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Holmes

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[54] **PORTABLE HOISTING AND EVACUATION APPARATUS**

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[52] **U.S. Cl.** **187/6,** 182/73, 254/142, 254/154

[51] **Int. Cl.** **A62b 1/02**

[58] **Field of Search** 254/142, 151, 154, 188; 212/145; 182/3, 73; 187/6, 7, 11, 10, 12, 20, 27

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Primary Examiner—Evon C. Blunk
Assistant Examiner—Jeffrey V. Nase

[57] **ABSTRACT**

A portable emergency hoisting method and apparatus are described for use with ground level winching apparatus for moving equipment and personnel about and in rescue operations from the exterior of high rise buildings and the like. Light weight flexible cables are provided with quick release snap shackles for coupling to or about existing building structures, snatch pulleys and loads. A ladder and a cage are provided for hauling equipment and personnel to or from a roof or window on the face of a building. Additionally, anchor cables and snatch pulleys are provided for moving a load line and the cage, if necessary, to other parts of a building without requiring a significant modification or movement of an initial hook-up of anchoring cables and pulleys or ground located winching apparatus. The apparatus described may be deployed and placed in operation within a matter of minutes and moved as rapidly when circumstances require. All equipment and cables are provided with quick release safety coupling members eliminating the use of conventional clamps, nuts, bolts and tools which are easily dropped, lost or misplaced in the confusion of an emergency, and are time consuming to install.

37 Claims, 18 Drawing Figures

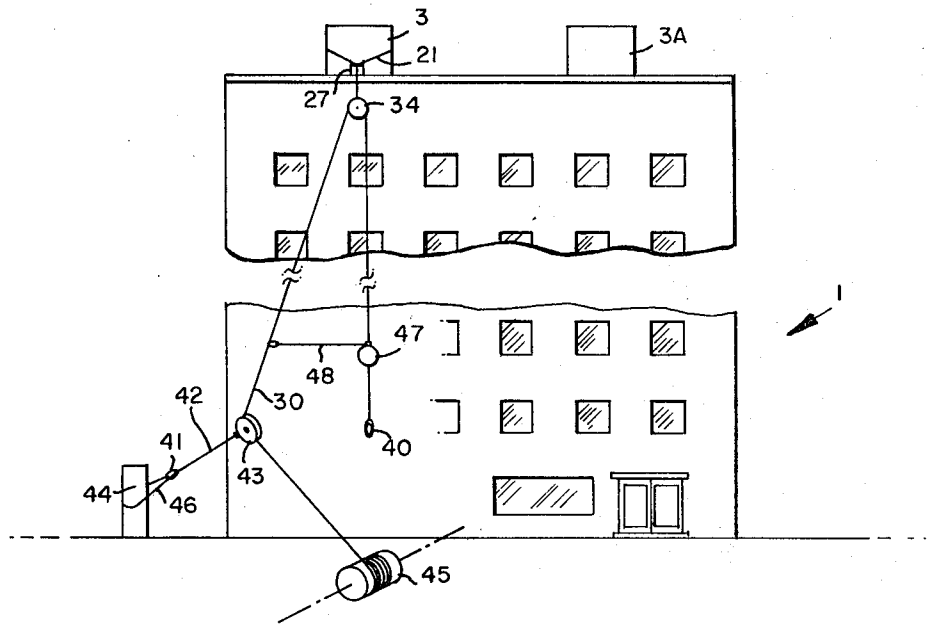


FIG. 1B

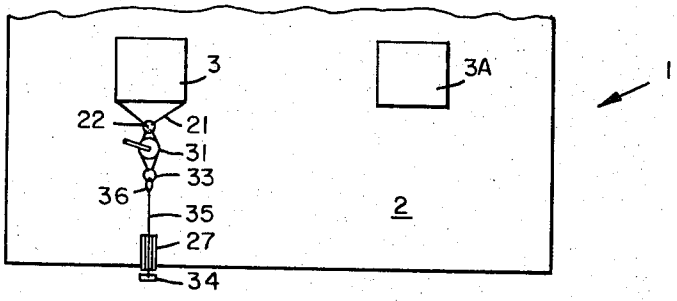
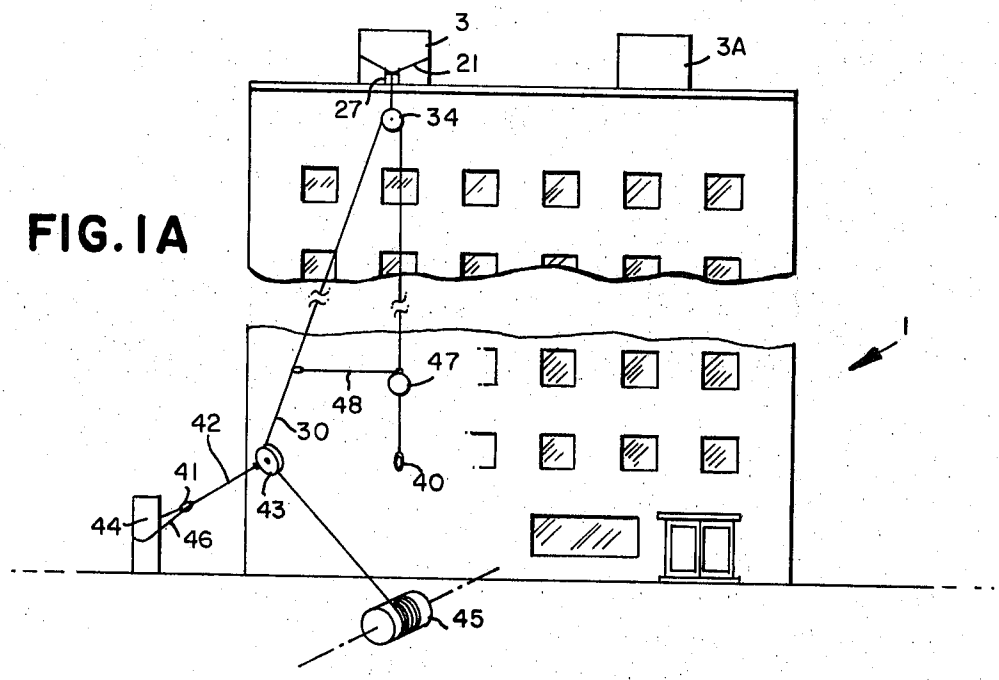


