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 [21] Appl. No. **881,979**
 [22] Filed **Dec. 4, 1969**
 [45] Patented **Dec. 14, 1971**
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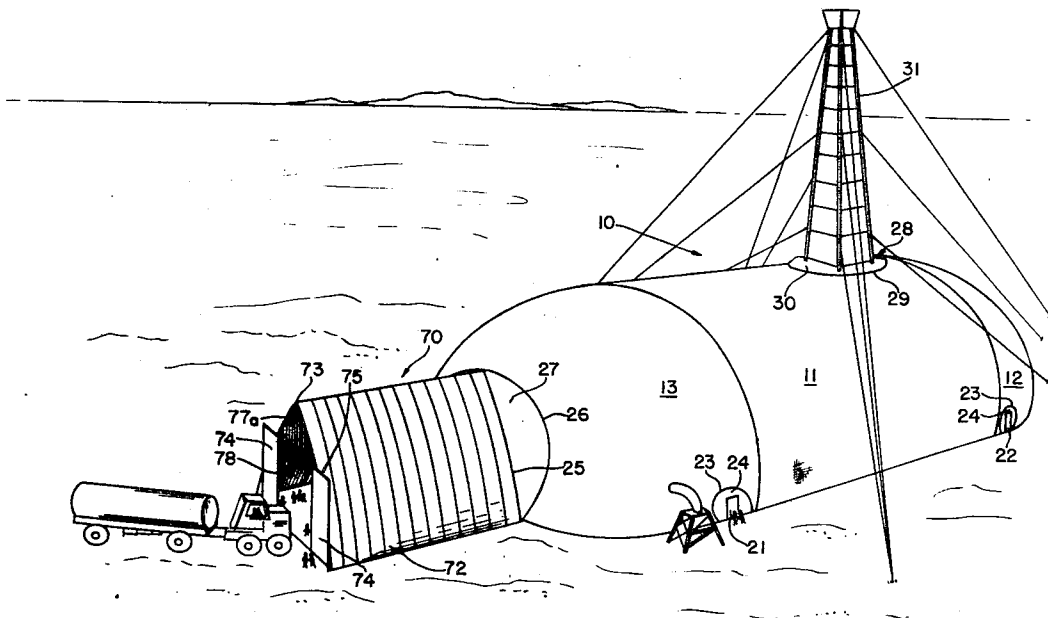
[54] **DRILLING OPERATION SHELTER**
16 Claims, 15 Drawing Figs.

[52] U.S. Cl. **98/33,**
49/68, 52/2, 135/1, 175/219
 [51] Int. Cl. **F24f 13/00**
 [50] Field of Search **52/2;**
175/219; 98/29, 33; 135/1; 49/68

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ABSTRACT: An enclosed system providing a shelter large enough to permit unhampered oil well drilling operations under adverse weather and wind conditions includes an air inflated enclosure large enough to surround a drilling site and drilling rig of a drilling operation, the upper part of the mast of the drilling rig extending through the roof of the air-inflated enclosure without any load from the enclosure being exerted on it. Entry into the air-inflated enclosure is through a prefabricated double-door air lock. A venting system provides continuous exhaust of gases from the drilling area. A quick release emergency venting system is provided to exhaust large volumes of gas adjacent the wellhead in the event of a major gas blowout. The air supported enclosure can be erected in a minimum amount of time using the mast of the drilling rig to assist in the erection. The air-inflated enclosure is made up of sections of flexible, gastight, water-impervious material which are laced together so they can quickly be assembled and disassembled.



