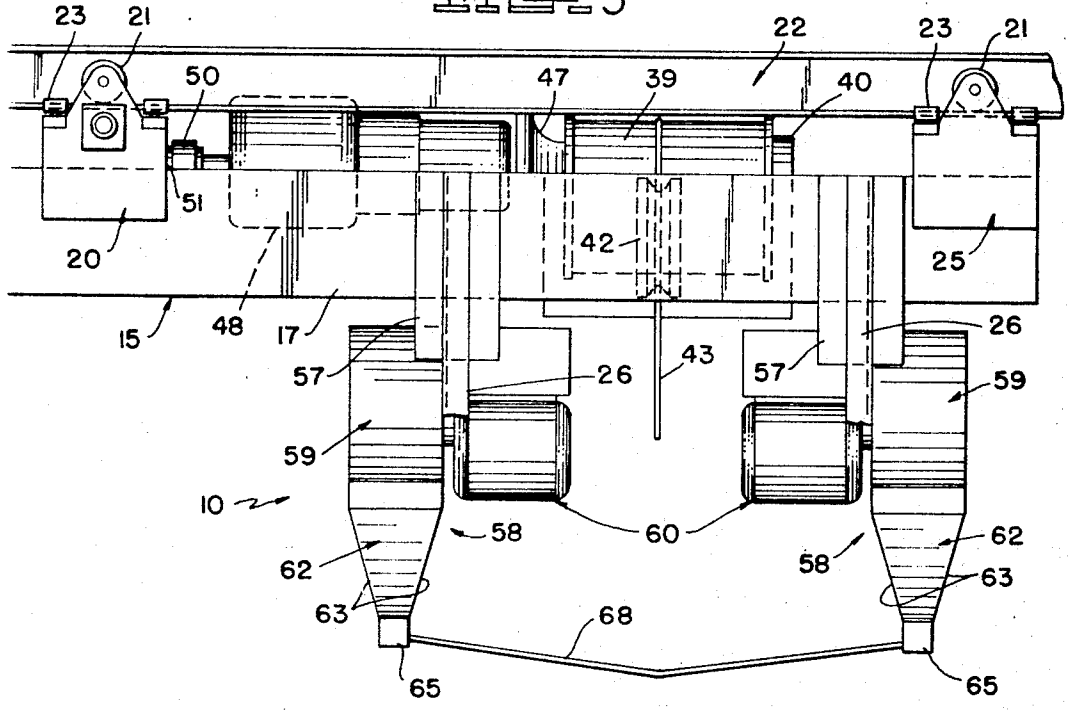


FIG. 5



INVENTOR
JAMES BARTON

BY Whittemore, Hulbert & Belknap

ATTORNEYS

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FORCED AIR CURTAIN WALL FOR HOIST AND AUXILIARY EQUIPMENT

James Barton, Grosse Pointe Woods, Mich., assignor to Ionic International, Inc., Warren, Mich., a corporation of Michigan

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U.S. Cl. 98—115 11 Claims

ABSTRACT OF THE DISCLOSURE

A work transfer hoist, as supported by an overhead track system, horizontally traverses and successively lowers work borne by the hoist into a series of treating tanks; and the hoist is equipped with a pair of motor driven forced air blowers, which are spaced longitudinally from one another in the direction of traverse and are elongated transversely of that direction at the bottom discharge throats of the blowers. These blowers direct intense air streams downwardly approximately in the vertical zones of the end walls of the tank, thus providing air curtains in those zones to prevent the escape of corrosive, harmful or obnoxious fumes into the area of the installation external of the tank, particularly as the work is elevated out of the latter. The fumes are driven downwardly toward the intake of the usual end wall suction hoods with which the tank is equipped; and the sides of the hoist paralleling the direction of traverse have confining plates to prevent mechanically the escape of the fumes in the transverse directions.

Background and summary of the invention

The improvements are particularly devised for incorporation in industrial hoist and auxiliary equipment, for example of the type in which an overhead rail or track supported hoist has horizontal traverse, under the control of automatic sequencing means, from one treating tank station to another or several more, at which stations the vertically acting structure of the hoist moves downward to immerse a workpiece-containing barrel of the hoist into a treating acid or solution in the tank, then return the work barrel upwardly for further traverse. Particularly in the last named phase corrosive, objectionable or noxious vapors mushroom up from the tank with the barrel, creating a threat to the health of personnel and the life of equipment. Pursuant to the invention the hoist has improved means moving with the same and operative to produce downwardly forced air walls which drive the vapors down into the immediate upper zone of the tank, from which the vapors then are removed to a stack by suction equipment conventionally associated with the individual tanks. This protective arrangement relieves the production area of the above-mentioned health hazard and extremely corrosive effect on equipment in the area.