FIG. 1A



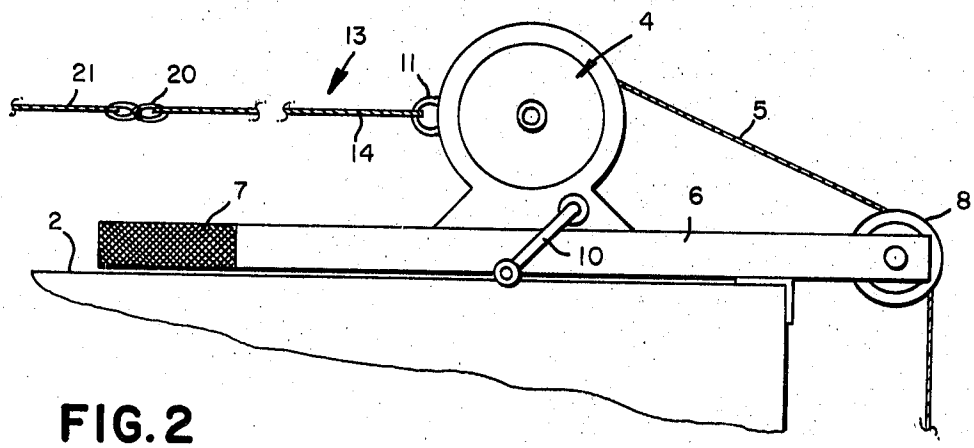
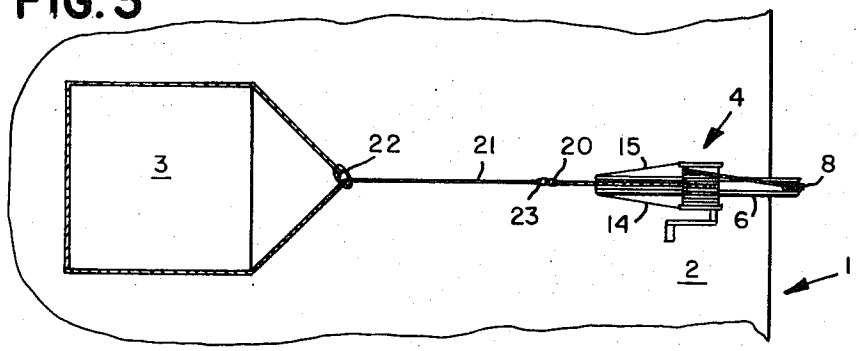


FIG. 2

FIG. 3



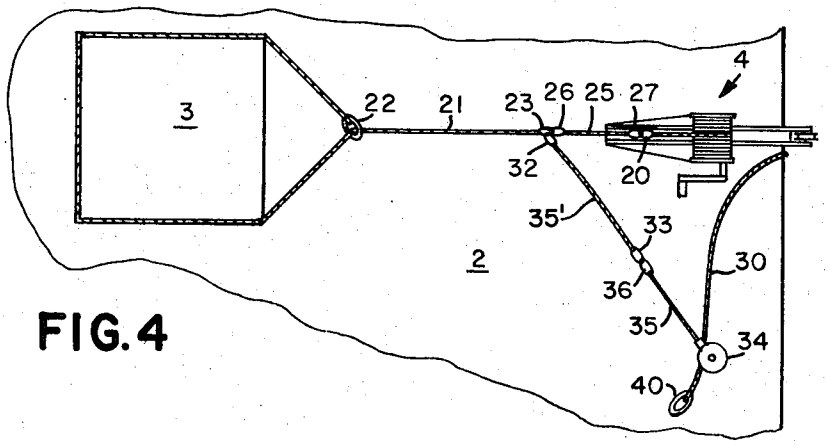


FIG. 4

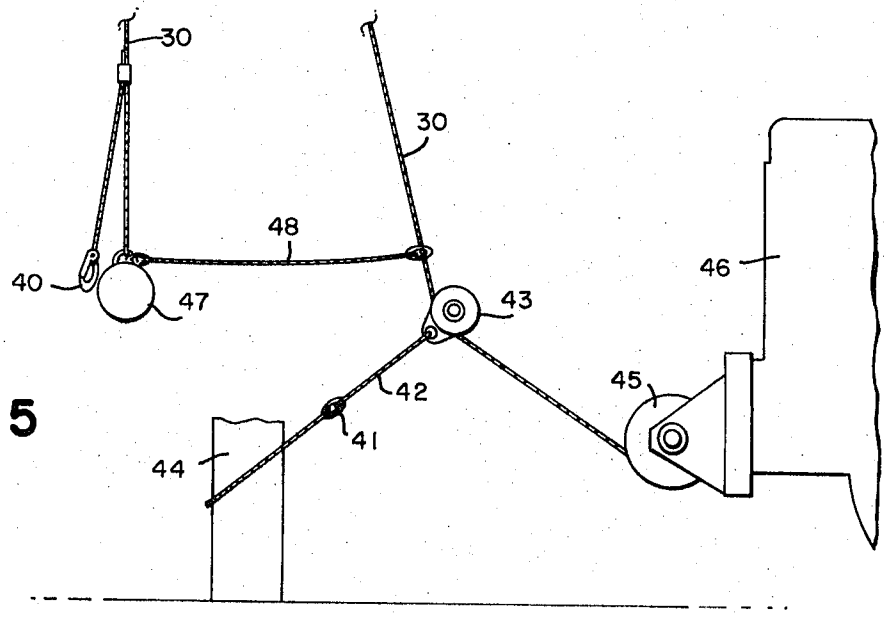


FIG. 5

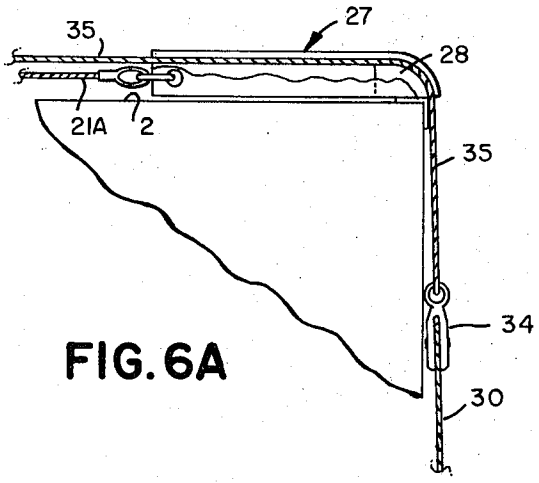


FIG. 6A

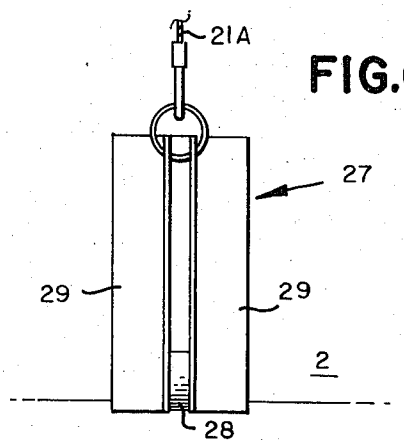
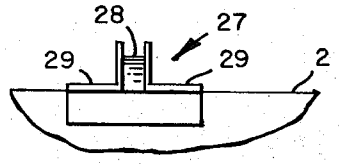