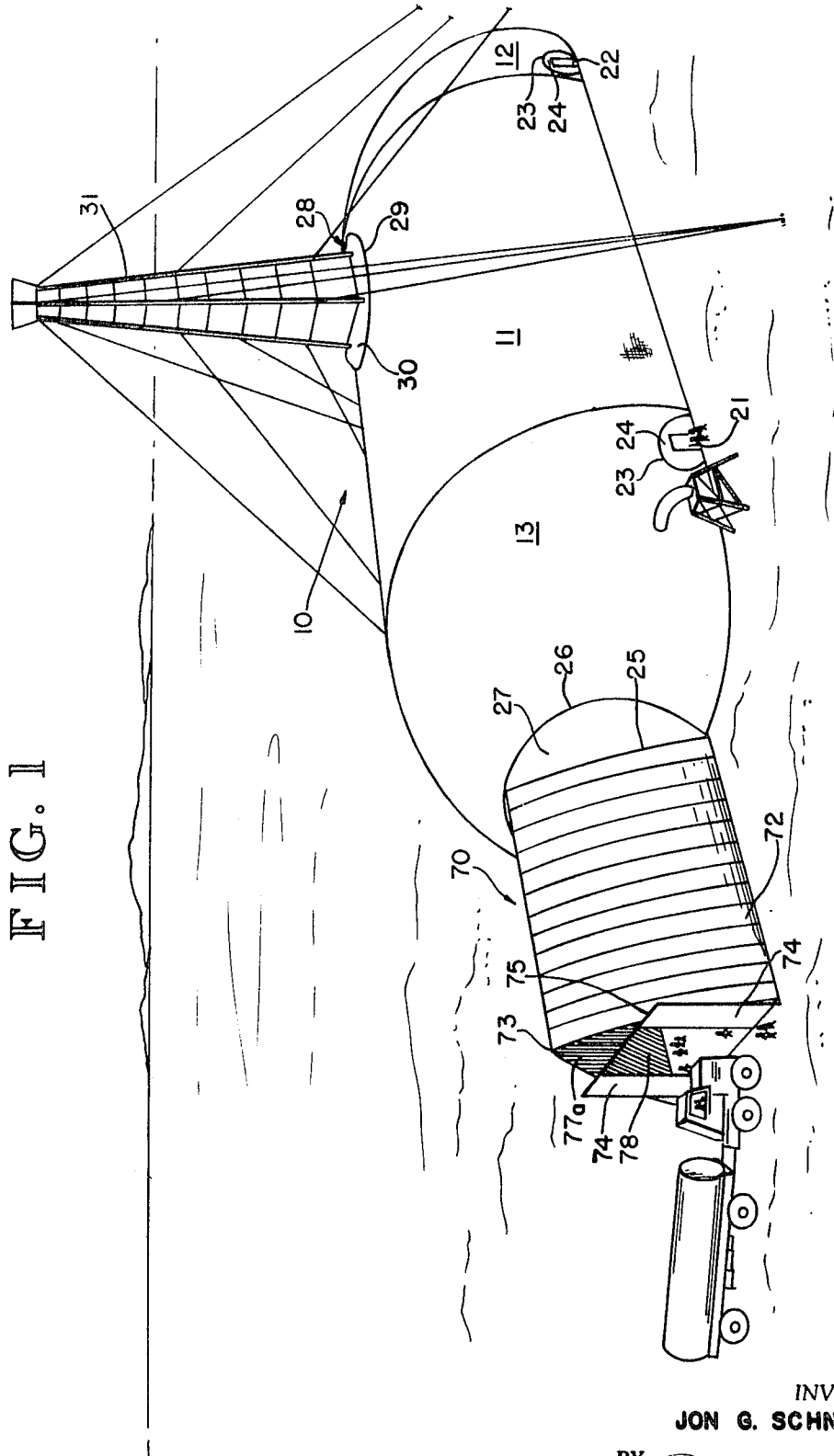


FIG. 1

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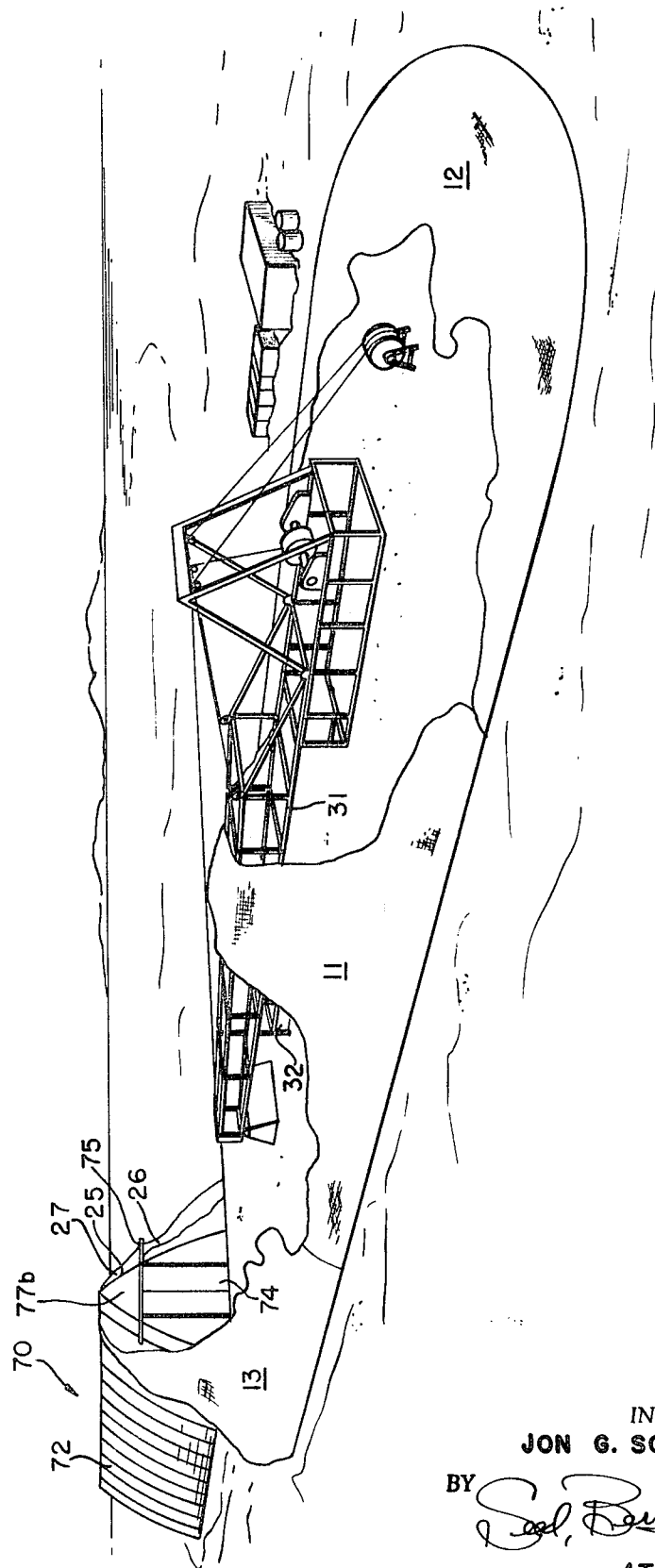
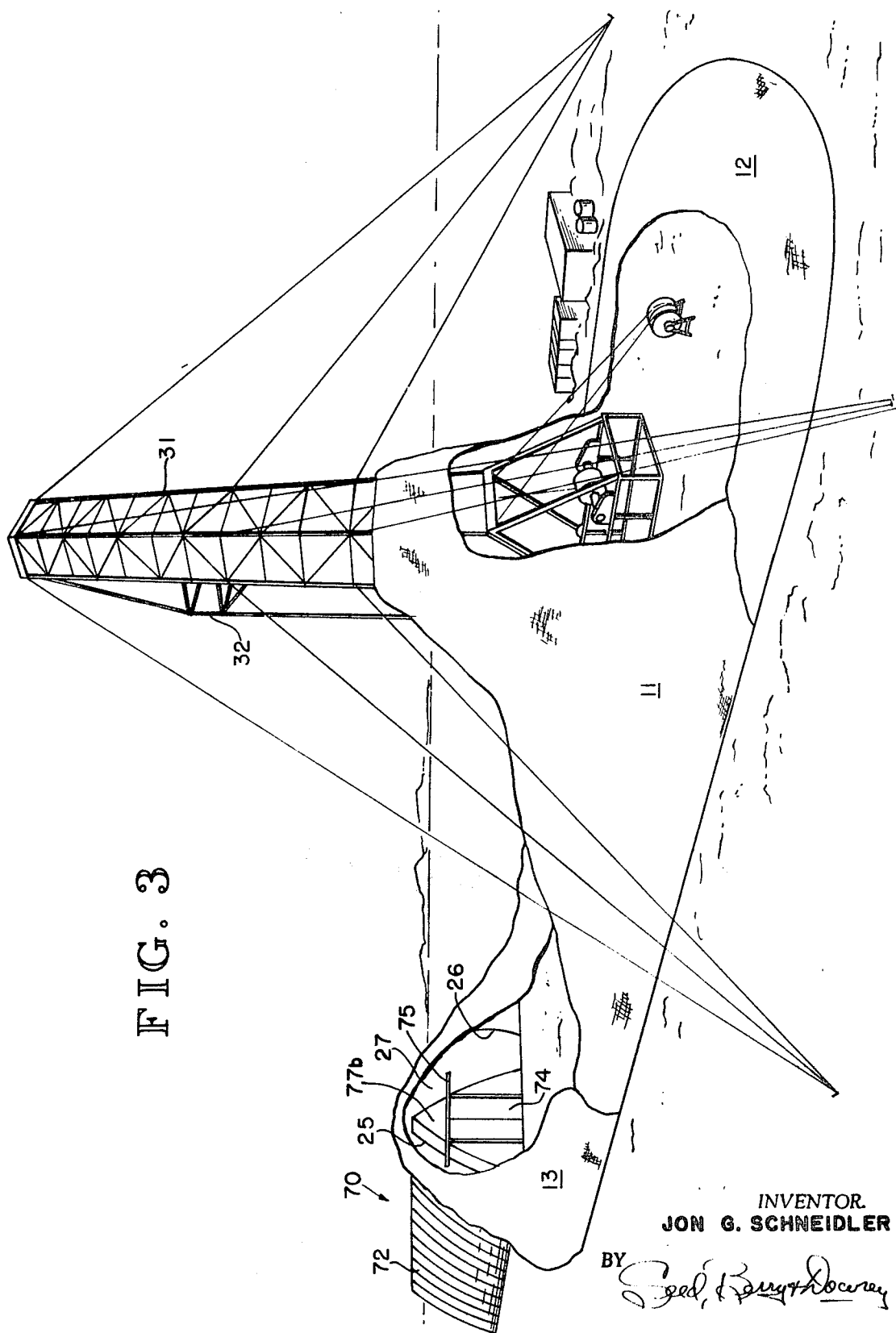