Brief description of the drawings

FIG. 1 is a fragmentary, and considerably schematic, perspective view illustrating the hoist improvement of the invention and the operation thereof in providing the desired protective forced air curtain walls in the zone of a treating tank station, a further pair of physical fume confining walls being omitted for clarity;

FIG. 2 is a view of the equipment in end elevation in the direction of horizontal traverse of the hoist unit, illustrating the action of raising a workpiece-containing barrel of the hoist from a lower, solid line position, immersed in the content of a treating tank, to an elevated, dotted line position for traverse, or vice versa, and the

action of the transversely elongated forced air curtain pair in confining and driving fumes downwardly into the top zone of a tank, an end wall of which is shown broken away;

FIG. 3 is a view, partially broken away, in horizontal section on line 3—3 of FIG. 2;

FIG. 4 is a schematic side elevational view generally depicting the operation of the improved hoist in traversing horizontally over a series of treating tanks, at some or all of which the hoist lowers its workpiece-charged treating barrel into the tank; and

FIG. 5 is a fragmentary side elevational view illustrating primarily the motor driven forced air or blower housings to evolve the protective downward air curtain wall.

Description of a preferred embodiment

The improved structure of the invention is illustrated as being incorporated in a typical industrial plant, or subdivision or department thereof, in which one or a number of horizontally traversing hoists, generally designated by the reference numeral **10**, have indexing movement, under control of automatic sequencing means **11** (FIG. 2), over and vertically toward and from serially arranged treating tanks **12**, in the manner illustrated in FIG. 4. At certain or each of the tanks the hoist lowers its workpiece-containing barrel **13** into the treating chemical or solution in the tank, then, after the indicated period of treatment, elevates it for further traverse. Generally considered, the hoist structure **10**, save for the air curtain equipment thereof, is conventional in nature.

Thus, hoist **10** comprises a strong and rigid, box-like upper frame **15** of rectangular shape, constructed of weld-united side channels **16** of considerable height and similarly proportioned end channels **17**, the latter braced transversely by intermediate parallel plates **18**. The side members **16** of frame **15** each have an end track drive carriage **20** welded thereto and projecting thereabove adjacent the rear of the hoist, in reference to a traverse of the latter to the right, as viewed in FIG. 4.

Rear carriages **20**, as best shown in FIGS. 2 and 3, journal the axles of horizontally aligned track wheels **21**, which ride the lower flange of an I-beam type monorail or track **22**, in the manner of a conventional industrial trolley. Vertically journalled rollers **23** stabilize the carriage **20** horizontally. The carriage supporting rails **22** are in turn suspended rigidly from transverse I-beams **24** (FIG. 2) each having its bottom flange located about 18 feet above the floor of the installation. The rear end carriages **20** are powered to effect the horizontal traverse of hoist **10** along rails **22** by means hereinafter described.

The opposite or forward end of the hoist frame **15** is also equipped at each of its opposite sides with a carriage **25**; but whereas the carriages **20** are powered, the carriages **25** are idlers, simply sustaining wheels **21** which ride the bottom flange of a rail **22**.

The side frame channels **16** of hoist frame **15** have vertically elongated, upright and parallel channels **26** welded thereto in the center zone thereof, these channels constituting spaced guideways which depend approximately to the top of the tank **12** (FIGS. 1 and 2); and a control panel **28** for the hoist is shown in FIG. 2 as being mounted externally of one pair of guide channels **26**. Vertically traveling lifter brackets **29**, each equipped at its bottom with a lifter pad **30**, are guided in the respective pairs of channels **26**, as by means typically including antifriction rollers **31** on bracket **29** working between the inturned flanges of the channels. Provisions for lifting and lowering the brackets **29** are hereinafter described.

The workpiece receiving barrel **13** is journaled in

brackets 33 depending from a lifter frame 34; and the latter has upwardly projecting, L-shaped brackets 35, beneath the horizontal arms of which lifter pads 30 engage to elevate barrel 13 from its solid line immersed position of FIG. 2 to its dotted line position for traverse. The installation is typically equipped with a small gear head motor unit 36, with appropriate drive connections from the latter to barrel 13 for rotating the latter while immersed in a treating acid or other liquid in tank 12.

In supplementation of the forced air curtain means to be described, side wall plates 37 (FIG. 2), which are approximately coextensive in width with the length of frame channels 16 and in height with the guide channels 26, are fixedly applied to the latter to physically bare the escape of fumes at the sides of hoist 10.