FIG. 6C

FIG. 6B



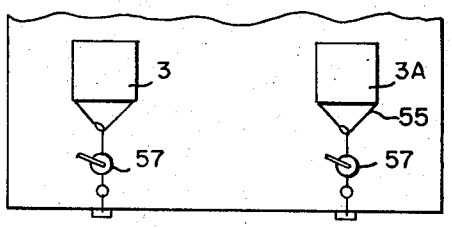


FIG. 7B

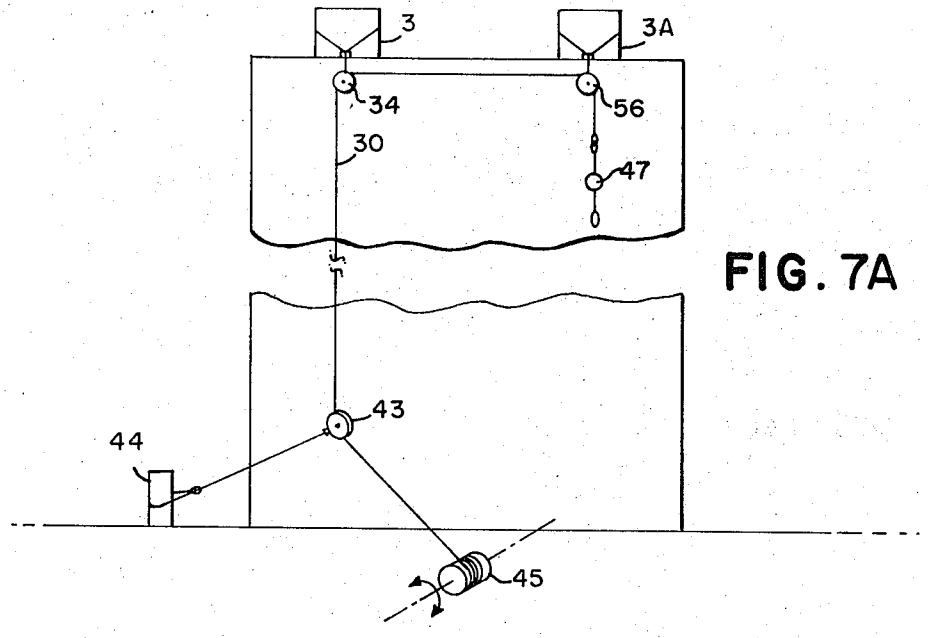


FIG. 7A

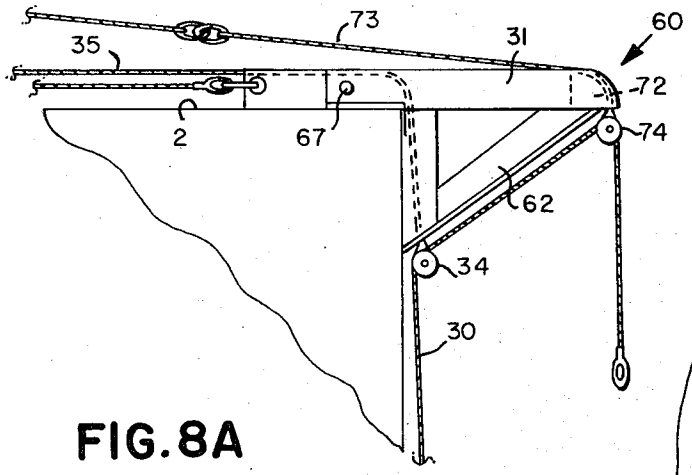


FIG.8A

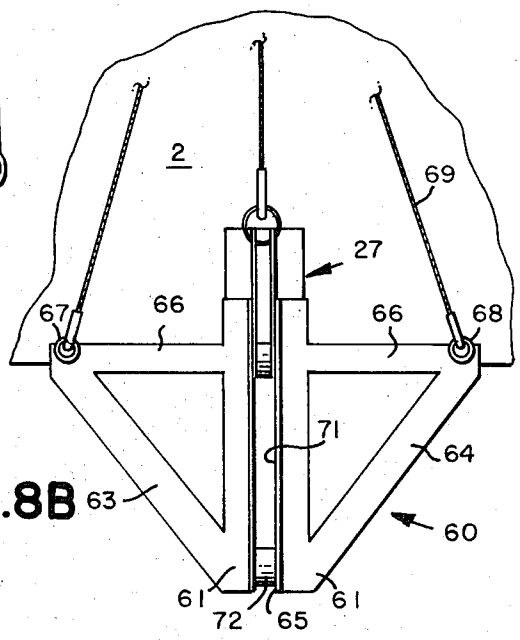