FIG. 2

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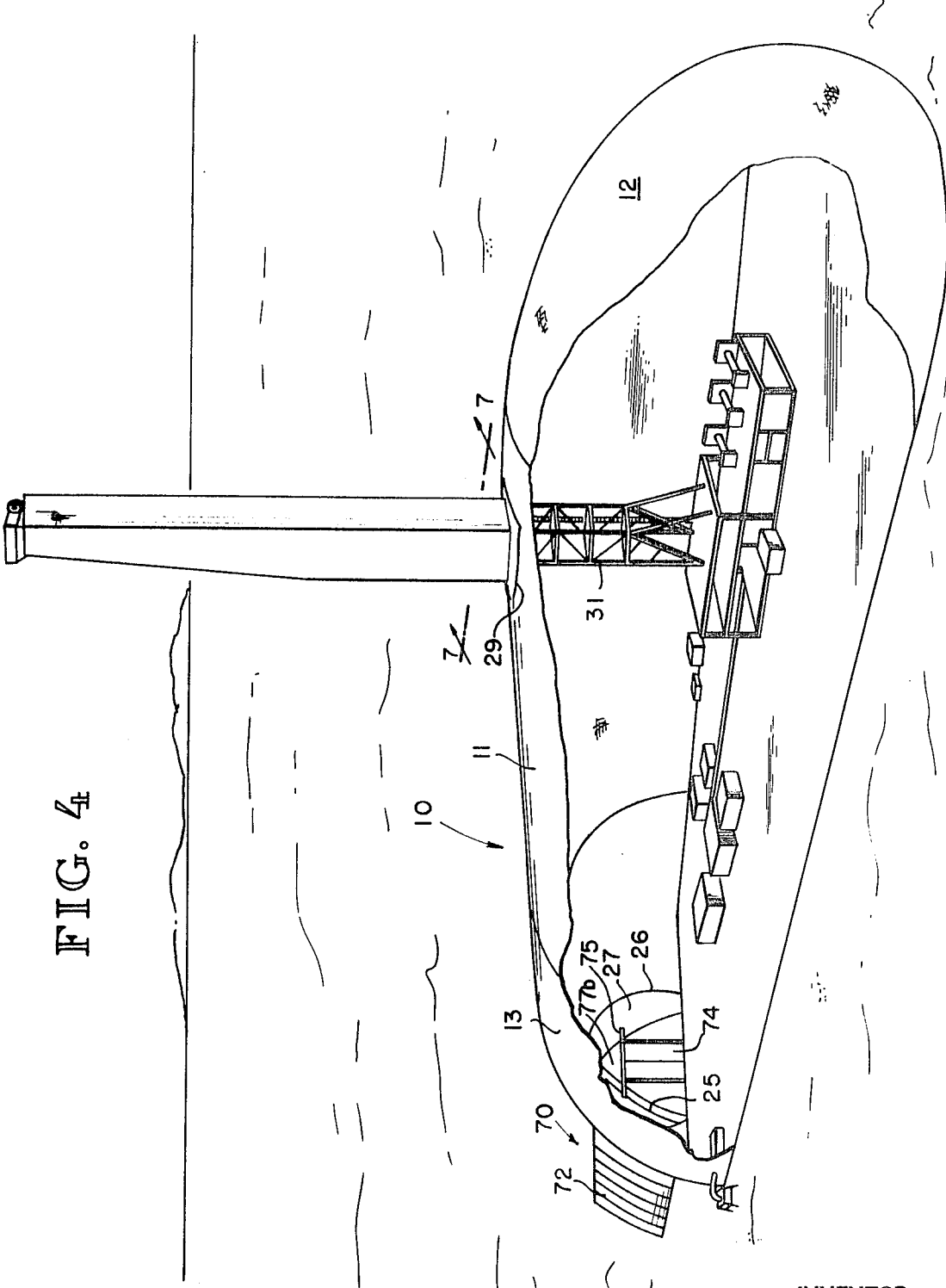
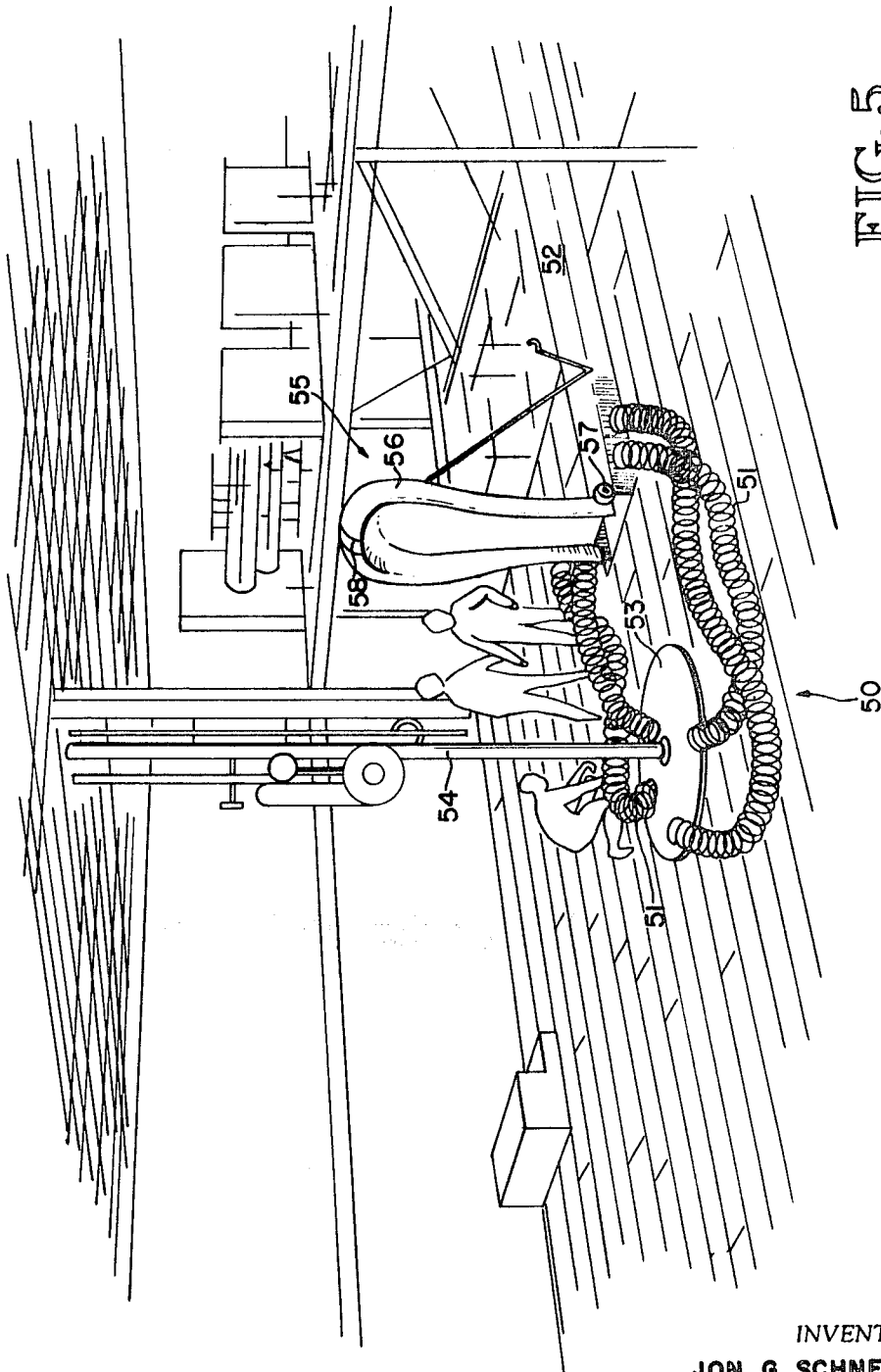


FIG. 4

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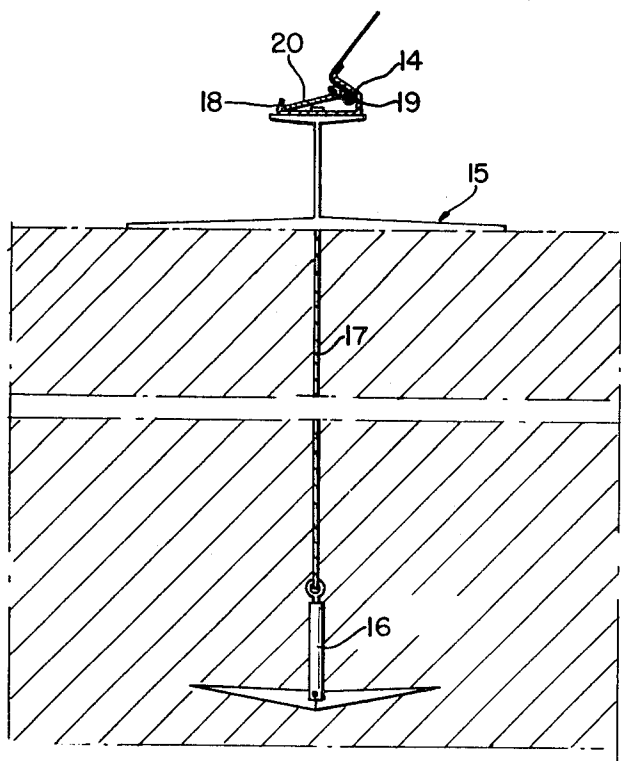