As best shown in FIGS. 2 and 3, the box-like top frame 15 of hoist 10 supports various motor, drum and sheave provisions by means of which the hoist load is elevated, lowered and traversed. To these ends a longitudinally extending, horizontal supporting panel 38 is welded between and along the lower edge of the upright bracing plates 18 of top frame 15, panel 38 serving as a support for a steel hoist drum 39. The drum is journaled in upright brackets 40 at the ends thereof, which brackets are appropriately secured to plates 18 and panel 38 of the super-structure of hoist 10.

Furthermore, pairs of parallel upright channels 41 are mounted in 90° relation between the brace plates 18 and the respective longitudinal channels 16 which define the sides of top frame 15. Steel sheaves 42 are journaled between the channel pairs 41, equidistant laterally from the axis of drum 39; and a steel wire rope or cable 43, wound in conventional manner above drum 39, passes in opposite transverse directions over the top of the respective sheaves 42, one of the plates 18 being provided with an aperture to receive a lower reach of cable 43. Passing over the sheaves 42, each cable 43 is connected at its lower end to an integral, laterally projecting arm 45 of one of the brackets 29 which are guided vertically in the channel ways 26.

A variable speed brake-type motor 47 of, say, 15/3 HP, 1800–600 r.p.m. and 10,000 lbs. capacity, is mounted on the horizontal support panel 38 of top frame 15, and is drivingly connected to the shaft of drum 39 for the powering of hoist 10 in its up and down movements.

In addition, a reversible speed traverse motor 48 of, say, 3½ HP rating, is mounted upon a second horizontal support panel 49 of frame 15, which panel is supported between one of the upright transverse channels 41 and the rearmost frame channel 17. Motor 48 drivingly connects through a chain coupling 50 and shaft 51 with a cone-type speed reducer unit 52 (FIGS. 1 and 3), the output of which powers a transversely extending drive shaft 53; and shaft 53 connects through chain couplings 54 with gear box units 55 associated with the respective two rear trolley-like carriage units 20.

Through these units the track wheels 21 of the rear drive carriages 20 are rotated for a horizontal, pinion and rack type traverse of hoist 10 along the rails or tracks 23. This traverse may be under the control of control bar devices 56 such as appear in FIG. 2 of the drawings, these devices conventionally constituting parts of the automatic sequencing system 11. Specific structural details of such systems are known in the art, as well as electrical circuitry therefor, and constitute no part of the present invention.

Referring to FIGS. 4 and 5, the top hoist frame 15 is provided, midway between its side channels 16 and in a zone central of its forward and rearward channels 17, with a pair of depending support brackets 57 secured to that channel. These brackets each rigidly sustain a motorized fan or blower unit, generally designated 58. Unit 58 comprises a blower 59 of suitable capacity, for example 900 c.f.m., appropriately powered, as by means of a ¾ HP, 1750 r.p.m. motor 60; and the output of each blower

is shrouded by a sheet metal housing or hood of a special transversely elongated and narrow design.

As best illustrated in FIGS. 2 and 5, the blower units 58 are located approximately equidistantly from the opposite axial ends of cable drum 39 and (FIG. 4), directly on opposite sides of the channel guide pairs 26 in which the barrel-lifting brackets 29 operate vertically. Each unit 58 includes a housing hood or shroud 62 converging downwardly on its opposite transverse sides 63 (FIG. 5) from the discharge of the fan thereof (not shown); and the housings diverge or flare sharply at their top walls 64 (FIG. 2). As thus shaped, housings or hoods 62 downwardly discharge at longitudinally elongated throats 65 of limited transverse width.

Accordingly, upon energization of the blower motor 60, intense and concentrated blasts of protective curtain air are discharged downwardly through the respective throats 65 in vertical zones substantially aligned adjacent the upright planes of the end walls 66 (FIGS. 1 and 2) of the tanks 12. In order to shield the respective blower units 58 themselves from corrosive fumes, the shrouding housings 62 thereof are joined across their discharge mouths 65 by a generally horizontal shield plate 68 substantially co-extensive in length with those throats, plate 68 being of very mild V-shape (FIGS. 1 and 5) to accumulate and drain fume condensate or the like.

As indicated above, the upright side walls 37 (FIG. 2) protect mechanically against lateral escape of fumes, i.e., transversely of the ends protected by the air curtain walls. The improved hoist unit is illustrated in FIGS. 1, 2 and 4 as being operated in association with tanks 12 equipped with suction vents or exhaust hoods 70 located adjacent side rims of the tank, and having intake openings in these zones. Through this means fumes at the surface of the liquid in the tank are withdrawn forcibly to atmosphere through a 30″ stack 71, as under the suction of an exhaust fan 72 in the stack. See FIG. 2.