FIG.8B

FIG.9

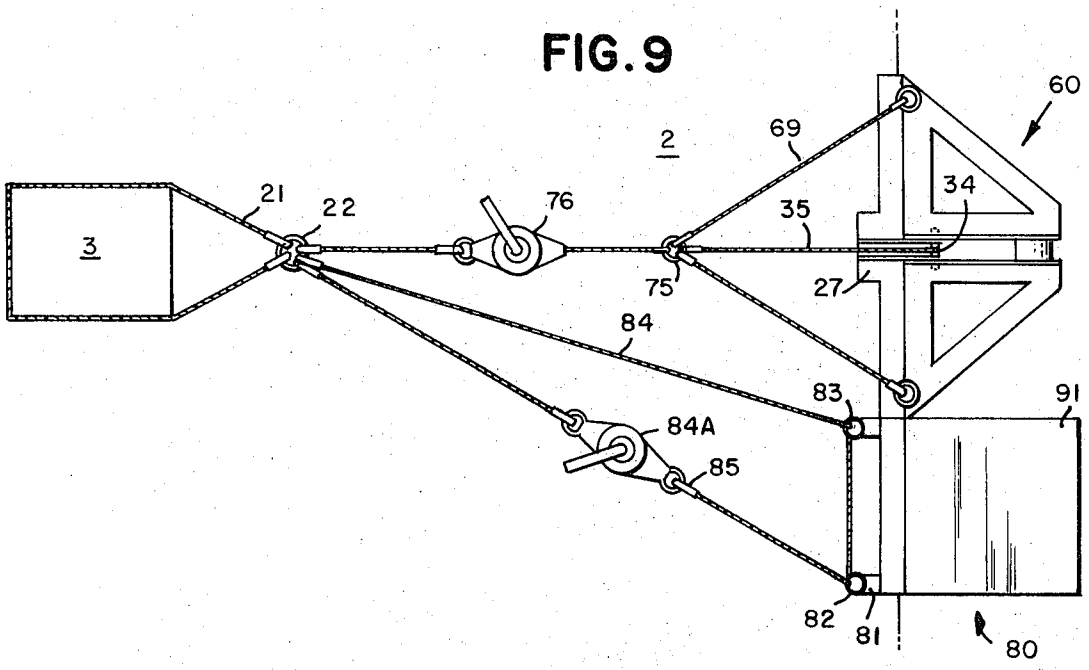
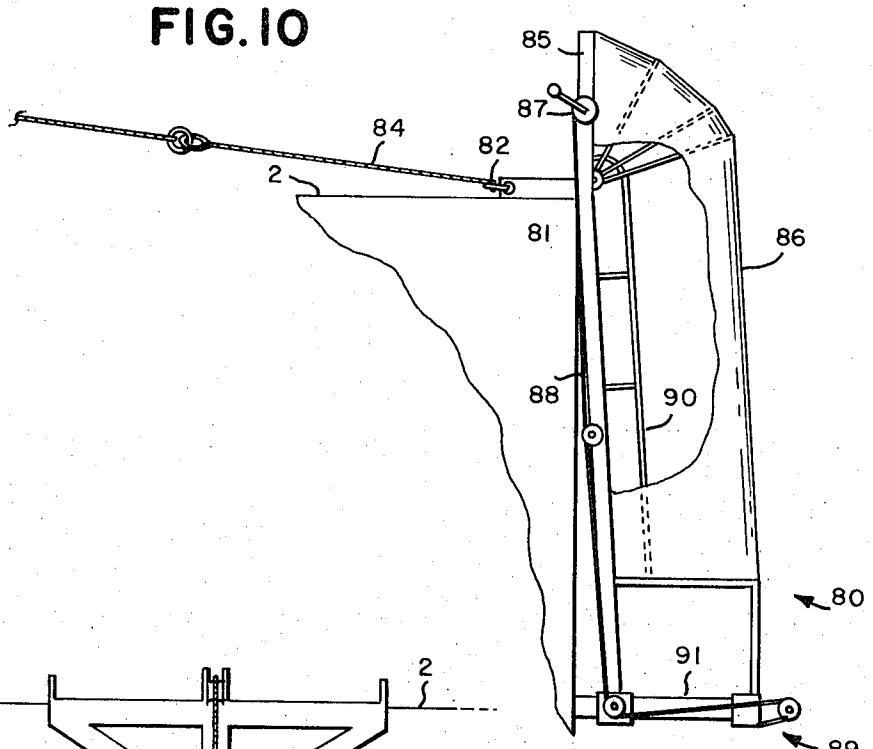


FIG. 10


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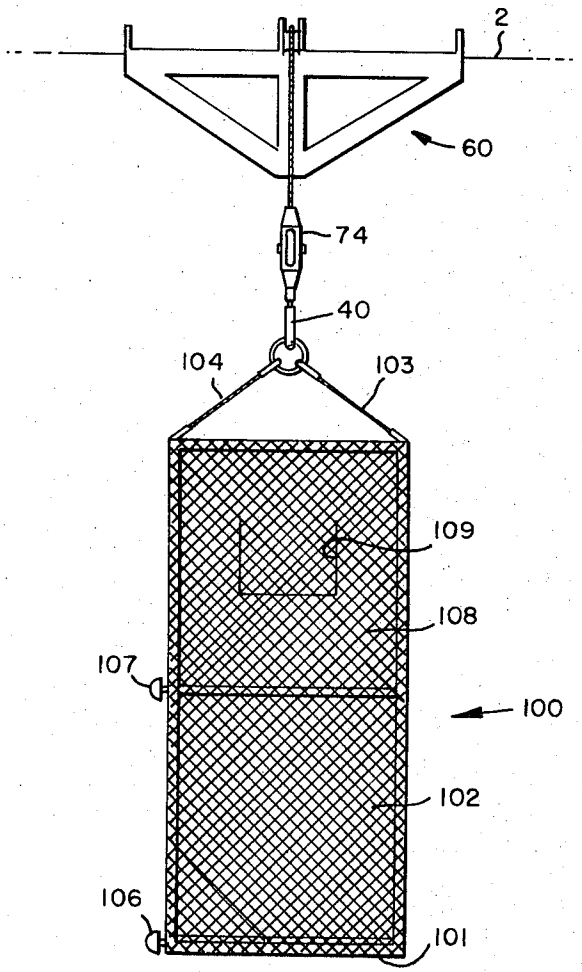