FIG. 6

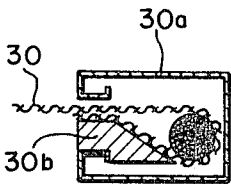


FIG. 7A

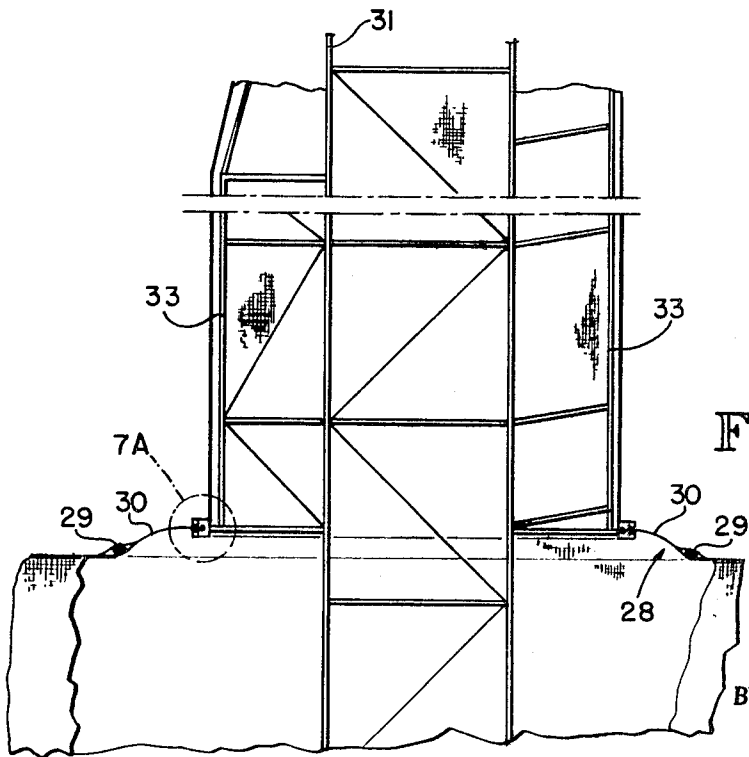
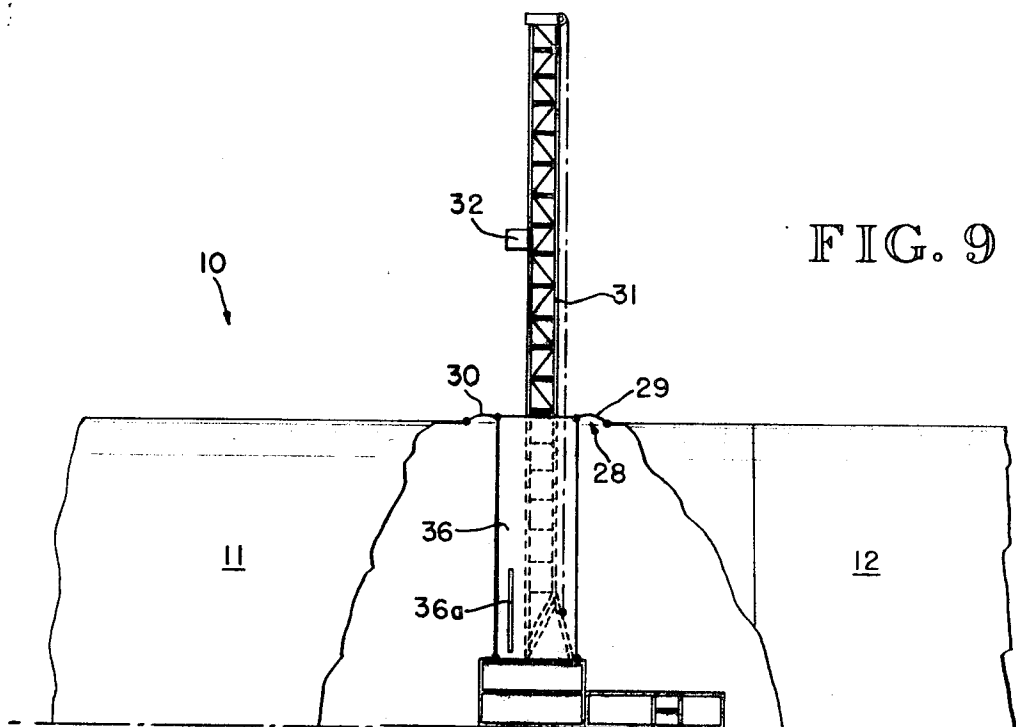
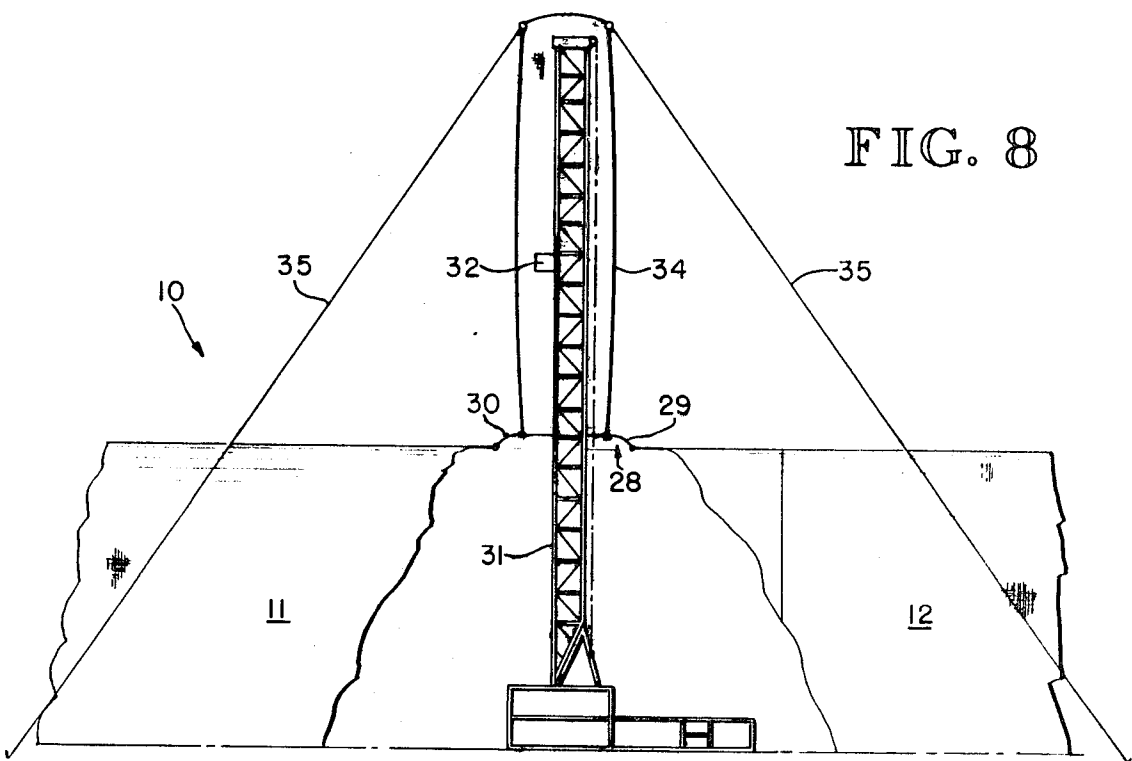


FIG. 7

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FIG. 10

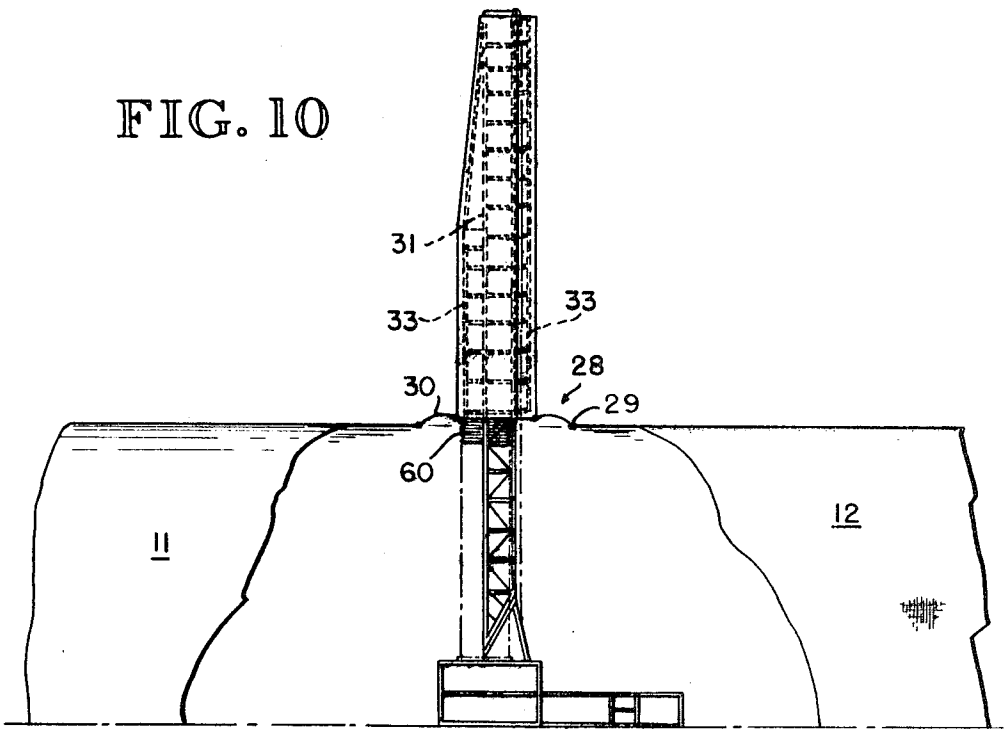
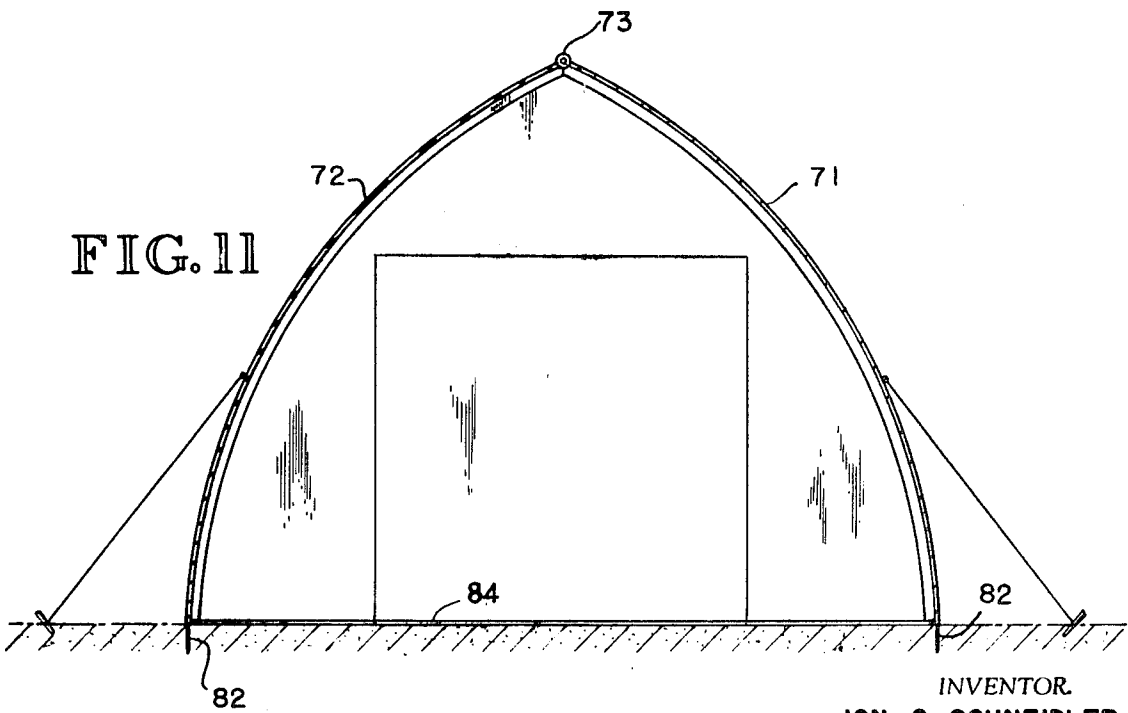