To recapitulate the action of the blower units 58, as powered through appropriate wiring (not shown) of the motor 60 thereof (and that of the traverse and lift circuitry of hoist 10) they create vertical protective walls or curtains which have the effect, as the charged work barrel 13 travels upwardly and downwardly, to drive fumes downwardly at the forward and rearward ends of the hoist 10 into the zone of intake of the stationary tank hoods 70. With the side walls further shielded by plates 37, and an upper zone shielded by plate 68, it is impossible for corrosive and/or obnoxious or injurious fumes to escape to the area surrounding the installation.

What is claimed is:

1. In hoist or like equipment movably handling work in the treating of the latter by equipment in a fume-containing or evolving atmosphere, such as that directly above a treating tank; the improvement comprising a frame, work elevating members carried by said frame, said frame having a hoist drum thereon provided with cable means, the ends of said cable means extending downwardly along the sides of said hoist to connections to said work elevating members, means for energizing said hoist drum to move the work in a vertical direction relative to the tank, a pair of air blower units fixedly secured to said frame, each unit including a horizontally elongated housing of relatively narrow width from which air is directed downwardly in a concentrated stream in parallel relation to the air stream of the other unit, each air stream defining a fluid curtain laterally confining fumes in the zone of the tank and directing the fumes back to the tank, the housings of the respective units being positioned parallel to one another so that the fluid curtains impinge the tank adjacent end confines thereof, said hoist having a traverse movement in addition to its vertical movement, and said housings are elongated in a direction transverse of the traverse movement, said hoist having physical shielding walls paralleling the direction of traverse along either side of the path of traverse of the hoist.

2. The equipment of claim 1, in which said housings are connected by a generally horizontal shield plate substantially coextensive in length therewith.

3. A material transfer system comprising in combination a tank adapted to hold a vapor-emissive liquid, exhaust hoods mounted at the ends of the tank, each hood having an intake opening near the top of the tank, conduit means connecting the exhaust hoods to atmosphere at a point remote from said tank, tracks mounted above said tank, a movable work transfer hoist movably supported by said tracks, said hoist comprising a frame, drive means on said frame for moving the latter along said tracks, work elevating members carried by said frame, said frame having a hoist drum thereon provided with cable means, the ends of said cable means extending downwardly along the sides of said hoist to connections to said work elevating members, means for energizing said hoist drum, and blower means carried by said frame at the ends thereof for directing air streams downwardly towards the liquid in the tank and into said exhaust hoods.

4. The system of claim 3, in which said hoist includes a work supporting member having elements engaged from beneath by said work elevating members to lift the work supporting member from the tank.

5. The system of claim 3, in which each of said blower means has a stream directing shroud elongated transversely of the direction of movement of the hoist.

6. The system of claim 3, in which the sides of the hoist between the blower-equipped ends thereof have means mechanically shielding against lateral emission of fumes.

7. The system of claim 3 in which each of said blower means has a stream directing shroud elongated transversely of the direction of movement of the hoist, the sides of the hoist between the blower-equipped ends thereof having means mechanically shielding against lateral emission of fumes.

8. A material transfer system comprising in combination a vertical tank open at its upper end and adapted to hold a fume-containing or evolving atmosphere or liquid, said tank having fume exhaust means adjacent said upper end thereof, a movable work transfer hoist movably supported above said tank, said hoist comprising a frame, work elevating members carried by said frame, said frame having a hoist drum thereon provided with cable means,

the ends of said cable means extending downwardly along the sides of said hoist to connections to said work elevating members, means for energizing said hoist drum to move the work in a vertical direction relative to said tank, blower means fixedly secured to said frame, said blower means including a housing opening downwardly towards said tank from which a fluid is directed in a concentrated stream as a fluid curtain confining fumes in the zone of said tank and directing them into said exhaust fumes, said hoist having a traverse movement in addition to its vertical movement, and said housings which direct the fluid curtains are elongated in a direction transverse of the traverse movement, said hoist having physical shielding walls paralleling the direction of traverse along either side of the path of traverse of the hoist.

9. The system of claim 8, in which said fume exhaust means comprises exhaust hoods mounted at the top of the end edges of the tank, said blower unit fluid curtains being in substantial vertical alignment with said edges when the hoist is in the vertical zone of the tank.

10. The system of claim 8, in which said housings are connected by a generally horizontal shield plate substantially coextensive in length therewith.

11. The system of claim 9, in which said housings are connected by a generally horizontal shield plate substantially coextensive in length therewith.

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FRED C. MATTERN, JR., *Primary Examiner.*

M. ANTONAKAS, *Assistant Examiner.*

U.S. Cl. X.R.

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