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FIG. 11

FIG. 12

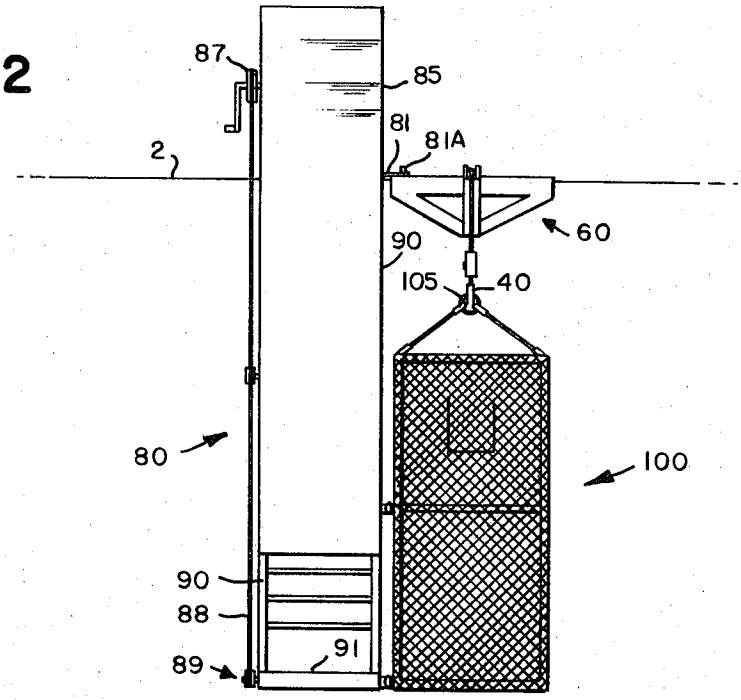
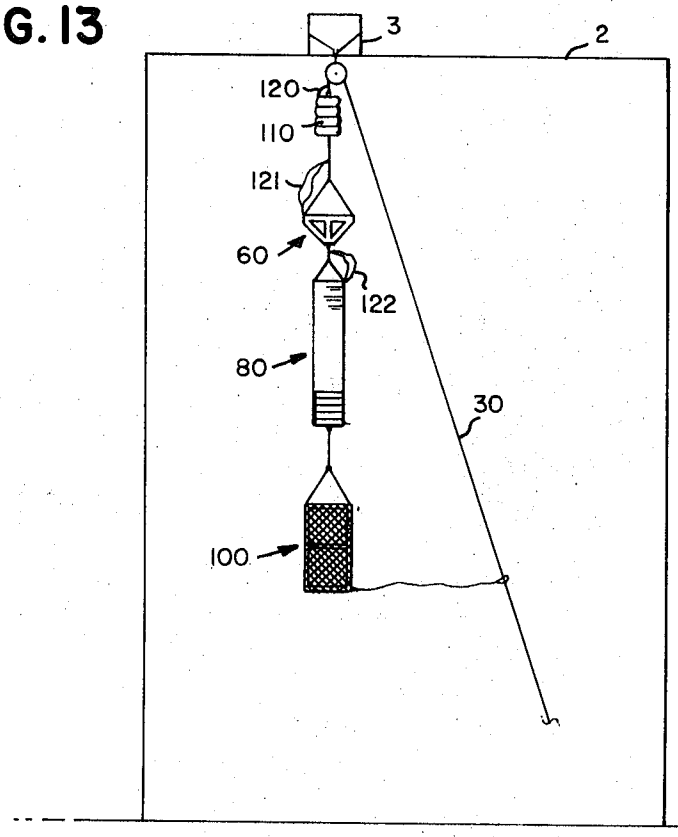

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FIG. 13


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PORTABLE HOISTING AND EVACUATION APPARATUS

BACKGROUND OF THE INVENTION

In situations where a building is on fire and has no water, power, or elevators, and stairwells are blocked by smoke, present fire-fighting and rescue techniques have proven inadequate whenever it is necessary to carry out such operations, especially beyond the seventh to tenth floors. In such circumstances, persons trapped on these or higher floors are often presented with no alternative but to jump to their almost certain deaths or perish from fire or smoke.

Heretofore, many schemes have been proposed for the rescue of persons trapped in buildings under such circumstances. In most every instance, however, the schemes proposed have required the use of permanent fixtures attached to the sides or roof of a building and, in no known instance, have such fixtures ever been utilized on buildings higher than seven to 10 stories. For the most part, such fixtures have consisted of ladders and stairs, wheels and pulleys and permanent crane-like devices for lowering balconies and baskets from windows. Others have been manually operable block and tackle arrangements slung from windows.

In schemes not using permanent fixtures, cannons or similar devices have been proposed for shooting a grappling hook or the like onto or over a building or through a window for anchoring some sort of personnel carrier. Needless to say, such methods do not provide for the hoisting of equipment for fighting a fire and are not reliable, or are, at best, inadequate for the rescue of people from present high-rise buildings reaching 50 or more stories.

In cases where permanent fixtures are provided, there is required a program of training and maintenance to ensure reliable and proper operation of the equipment in the event of an emergency. In practice, however, personnel who are trained are generally insufficiently trained to use and maintain the equipment. The equipment is frequently tampered with, deteriorated by the elements and, in many cases, there is no provision or procedures for moving the equipment quickly and easily as circumstances may require in an emergency. Moreover, in the event of a loss of power in a building, there is frequently no means for transporting people to the permanent escape equipment, and certainly none for hoisting needed equipment to the location of an emergency.

There is, therefore, a present and urgent need for a portable hoisting system including emergency evacuation apparatus which may be rapidly deployed and operated on any building, regardless of size, regardless of the existence and condition of permanently installed equipment, and regardless of the availability of water pressure or power in the building.

SUMMARY OF THE INVENTION

To cope with the problem of an emergency, such as a fire, and, more importantly, the rescue of people, there is described herein a method and apparatus for deploying in a matter of minutes a portable emergency hoisting system for equipment, personnel and rescue operations in any high-rise building or other environment presenting similar problems. The system described comprises flexible, easily movable anchor slings with quick release snap shackles which are used to secure a primary line or system to or about an existing fixed structure in or on a building. While a primary anchor line is deployed on the building, a trolling line is reeled to ground level to pick up a load line. Upon retrieval, the load line is reeved in a snatch pulley releasably secured to the primary anchor sling by a length of line and a hand-powered winch. The load line is then overhauled to ground level by an appropriate weight, such as a bag of roof gravel or the like, and the hand-powered winch used to adjust the length of the anchor system to position the pulley to provide clearance relative to the building. The load line is then coupled to a power winch on the ground, as on a fire truck, for immediately providing the power necessary to hoist other equipment up the exterior of the building.

When a rescue operation is required, a bracket, a ladder and a collapsible steel fish-net cage are releasably coupled to the load line and hoisted to the roof or any desired floor of the building by means of the winching apparatus coupled to the load line. When in position, the bracket is removed from the load line and placed between the pulley and the building to provide clearance for the cage. The ladder is removed from the load line and secured at its upper end to the building and at its lower end to the cage. An adjustable outrigger or stand-off is provided in the base of the ladder to adjust the distance between the base of the ladder and the building to facilitate use of the ladder and entry therefrom into the cage.

If a rescue operation from another part of the building is required, the cage is lowered to the ground. The load line is captured in a second snatch pulley on the building, slackened and pulled, without repositioning of the first pulley, to the desired location, at which point it is releasably anchored in the building by means of a second flexible sling. All coupling and decoupling of cables and equipment are done with quick-release safety snap shackles and clamping members which eliminate the use of clamps requiring nuts, bolts, and other fasteners and tools which are time consuming to use and are easily lost or misplaced in the confusion of an emergency.

In this manner, equipment and personnel may be carried to and rescue operations carried out from any point on the face of a building, quickly, reliably and safely.