FIG. 11



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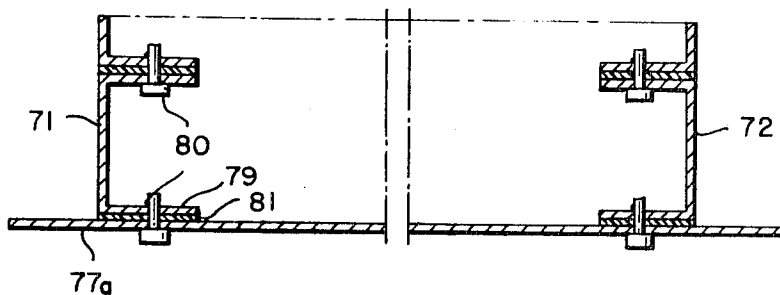


FIG. 12

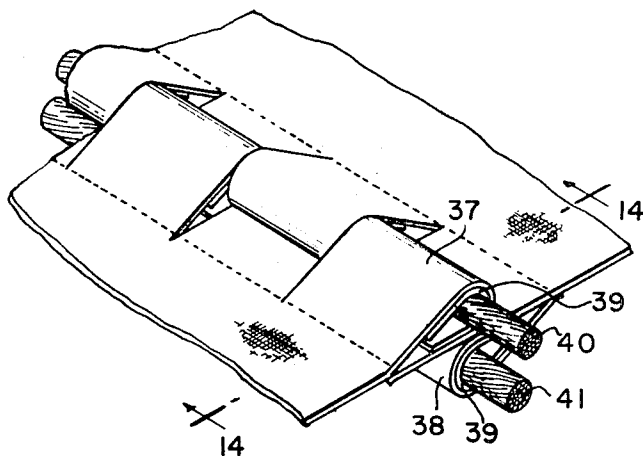


FIG. 13

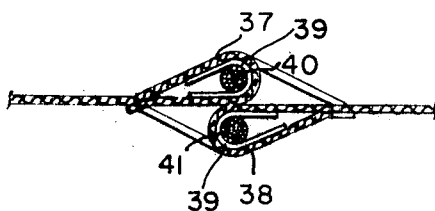


FIG. 14

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DRILLING OPERATION SHELTER

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to an enclosed system including an air-inflated enclosure of flexible material, venting, access and anchoring means for the air-inflated enclosure, and to a method of erecting the enclosure.

2. Prior Art Relating to the Disclosure

Recent discovery of major oil deposits in the North Slope area of Alaska have led to major drilling operations by numerous companies. Because of short periods of good weather and the unstable condition of the tundra covering most of the North Slope drilling operations are conducted for the most part during the midarctic winter when temperatures range as low as minus 60° F. or lower. Under calm conditions the functioning ability of men and machinery is difficult but possible at temperatures as low as minus 50° F. However, if the wind is blowing the chill factor resulting from the combination of low temperatures and wind renders the functioning ability of both men and machinery almost impossible. At a wind velocity of, for example 40 miles per hour at a temperature of minus 60° F., the wind-chill factor reduces the temperature to minus 148° F. By sheltering the drilling area from the wind with a structure large enough to permit unhampered drilling operations many of the problems associated with drilling operations on the North Slope and other similar areas are minimized.

Building structures surrounding an oil well drilling operation have been proposed as indicated by U.S. Pat. No. 2,804,951 and 2,872,933. The former patent is directed to a framed enclosure for a portable oil drilling rig, the enclosure adapted to be supported in part by the mast of the rig. The latter patent is directed to an air-inflated enclosure for an oil well drilling rig wherein the enclosure is suspended from the top of rig. In both instances the enclosure is supported in part by the mast of the drilling rig. This is economically impractical for such areas such as the North Slope wherein high winds are encountered. If the enclosure is supported by the drilling rig the high winds common to the Arctic and semiarctic areas exerts a tremendous force on the mast of the rig requiring a specially designed structure and special guying of the overall structure.

In providing a practical air supported structure for use in drilling operations under conditions found on the North Slope of Alaska and other similar locations, numerous problems must be solved. The shelter (1) must be large enough to permit unhampered drilling operations; (2) must be durable to withstand the wind and temperature conditions found; (3) must be portable to permit moves from one drilling site to another without delaying inordinately the normal rig setup time; (4) should accommodate different sizes and models of drilling rigs and masts; and (5) must provide adequate venting to remove substantial quantities of noxious gases emanating from the drilling area. In the event of a major gas blowout means must be provided to vent very large quantities of gas without deflation of the structure.

SUMMARY OF THE INVENTION

This invention relates to an air-inflated building enclosure for enclosing a work site. In particular the air-inflated enclosure is designed to provide a wind shelter for oil well drilling operations in drilling areas where the combination of low temperature and high winds make such operations substantially impossible.

It is a primary object of this invention to provide an air-inflated building enclosure large enough to permit unhampered drilling operations without requiring changes in equipment presently used and without the necessity of specialized personnel on the site.

It is another object of this invention to provide an air-inflated building enclosure which is portable and which can be assembled and disassembled with relative ease in a relatively short amount of time without specialized personnel.

Other objects of this invention are (1) to provide an inflated building enclosure capable of withstanding wind velocities up to 100 miles per hour and temperatures down to minus 65° F., (2) to provide an enclosure in which the mast of the drilling rig passes through the roof of the enclosure without any load from the enclosure being exerted upon it, (3) to provide a method of erecting an air-inflated enclosure using the mast of the drilling rig to assist in the erection, (4) to provide an air-inflated building enclosure including a venting system for removing large quantities of noxious gases from within the enclosure, and (5) to provide an enclosure having an anchoring system providing reliable anchorage even during periods of thaw while requiring very little time to put it in place.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of the enclosed system with the upper portion of the mast of the drilling rig extending through the roof of the air-inflated enclosure, the mast guyed against wind loading; FIG. 2 is a perspective view of the drilling site wherein the lower edge of the material making up the air-inflated enclosure, in three sections, has been anchored around the perimeter of the drilling area with the opening in the center section secured around the mast of the rig; the mast being in horizontal position;

FIG. 3 illustrates the method by which the air-inflated enclosure is erected, erection of the mast of the rig assisting in erection of the air-inflated enclosure;

FIG. 4 is a perspective view of the erected and inflated enclosure, the mast being an unguyed cantilevered mast with the upper portion extending through the roof of the enclosure sheathed;

FIG. 5 is a perspective view of the drilling platform illustrating two possible means for continuously venting noxious gases emanating from the wellhead during drilling operations;

FIG. 6 is a partial cross-sectional view of the anchoring and base support systems for the air-inflated building enclosure;

FIG. 7 is a partial transverse cross-sectional view through the air-inflated enclosure and mast illustrating the manner in which the upper part of the mast is sheathed and the manner in which the enclosure is attached to the mast;

FIG. 7a is an expanded partial transverse sectional view of one means of securing the enclosure to the mast;

FIG. 8 is a partial transverse cross-sectional view through the air-inflated enclosure in the area of the mast illustrating an air-inflated boot completely free of the mast enclosing the upper part of the mast, the boot being guyed to absorb wind loading;

FIG. 9 is a partial transverse cross-sectional view through the air supported enclosure in the area of the mast illustrating means of enclosing the mast wherein the lower portion of the mast below the roof of the enclosure is sheathed and an access opening provided in the side of the sheathing for drill pipe;

FIG. 10 is a partial transverse cross-sectional view through the mast and air supported enclosure illustrating the high capacity venting system used in the event of a major gas blowout;

FIG. 11 is a transverse cross-sectional view through the double-door air lock structure illustrating how the sidewalls are hinged at the apex and the manner of anchoring the air lock;

FIG. 12 is a cross-sectional view through the double-door air lock illustrating how the end walls are secured to the sidewalls and how the corrugated steel sections are secured together;

FIG. 13 is a perspective view of the lacing system for joining sections of material making up the enclosure; and

FIG. 14 is a transverse cross-sectional view of the lacing of FIG. 13.

DETAILED DESCRIPTION OF THE INVENTION

The enclosed system providing a shelter large enough to permit unhampered drilling operations is shown in perspective in FIG. 1 and includes an air-inflated structure 10 anchored to

base supports resting on the ground around the perimeter of the drilling area, a double-door air lock opening to the interior of the air-inflated enclosure and a weather-insulated power blower system for inflating and keeping inflated the air supported enclosure. The upper part of the mast of the drilling jig passes through the roof of the air supported enclosure 10 without any load of the building being exerted upon it. The upper part of the mast extending through the enclosure is enclosed to prevent air loss and may be guyed to absorb wind loading. Alternatively, the lower portion of the mast may be sheathed.

In more detail the air supported building enclosure comprises hemispherical end sections 12 and 13 of flexible, water-impervious, gastight material detachably joined together or to one or more center section 11. Lacing means for joining the sections together are shown in FIGS. 13 and 14 and will be described later. The air supported enclosure is preferably made of a woven fabric, such as nylon or polyester, which is coated or impregnated with a vinyl material or other suitable synthetic material capable of rendering the woven material impervious to the passage of air and capable of withstanding low temperatures without embrittlement.

The bottom edges of each of the fabric sections 11, 12 and 13 making up the enclosure 10 have an anchor cable 14 running the length thereof for anchoring to a base support. FIG. 6 shows a partial cross-sectional view of the base support for the air supported enclosure. Before the base support is laid down the ground area to be enclosed by the air supported enclosure is prepared and levelled. Pilings are set to furnish adequate support for the drilling rig. Gravel is usually used to build up the area to be enclosed around the pilings for the drilling rig. I-beam sections 15 are butted together around the perimeter of the drilling area to form a base support for the air supported enclosure 10. At spaced intervals the I-beams are secured to the ground by ground anchors 16. Various types of anchors may be used. For example, an anchor may be used which can be driven into hard frozen ground by explosive means, the anchor having flukes thereon which spread as strain is applied. A suitable imbedment anchor of this type is the "Vertohold" anchor manufactured by Edo Western Corporation of Salt Lake City, Utah. Holes for other type anchors can be drilled in the frozen ground by steam or water and the anchor inserted. Guy lines 17 leading from the ground anchors are secured to the I-beam sections at spaced intervals. The I-beam sections may be of any desired length. Along the top of each of the I-beam sections is bolted, welded or otherwise secured continuous channel members 18 of heavy duty extruded aluminum or other suitable material. The bottom edges of the fabric sections through which anchor cable 14 runs are detachably secured to channel members 18. Each of the channel members 18 has an upstanding portion 19 which cooperates with a locking key 20 to retain the anchor cables 14 and bottom edges of the fabric sections in place. To detach the fabric sections from the channel members the locking key is removed and the fabric and cable removed. If air leakage is a problem flaps (not shown) can be secured continuously near the lower ends of the fabric sections on the inner side thereof, the loose ends of the flaps overlying the I-beam sections and the ground. As the air pressure in the enclosure is greater than atmospheric the flaps are pressed against the ground and I-beam sections forming a fluid seal against leakage.

One or more access openings 21 and 22 for personnel are provided as needed. The access openings include a frame defining the opening and a door therefor. The frame is connected to the fabric of the air-inflated enclosure to maintain uniform load distribution of the fabric around the opening. Various means of connecting the fabric of the enclosure to the frame of the access opening are known. Preferably an opening is cut in the fabric which is generally circular and a flexible cable 23 enclosed along the edge of the opening. A flexible boot 24 of similar material of which the enclosure is made is secured around the frame of the access opening in airtight relation by batten boards, by the means used to secure the bot-

tom edges of the enclosure to the base support, or by other known and conventional means. The free end of the boot is then stitched or otherwise secured in airtight relation to the enclosure. The extreme ends of cable 23 are anchored to the base support by suitable means.

For big equipment such as trucks and other machinery needed for the drilling operation access to the interior of the air supported enclosure is provided through a double-door air lock structure. An opening 25 of generally circular shape is cut, preferably in the end of one of the hemispherical end sections. A flexible cable 26 is enclosed along the edge of the opening and anchored at each end to the base support. The double-door air lock structure is joined to the enclosure by a boot 27 in the same manner that access openings 21 and 22 are joined or by other conventional means.

The mast of the drilling rig used in the drilling operation extends through the roof of the air-inflated enclosure 10 and is enclosed to prevent air loss from the interior of the enclosure. In most oil well drilling operations today portable deep well-drilling equipment is used. Various types of drilling rigs can be enclosed using the system herein. For example, rigs which are transported to the drilling site in sections and assembled at the site can be used. A popular type of drilling rig used is a raised floor cantilevered mast manufactured by the Lee C. Moore Corporation. Regardless of the type drilling rig used the enclosure is detachably secured around the upper part of the mast in airtight relation so that there is no substantial load from the enclosure exerted on the mast. Because air-inflated enclosures distort under wind loads the fabric of the enclosure cannot be directly connected to the mast without the possibility of incurring load concentrations which could cause failure of the fabric and unduly load the mast. As shown in FIG. 1 the upper part of the mast extends through an opening 28 in the center section 11 of the air-inflated enclosure 10. The opening is preferably circular. Around the opening a flexible cable 29 is enclosed. When the enclosure is inflated the cable is under tension. A boot 30 is secured in airtight relation to the fabric around opening 29 and detachably secured to frame members around the mast by batten boards fastened to the frame members or by securing the boot in a channel member 30a with a locking key 30b as shown in FIG. 7a, the channel member being rigidly secured around the mast. The boot 30 is secured so that it is not under tension.

Means for enclosing the mast to prevent loss of air from the interior of the air supported enclosure are provided. The part of the mast extending above the top of the air-inflated enclosure can be enclosed by sheathing such as shown in FIG. 7 or by an air-inflated boot which completely surrounds the upper part of and is free of the mast. As an alternative the upper part of the mast can be left open and the lower part of the mast extending down into the enclosure sheathed. Exit flaps are provided in this instance for entry and exit of personnel and drilling equipment. The preferred means of enclosing the mast is that shown in FIG. 7. Referring to FIG. 7 mast 31 extends through the opening 28. The upper part of the mast from the crown assembly thereof to the point where it extends through the roof of the enclosure is sheathed with the same material from which the air supported enclosure is made or with plywood, sheet steel or similar materials. A racking platform 32 extends outwardly from one side of the mast 31 about one-half of the way up the mast. The racking platform is used to hold the drilling pipe during drilling operations. To enclose the racking platform a frame 33 of wood or steel is built around the racking platform. The frame extends downwardly beneath the platform so that personnel working on the racking platform are within the enclosed system. If a cantilevered mast of the type shown in FIG. 7 is used the cable coming from the crown block is enclosed within a frame structure and sheathed.

The sheathing is overlapped and laced to the framework of the mast if fabric material is used. If plywood or other sheet materials are used as the sheathing they are bolted or otherwise secured to the mast framework in airtight relation.

For safety reasons an access opening and cable leading to the ground are usually provided adjacent the racking platform so that the crew man or men working on the platform can escape quickly in the event of a major gas blowout.

FIG. 8 illustrates an alternative way of enclosing the upper part of the mast extending through the roof of the air supported enclosure. A boot 34 of flexible, water-impervious gastight material encloses and is completely free of mast and racking platform extending above the roof of the air supported enclosure. The boot is secured to the opening 28 through which the mast extends by stitching or other conventional means. Guy wires 35 are used to secure boot 34 against wind loading.

FIG. 9 illustrates a third way of enclosing the mast. In this instance the mast is not enclosed except for a portion of the area around the drilling platform of the rig. A boot 36 extends from opening 28 down to the drilling platform. The diameter of the boot is made sufficiently large that drilling pipe hanging from the racking platform is clear of the boot. An access opening 36a is provided in boot 36 for entry and exit of personnel and drilling equipment. The opening, as shown, is a narrow elongated opening having flaps extending down the length of both sides. The flaps overlap and, because of the higher air pressure on the interior of the enclosure prevent substantial air loss through the access opening.