While described in detail hereinafter with respect to a method and apparatus as used in connection with an emergency in a high-rise building, it is understood that the above and other objects, features and advantages of the present invention are applicable and have utility as well in other structural environments.

DESCRIPTION OF THE DRAWING

Accordingly, the present invention is described with respect to the accompanying drawings in which:

FIGS. 1A and 1B are elevation and plan views, respectively, of an initial hoisting system in accordance with the present invention.

FIG. 2 is a side elevation view of a reel and pole assembly used in the deployment of the initial hoisting system of FIG. 1.

FIG. 3 is a plan view of the deployment of reel and pole assembly of FIG. 2.

FIG. 4 is a plan view of the initial deployment of the initial hoisting system of FIGS. 1A and 1B before disengagement of the reel and pole assembly of FIG. 2.

FIG. 5 is an elevation view of the deployment of a ground level anchoring system in accordance with the present invention.

FIGS. 6A, 6B, and 6C are side and front elevation views and a plan view, respectively, of a roof softener in accordance with the present invention.

FIGS. 7A and 7B are elevation and plan views, respectively, of an expanded hoisting system in accordance with the present invention.

FIGS. 8A and 8B are side elevation and plan views, respectively, of a roof bracket in accordance with the present invention.

FIG. 9 is a plan view of the deployment of an escape ladder and the roof bracket of FIGS. 8A and 8B in accordance with the present invention.

FIG. 10 is a side elevation view of the ladder of FIG. 9.

FIG. 11 is a front elevation view of an escape cage in accordance with the present invention.

FIG. 12 is a front elevation view of the ladder and cage of FIGS. 9 and 11.

FIG. 13 is an elevation view of the single lift hoisting of the bracket, ladder and cage of FIGS. 8A, 8B, 9, 10 and 11.

DETAILED DESCRIPTION OF THE DRAWING

Present attempts to fight fires and rescue people trapped in a high-rise building have become tragically deficient, if not nearly impossible, due to the limitations of presently available equipment and conventional techniques particulary if the building involved is rendered helpless through lack of water pressure and loss of power and especially when the location of an emergency is higher than seven to ten stories above the ground level.

To effectively fight a fire and carry out rescue operations under such circumstances there is provided, in accordance with the present invention, apparatus and a method for the deployment of a portable hoisting system including evacuation equipment which is powered by an external winch and which includes means for anchoring to any existing building structure wholly independent of the availability of lack of water pressure, power or existing emergency equipment in or on the building.

For convenience, the system is described as comprising essentially three principal groups of prefabricated, pre-packaged equipment. The first group comprises a pair of equipment packs called roof packs which contain the equipment necessary for initially rigging a building from above ground level, such as from a roof, to provide a load line which is thereafter powered from the ground. The second group includes a ground pack which contains equipment for rigging the load line to ground level equipment. The third group is a portable escape stairway which is provided for use with a six-passenger, collapsible rescue cage. All of the equipment, as well as auxiliary equipment, is carried on an emergency vehicle having a winch for use in providing the power for the load line.

The system typically uses for deployment and operation a crew of five. Two crew members, conveniently called the high crew, are assigned to rig the equipment on the building, and three members are assigned to deploy, anchor and operate the ground level equipment. Ordinarily, one of the three ground crew members operates the winch, and the remaining two members of the ground crew couple material and equipment to the load line to be hoisted.

Upon arrival at the scene of a fire, such as in a 50-story high-rise building **1**, as illustrated in FIGS. 1A and 1B, a position, such as a roof **2** of building **1** will be designated to be taken by the high crew. The high crew will each take one of the roof packs, which are prepackaged fireproof fluorescent back-packs (one red and one blue), each weighing approximately 25 pounds, and proceed by way of a stairs or elevator to the designated position. In case these access ways are blocked as by fire, smoke or loss of power in the building, the crew and back-packs may be taken to or near the designated area by means of a helicopter. Upon reaching the designated position, the high crew will choose, as shown in FIG. **1**, a suitable anchor point **3**, such as an elevator penthouse, air conditioning machinery foundation, a door or other suitable structure found on most, if not all, building, and begin deploying the initial rigging.

It is important to note, at this point, that initially the most important operation to be performed is quickly obtaining a power hoist to the roof of the building in order that other equipment, such as a rescue cage, can be raised if needed. Accordingly, the roof packs, which must necessarily be hand carried, have been specially packed and weighted for this operation.

Referring to FIGS. **2** and **3**, one of the roof packs, the red pack for example, contains a reel and pole assembly comprising a high speed reel **4**, such as a sea fishing reel. Reel **4** is provided with at least 750 feet of 1/32-inch steel trolling cable **5** and is mounted on a 2-foot aluminum pole **6** having a handle **7** at one end and a pulley **8** at the opposite end. To facilitate packing and reduce space requirements, pole **6** is of a telescoping variety and reel **4** is provided with a conventional detachable mounting mechanism (not shown) for removably coupling the reel **4** to the pole **6**. Reel **4** is further provided with a crank **10** and a brake (not shown) for controllably paying out and retrieving the cable **5**. Provided at the rear of reel **4** is a pair of fittings **11** and **12** for coupling to a bridle **13** comprising a pair of lines **14** and **15**. The ends of lines **14** and **15** are terminated by a safety snap shackle **20** for releasably coupling reel **4** to an anchor line **21** as described in more detail with respect to FIG. **3**.

Snap shackle **20** and all of the snap shackles herein referred to are of a variety of commercially available shackles provided with a spring-biased clip or closure which prevents involuntary decoupling while at the same time permitting rapid voluntary coupling and decoupling to and from a line or other similar shackle. The use of snap shackles eliminates entirely the need for nuts and bolts, conventional clamps and tools, all of which are easily dropped, lost or misplaced in the confusion of an emergency, and which, at best, are time consuming in their use.

In addition to the reel assembly, which weighs about 8½ pounds, the red pack further contains one 50-foot sling provided with safety snap shackles at each end (4 pounds) for additional anchoring, if needed, a two-way radio (2 pounds), a fluorescent streamer with means for tying to the end of cable **5** for use when deploying cable **5** from reel **4** and a pair of line protective roof softeners (3 pounds).