Rather than enclose the mast with sheathing or surround it with a hood or boot of flexible, water-impervious, gastight material loss of air through the opening created by the mast extending through the roof of the enclosure can be prevented by use of a dynamic air passage that remains continuously open without loss of internal air pressure. Means are provided for directing pressurized air into the passageway in amounts sufficient to prevent air exhaust through the passageway so as to maintain a predetermined positive pressure within the air supported enclosure. Blower means (not shown) are provided to draw air inwardly from the ambient atmosphere through an external grillwork and to discharge air through the louvered sections into the passageway. More than one such blower means may be provided depending on the configuration of the passageway and the amount of air needed. Reference may be made to Ser. No. 706,285, filed Feb. 19, 1968, now Pat. No. 3,561,174 hereby incorporated by reference, for disclosure of the dynamic air passage.

As shown in FIGS. 1 to 3 the air inflated enclosure is made up of independent sections which are joined together to form the complete enclosure. The enclosure includes a center section 11 and hemispherical end sections 12 and 13. If it is desired to make the structure larger additional center sections may be provided. The center and end sections are detachably joined together so that the structure can be quickly assembled and disassembled for moving to a new drilling site. The longitudinal edges of the center section are joined to corresponding edges of the end sections by a means shown in FIGS. 13 and 14. As shown in FIG. 14 the edges of the center and end fabric sections are looped back on themselves and stitched to form looped edge portions 37 and 38. The looped edge portions of both the center sections and end sections are then severed transversely of the loop at regularly spaced intervals to form a plurality of individual looped edge portions. The individual looped edge portions of the center section are alternately overlapped and underlapped with corresponding looped edge portions of the end sections and cables 40 and 41 extended through the overlapped and underlapped portions to hold them together. As shown in FIG. 13 the looped edge portions are alternately overlapped and underlapped with complementary looped edge portions of the adjoining fabric section. The looped edge portions are preferably reinforced with a sleeve 39 of material such as polytetrafluoroethylene which strengthens the looped edge portions and reduces the friction between the cables 40 and 41 and the edge portions so that the cables can be more easily inserted and removed from the loops. When the structure is inflated the pressure on the inside of the structure, being greater than that on the outside, holds

the joint between the fabric sections together in substantially airtight relation. It is possible to provide modular components to form structures of varying sizes and shaped to meet service requirements. The double cable connection provides a simple connection capable of uniformly transferring high tension and shear loads. The fabric sections can be laced together and unlaced in a minimum amount of time. The ends of cables 40 and 41 are secured to the base support by means of eye bolts secured to the I-beam sections or by other suitable means. Instead of conventional cable the sections may be laced together with a cablelike material which disintegrates on activation by a blasting cap. Such a material is sold under the trademark "Primacord."

During a typical oil well drilling operation noxious gases emanating from the wellhead are common and must be removed from the enclosure for safety and well-being of the personnel working within the enclosure. Venting means 50 are provided for continuously exhausting gases from around the wellhead at the rate of about 3,000 cubic feet per minute. This is sufficient under normal drilling conditions. In the event of a major gas blowout wherein very substantial amounts of gas are released a quick-release emergency system is provided capable of venting an additional 500,000 cubic feet per minute. Venting means are not needed if the mast is left open to the atmosphere as shown in FIG. 9. However, where the mast is enclosed as shown in FIGS. 7 and 8 a venting system must be provided.

The venting system 50 for continuously venting noxious gases at the rate of about 3,000 cubic feet per minute is shown in FIG. 5 and includes a series of flexible conduits 51 leading from the wellhead directly through the enclosure to the atmosphere or to common exhaust duct 52 which extends through an opening in the air supported enclosure. Flexible conduits 51 extend at spaced intervals from plate 53 which fits over the wellhead on the drilling platform. The drilling stem 54 extends through an opening in the plate.

During drilling operations the volume of noxious gases may be in excess of that which can be handled by the conduits but less than that considered necessary to warrant activation of the quick release system. An auxiliary system 55 is provided capable of venting intermediate amounts of gas, for example, in the range of 5,000 to 10,000 cubic feet per minute. This system is shown in FIG. 5 and comprises a releasable hood 56 in fluid communication with common duct 52. The releasable hood, when not needed, is pivoted upwardly around pivot point 57 in an out of the way position as shown in FIG. 5. When needed the duct is released by a suitable release mechanism and allowed to fall over the wellhead. As the air pressure in the interior of the enclosure is greater than atmospheric the gasflow is to the outside of the enclosure. Hood 56 has a slot 58 therein which allows it to fall around the drill stem 54 extending through the wellhead.

In the event of a major blowout, neither of the venting systems previously described is adequate to vent amounts of gas necessary. In the event of such a blowout quick-release means must be provided to vent large amounts of gas out of the enclosure without damage to the enclosure. Referring to FIG. 10 an extendible sealing member 60 operable to isolate the area around the wellhole from the remainder of the enclosed area on release is illustrated. Simultaneously with release of the sealing member an opening in the sheathing is provided in the upper part of the mast extending above the enclosure. The sealing member 60, in extended form, is an elongated hollow cylinder of sufficient length to extend from the roof of the enclosure to the top surface of the drilling platform. The sealing member may be made of the same type material as the air supported enclosure. The upper end of the sealing member is secured in airtight relation around opening 28 in the center section of the enclosure. When not needed the sealing member is reefed and suspended above the wellhead. It is secured for quick release. Various release means may be provided. One means of quickly releasing the sealing member is to tie it in place with "Primacord" cable which dis-

integrates on activation by a blasting cap. When released, the sealing member falls by gravity around the wellhead, isolating the remainder of the enclosure from the noxious gases issuing from the well hole. Signal means of a conventional nature are provided to release the sealing member. A heavy metal ring or other weight is preferably secured in the hem of the lower edge of the sealing member to hold it around the wellhead when released. Simultaneously with the drop of the sealing member vent holes are opened in the upper portion of the mast to allow the gases to vent into the atmosphere. The signal means actuating release of the sealing member also opens the vent holes in the upper mast. If the upper mast is sheathed with plywood panels or other structurally rigid material openings are cut in a sufficient number of panels and covered with spring biased doors. The doors are normally held closed by a conventional release catch, which on receipt of a signal, releases the doors. If a gastight, water-impervious fabric is used to sheath the upper mast, vent openings are created by lacing the fabric with "Primacord" rope. On receipt of the signal the "Primacord" rope disintegrates and splits the fabric.

Controls for activation of the quick-release system are provided adjacent the personnel access openings and on the drilling platform so that the system can be quickly activated if needed.

The double-door air lock structure 70 includes side walls 71 and 72 which are hinged together at the apex 73 thereof as seen in FIG. 11. The sidewalls may be made of sections of corrugated steel or gastight, water-impervious, flexible fabric stretched over and secured to spaced framing elements. The bottom edges of the sidewalls preferably have spikes 82 formed thereon to assist in holding the sidewalls in place, once erected. The sidewalls are secured in place with guy wires 83. Cables 84 extend along the ground between the sidewalls and are secured thereto to prevent expansion of the sidewalls beyond the length of the cables 84. The sidewalls preferably extend through opening 25 in the end section of the air supported enclosure a few feet so there is no danger of snagging the fabric of the enclosure during opening or closing of the sliding doors 74 which ride on rail 75 extending across the access opening 78. Boot 27 is detachably secured in airtight relation to the sidewalls with batten boards secured to frame members on the sidewalls or by other suitable means. End walls 77a and 77b are detachably secured to the open ends of the sidewalls. The end walls, made of a structural material such as wood, steel, etc., have openings 78 covered by sliding doors large enough to allow trucks and other machinery to pass therethrough. The inflated enclosure shown in FIG. 1 is 150 feet wide, 300 feet long and 60 feet high. The double-door air lock is 65 feet long with the opening in the end walls being about 15 feet wide and 18 to 25 feet high. If rigid corrugated sections are used to fabricate the air lock structure, each section is provided with flanges 79 on both edges which extend the length thereof. The flanges have regularly spaced openings along the length thereof for insertion of removable pins 80 to secure the sections together, as shown in FIG. 12. The end walls 77a and 77b are also detachably secured to the wide walls by removable pins. A sealing strip of rubber or other suitable elastomeric material 81 may be interposed between the end walls and sidewalls and between the sidewall sections to prevent loss of air pressure within the air lock.

METHOD OF ERECTION

The enclosure of this invention is fabricated in sections so that it is portable. Erection of the air supported enclosure requires no specialized equipment or personnel and the structure, as large as it is, can be erected in a relatively short period of time so that preparation of a new drilling site is not unduly prolonged. On selection of a suitable drilling site the site is prepared by grading and leveling. Pilings are positioned to support the drilling rig. The entire area to be enclosed is then covered with gravel or other suitable material. The drilling rig is then positioned to be supported by the pilings. Various types

of drilling rigs can be used. If a cantilevered mast is used similar to that shown in FIG. 2 the mast is left in horizontal position and the boot 30 secured around the mast at the point where it extends through the roof of the enclosure. If a drilling rig is used in which the mast is erected in sections, the boot 30 is secured around the section which extends through the roof of the enclosure prior to hoisting of the section in place.