The other of the roof packs, designated a blue pack, contains two 20-foot slings with snap shackles on each

end for anchoring (8 pounds), one signal flashlight with a red lens for night operations (1 pound), one 2-ton, manually operable winch commonly called a come-along (9 pounds) for anchor length adjustments, and two 4-inch snatch pulleys for carrying a load line in a simple and expanded system. Both the manual winch and the snatch pulleys are commercially available items which are modified to include snap shackles. The manual winch is provided with a reel of cable and a hand crank or lever which is moved to deploy or retrieve the cable on the reel under the control of a ratchet and pawl mechanism. The snatch pulleys are provided with a removable bolt for use in breaking open the pulley for reeving the pulley in a bight of a line. This permits rigging a line at any point intermediate its ends.

As will be apparent, the use of snatch pulleys and snap shackles throughout the system permits rapid deployment and redeployment of the system as required.

Referring to FIGS. 1A, 1B, 3, and 4, a flexible anchor line or sling 21 is provided with a pair of safety snap shackles 22 and 23. The sling 21 is rigged by one of the high crew members to or about fixed anchor point 3 on roof 2 of building 1, while the other high crew member is deploying trolling cable 5, weighted by either or both the flashlight and streamer, to the ground. The snap shackle 20 on the reel and pole assembly 4 is then coupled to shackle 23 of anchor line 21, directly or by means of a second anchor line 25, similarly terminated with snap shackles 26 and 27. When the trolling cable 5 reaches ground level, the ground crew couples the load line 30, approximately 6 to 10 feet from its end, to cable 5 and signals the high crew, as by the two-way radio or other appropriate means. Upon receiving the signal, the high crew begins to reel in cable 5 and thereby pulls in the load line 30. While the load line 30 is being pulled in, one of the high crew deploys and anchors a roof softener 27 as described in detail with respect to FIGS. 6A, 6B and 6C, and fills one of the roof packs with approximately 25 pounds of roof gravel or other material commonly found on a roof for use in weighting the load line. Anchor line 21 takes up the weight during the retrieval of cable 5 and load line 30 coupled thereto and to a winch 45 on the ground by the ground crew as shown in FIGS. 1, 4 and 5.

When the load line 30 reaches the roof 2, the brake on reel 4 is set and the free 6 to 10 feet of load line 30 is pulled onto the roof, as shown in FIG. 4. A snatch pulley 34, coupled to manual winch 31 by pig-tails 35 and 35' and snap shackles 23, 32 and 36 (FIG. 4) is then opened on roof 2 by a high crew member and reeved with line 30. The pig-tail 35 coupled to pulley 34 is then coupled to winch 31 which is, in turn, coupled to the anchor line 21 by means of shackles 23 and 32, as illustrated in FIG. 1A. The roof pack, loaded with gravel, is then snapped to a snap shackle 40 terminating load line 30 and the reel and pole assembly 4 disengaged from the load line 30 and the anchor line 21, while winch 31 takes up the weight of the line.

The load line 30 is typically 5/32 inches in diameter and comprises a 7 × 9 galvanized aircraft cable having a tensile strength of 2,800 pounds and weighs approximately 4.5 pounds per 100 feet. It may be noted at this point that a length of such cable, sufficient to reach 500 feet or approximately the height of a 50-story high-rise building weighs less than 30 pounds. Such weight is clearly within the capability of most men to handle without difficulty and, in any event, the majority of the weight is taken up by the winch 31 during the disengagement of the reel and pole assembly.

Referring to FIGS. 1A, 1B, 6A, 6B and 6C, with the load line 30 weighted by the gravel, the winch 31 is manipulated to position the snatch pulley 34 just over the edge of the roof 2 while its pig-tail 35 is supported by the roof softener 27. Referring to FIG. 6A, roof softener 27 serves to carry and prevent fraying of the pig-tail 35 on the edge of the roof 2, by supporting pig-tail 35 by an arcuate member 28 supported between two spaced guide flanges 29 which are anchored to line 21 by a pig-tail 21A.

Once load line 30 is reeved in pulley 34 and pig-tail 35 placed in softener 27, the ground crew is then signaled to pay out the load line 30, which is overhauled to the ground under the load of the weighted roof pack.

The use of winch 31 for the positioning of the pulley 34 is important in that it provides an adjustable anchoring system for roofs of all structual configurations while providing just enough clearance for the pulley at the edge of the roof to permit the high crew to retrieve equipment from the load line, as will be apparent as the description of the present invention continues.

While the high crew is making its way to the roof, the ground crew is positioning a power winch, removing the contents of the ground pack and selecting an anchor point for a ground snatch pulley.

Referring to FIGS. 1A, 1B, and 5, there is provided an anchor sling or line 42 terminated at both ends by a snap shackle 41. Line 42 serves to couple a snatch pulley 43 to an anchor point 44 such as a post, the base of the building on fire, an adjacent building, a fire truck or the like. One end of the load line 30 is coupled to a power winch 45 which is preferably mounted on and forms a part of a fire truck or other emergency vehicle 46.

When the trolling cable 5 comes down from roof 2, the ground crew, as previously described, fastens the load line 30 to the cable 5 and signals the high crew, as by the two-way radio, to raise it to the roof. When the load line has reached the roof, it is reeved in the snatch pulley 34. When the load line is returned to the ground under the weight of the loaded roof pack, the roof pack is removed and a headache ball 47 and a lizard on the line 48 snapped to the load line to automatically tag the line and keep the loads from twisting and swaying. With the lizard attached, the deployment of the system, including both the roof anchoring system and the ground level anchoring system, is then completed and the system is ready for hoisting. If additional equipment is required on roof 2 or on any floor, it is coupled to load line 30 either by means of the snap shackle 40 or at some point intermediate the ends of the line as by a quick release cable clamp commonly called a "Chicago" grip. As is well known, "Chicago" grips grasp a cable in a vise-like fashion under a load and may be quickly removed from the cable when the load is removed.

The above described deployment of the system of the present invention may be quickly and easily expanded to reach any point on the face of a building by the simple expedient of slackening the load line 30, reeving a second snatch pulley with the load line and anchoring the second pulley above the location it is desired to reach. As will be apparent, the existing deployment of the system need not be disturbed in the expansion of

the system except for the redeployment of a roof bracket when an escape cage is being used.

As shown in FIGS. 7A and 7B, a second anchor point 3A is selected by the high crew. An anchor sling or line 55 with snap shackles is tied to or wrapped about point 3A and coupled to a snatch pulley 56 by means of a manual winch or come-along 57. As previously described with respect to the use of winch 31, winch 57 is used in lieu of supplying a plurality of different lengths of anchoring lines which would otherwise be required in order to appropriately position pulley 56 with respect to the edge of the roof 2.