The prefabricated double-door air lock may be erected during positioning of the drilling rig. As mentioned the double-door air lock consists of hinged sidewalls 71 and 72 preferably formed of sections of corrugated steel held together by removable pins, and detachable end walls having access openings therein large enough to permit trucks and other heavy machinery to enter and exit. The hinged sidewalls are positioned and anchored in place with guy wires and the end walls secured to the open ends of the sidewalls with removable pins. At the same time the perimeter of the area to be occupied by the air supported enclosure is marked off and I-beam sections 18 are laid around the perimeter of the area and butted together to form the base support. Each of the I-beam sections are anchored to the ground with ground anchors driven into the ground. Guy wires extending from the ground anchors are secured to the I-beams. The enclosure shown in the drawings is in three sections, although more sections can be used if needed. The three sections include a center section and two hemispherical end sections. Running along the lower edges of the fabric sections is a bead formed by a cable, rope or the like which is secured in channel members 18 running along the top of the I-beam sections by locking keys 20. The end section adjacent the double-door air lock is detachably secured to the boot 27 extending around opening 25 as previously described.

The center section in which the opening for the mast is provided is secured to the mast by boot 30 as shown in FIG. 7 and the mast raised or hoisted into drilling position. The mast may or may not be guyed depending on the design of the mast. After erection of the mast the looped edge portions of the center section and end sections are laced together. The powered portable blower is secured in place and the structure inflated.

When the drilling operation is completed the air supported enclosure can be quickly disassembled for movement to another site. To disassemble, the enclosure is deflated and the cables interconnecting the center section and two end sections are pulled free to separate the sections. The mast of the drilling rig is lowered or taken apart. At the same time the lower edges of the fabric enclosure are released from the base support. There is no need to remove the center section from the mast. Instead the fabric is reefed and secured about the mast with ropes or cables. The two end sections are pulled free of their base supports and folded for movement to the new location. The I-beam sections forming the base support are cut free of the guy wires extending to the ground anchors. The ground anchors are left at the site and not removed. The materials are then trucked to the new site and reassembled in the manner described.

The enclosed system of this invention offers a means of protecting men and equipment from severe weather conditions encountered in semiarctic areas, erection of the system being performed in a minimum amount of time to avoid adding to the time currently required to break down and erect a drilling rig. Erection and disassembly of the enclosed system can be carried out with nonspecialized personnel using equipment locally available. The enclosed system is also adaptable to various types of drilling rigs and requires no specialized equipment. The anchoring system which holds the enclosure in place can withstand wind conditions up to 100 miles an hour.

I claim:

1. An enclosed system providing a shelter large enough to permit unhampered drilling operations comprising;
 - a base support
 - anchoring means secured to the base support for anchoring said base support to the ground,

an air inflated structure of foldable, gastight, water-impervious material surrounding a drilling site and drill rig of a drilling operation having an opening in the roof thereof through which the upper part of the mast of the rig extends, the air-inflated structure subjected to flexing movement responsive to wind loading applied thereto,

a flexible cable secured around the edge portions of the opening in the structure, the cable being under tension on inflation of the structure,

a boot of flexible, airtight, water-impervious material surrounding the mast and detachably secured thereto in airtight relation and extending into connection around the opening in the structure to close the opening through which the mast extends, the boot adapted to flex relative to the cable and air-inflated structure without transfer of substantial loads to the mast,

means for detachably securing the lower edges of the air-inflated structure to the base support in airtight relation,

means enclosing the mast to prevent air loss from the interior of the structure, and

means for inflating and keeping inflated the structure.

2. The system of claim 1 including access means for men and equipment extending therinto.

3. The system of claim 1 including venting means for continuously removing noxious gases generated during the drilling operation from the interior of the air-inflated structure.

4. The enclosed system of claim 1 wherein the means for enclosing the mast comprises sheathing secured in airtight relation around the upper portion of the mast extending from the boot connection to the mast to the top thereof.

5 The enclosed system of claim 1 wherein the means for enclosing the mast comprises an air-inflatable boot of flexible, gastight, water-impervious material having its lower edges secured in airtight relation to the structure around the opening through which the mast extends, the boot completely covering the portion of the mast extending through the opening, and guy means for securing the boot to absorb wind loading.

6. The enclosed system of claim 1 wherein the means for enclosing the mast comprises an enclosure secured in airtight relation around the lower portion of the mast between the drilling platform and the boot surrounding the opening in the air-inflated structure, and access means in the enclosure for entry and exit of equipment and personnel.

7. The enclosed system of claim 1 wherein the base support comprises structural I-beam sections butted together to form the outer perimeter of the area to be enclosed by the air-inflated structure.

8. The enclosed system of claim 7 wherein the means for detachably securing the lower edges of the air-inflated structure to the base support comprises (1) channel members having external grooves therein rigidly secured to the upper surfaces of each of the I-beam sections, (2) an elongated locking key for each of the channel members adapted to fit in the external groove of the channel member, the lower edges of the air-inflated structure trained within the external grooves of the channel members and held in place by the locking key.

9. The enclosed system of claim 1 including an emergency venting system for venting large volumes of noxious gases from the interior of the structure without deflation thereof.

10. The enclosed system of claim 9 wherein the venting system includes sealing means operable to isolate the area around the wellhead from the remainder of the structure, thereby allowing the noxious gases to be vented to the atmosphere in the area where the mast extends through the roof of the air supported structure.

11. The enclosed system of claim 10 wherein the sealing means includes an elongated hollow cylinder of flexible gastight material secured in airtight relation at one end around the opening in the structure and extendible to the drilling platform to isolate the wellhead from the remainder of the structure, the sealing means normally suspended above the drilling area and adapted to extend to the drilling platform on release by gravity,

means for suspending the sealing member above the well-head

release means for releasing the sealing member on the receipt of a signal, and

signal means signaling release of the sealing member.

12. The enclosed system of claim 1 wherein the air-inflated structure includes walls and roof formed of a plurality of mating panels of foldable, gastight, water-impervious material joined together along their edges,

means detachably interconnecting the joined edges, said means comprising reinforced looped portions on each of the edges joined together, the looped portions of each of the edges arranged to alternately overlap and underlap, and flexible cables extending through the mated overlapped and underlapped looped portions to interconnect them.

13. The enclosed system of claim 2 wherein said access means includes a double-door air lock comprising (2) a pair of sidewalls hinged together at the apex thereof detachable secured in airtight relation at one end to the air-inflated structure, (2) end walls having closable openings therein detachably secured in airtight relation to the opposite ends of the sidewall, and (3) means anchoring the air lock structure to the ground.

14. An enclosed system providing a shelter large enough to permit unhampered drilling operations comprising:

a base support,

anchoring means secured to the base support for anchoring said base support to the ground,

an air-inflated structure of foldable, gastight, water-impervious material surrounding a drilling site and drilling rig of a drilling operation having an opening in the roof thereof through which the upper part of the mast of the rig extends, the air-inflated structure subjected to flexing movement responsive to wind loading applied thereto,

a flexible cable secured around the edge portions of the opening in the structure, the cable being under tension on inflation of the structure,

a boot of flexible, airtight, water-impervious material surrounding the mast and detachably secured thereto in airtight relation and extending into connection around the opening in the structure to close the opening through which the mast extends, the boot adapted to flex relative to the cable and air-inflated structure without transfer of substantial loads to the mast,

means for detachably securing the lower edges of the air-inflated structure to the base support in airtight relation,

means providing and directing pressurized air across the opening created by the mast extending through the roof of the structure in amounts sufficient to prevent air loss through the opening so as to maintain a predetermined positive pressure within the structure and

means for inflating and keeping inflated the structure.

15. The system of claim 1 wherein the means providing and directing pressurized air includes blower means adapted to draw in air external to the air-supported structure, compress the indrawn air, and discharge the compressed air through louvers oriented to direct the air stream.

16. A method of erecting an air supported enclosure around an oil well drilling operation which utilizes the mast of the drilling rig to assist in erection of the air supported enclosure, the enclosure having its lower edges detachably secured in airtight relation to a base support and composed of a plurality of panels of foldable, gastight, water-impervious material joined together in airtight relation along their edges, comprising

securing in airtight relation one of the panels to the mast of the drilling rig so as to allow the upper portion of the mast to extend through the roof of the air-inflated enclosure when inflated without any load from the enclosure being exerted on the mast,

erecting the mast into drilling position,

joining the free edges of the panel secured to the mast to complementary edges of the adjacent panels to form a unitary enclosure, and

inflating the enclosure.