To enable the high crew to reposition load line 30, the ground crew slackens the load line. The headache ball 47 is rested on the ground until the pulley 56 is positioned as illustrated. The ball 47 is then moved beneath the pulley 56 and tagged as by a manila rope (not shown) attached to thhe headache ball and payed out by the ground crew or by a static line (not shown) to which a lizard on the line is slidably coupled. In a static line is used, the roof crew uses the reel and pole assembly to retrieve a new line, one end of which is anchored by snap shackles to anchoring line 55 while the other end is anchored to a suitable point on the ground by the ground crew.

In the event it is necessary to rescue people from a burning building, there is provided, as shown in FIGS. 8–12, a roof bracket 60, a ladder or stairway 80 and an escape cage 100, which are clamped to line 30 and hoisted simultaneously to the roof as shown in FIG. 13.

Bracket 60, as shown in FIGS. 8A and 8B, and which serves to space the cage 100 from the building, is provided with a pair of spaced horizontally extending members 61 which are supported by a pair of spaced downwardly extending diagonal vertical support members 62 and a pair of diagonal horizontal support members 63 and 64. In the space between the outer ends of members 61 there is provided an arcuate member 72 for supporting without fraying a pig-tail 73 coupled to a snatch pulley 74. Outwardly of member 72, there is a slot 65 for receiving the pulley 74 to retain and foul the pulley in a fixed position to prevent twisting and swaying of the pulley under loads. A roof flange 66 extends rearwardly of members 61, 63 and 64 and is provided with a pair of snap shackles 67 and 68 for receiving an anchor line 69. Anchor line 69 is coupled by means of snap shackles 75 and a come-along 76 to the anchor line 21 as shown in FIG. 9.

To prevent fouling of the load line 30, the space between members 62 of bracket 60 is provided for receiving pulley 34. The pulley 34 is pulled into and retained in the space by the pig-tail 35 which is coupled to pulley 34. The fouling of pulley 34 in this manner prevents the pulley 34 from twisting and swaying under loads.

In the deployment of bracket 60, the pulley 34 is dropped a short distance and the load line 30 is reeved in snatch pulley 74, which is then pulled aside a short distance. The bracket 60 is then placed over the roof softener 27, there being sufficient space between members 61, and anchored. The snatch pulley 74 is then positioned with the pig-tail 73 laid over and supported on arcuate member 72. At this point, both pulleys 34 and 74 are pulled up and fouled in the space provided between members 62. It may be noted, at this point, that at no time in the deployment of bracket 60, as described, is it necessary for the high crew to personally take up the weight then on the load line.

Referring to FIGS. 9, 10 and 12, the ladder 80 is provided at its upper end with an anchor bracket 81 which overhangs the roof 2 and couples to bracket 60 by a pin 81A (FIG. 12). Bracket 81 is fitted with a pair of snap shackles 82 and 83 for receiving an anchor line 84 terminated by a snap shackle 85. One end of line 84 is snapped into shackle 22 of anchor line 21. The other end of line 84 is coupled to anchor line 21 by a come-along 84A which serves to anchor the top of ladder 80 to the roof 2. Also provided at the top of ladder 80 is a frame 85. Frame 85 provides support for an opaque hood 86 and a stand-off crank assembly 87 which is coupled by means of a cable 88 to an adjustable stand-off or outrigger assembly 89 mounted in the base of the ladder. The adjustment of the stand-off assembly 89 by means of crank assembly 87 serves to move the stand-off assembly 89 into contact with and away from the building to provide the necessary slope to facilitate use of the ladder. The ladder 80 is further provided with a conventional hand rail 90 and a platform 91 to facilitate entry into the cage 100 described hereinafter with respect to FIGS. 11 and 12.

As shown in FIGS. 11 and 12, a cage 100 comprises a base or platform 101 to which is attached a collapsible metal fishnet mesh 102. A pair of support cables 103 and 104 are threaded along the vertical corners of cage 100, criss-crossed along the platform 101 and terminated by a ring 105 which is adapted to be received by snap shackle 40 on load line 30. Provided on at least one side of cage 100 are D-rings 106 and 107 for use in releasably securing the ladder 80 to the cage 100. The cage 100 is also provided with means (not shown) for opening a portion of the mesh 103 to permit entry of the cage from the ladder. As is provided for ladder 80, an opaque curtain 108 with a viewing flap 109 is provided in the interior of cage 100 to prevent involuntary visual contact with objects beyond the immediate vicinity of the ladder and the cage. The provision of the hood 86 and curtain 108 is made simply to avoid frightening personnel who may otherwise be reluctant to use the ladder and cage at heights such as 50 stories above ground level.

In deploying the escape equipment, a pack of auxiliary equipment 110, the bracket 60, the ladder 80 and the cage 100 are aligned in a row on the ground in the order shown in FIG. 13. The load line 30 is then placed alongside the equipment and the equipment attached to the line by a quick-release clamp suchh as, for example, the "Chicago" grip previously described. The auxiliary equipment pack, which may contain additional slings or anchor lines, come-alongs or whatever else is required in a given situation, the roof bracket 60 and ladder 80 are each coupled to the load line 30 and provided with a hand line 120, 121 and 122, respectively. The hand lines 120, 121 and 122 are clamped to the load line above their associated equipment, and serve as a means by which the high crew can take the load off and remove the equipment from the load line.

In preparing for the deployment of the escape equipment, the high crew will have advised the ground crew of the auxiliary equipment required. When the auxiliary equipment pack reaches the roof, the high crew will grasp the hand line 120. When the hand line 120 is pulled safely on the roof and the load taken off the load line, the quick-release clamp will release and the pack may then be raised to the roof. Next in order is the bracket 60. In like fashion, the high crew will grasp the

hand line **121.** When the load of the bracket has been taken off the load line, the quick-release clamp supporting the bracket will release. Since the ladder **80** and cage **100** are relatively light, the bracket **60** is simply slipped over the softener **27** anchored as previously described. A come-along is then tightened to draw pulley **34** and **74** into the spaces provided. The ladder is then retrieved and anchored by grasping hand lines **122** and disengaging the ladder from the load line.

Once the ladder **80** is properly anchored, the outrigger assembly **89** is adjusted to provide the desired slope to the ladder. One of the high crew will then descend the ladder to releasably secure the ladder and the cage. At that point, the evacuation of people from the roof of the building may immediately proceed.

When the cage **100** reaches the ground, it may be evacuated through the side passage used in loading the cage or alternatively the fishnet mesh may be permmitted to collapse permitting the passengers to merely step out over the top edges.

In rescue operations below the roof, the ladder **80** is not generally required and the cage **100** can be loaded directly from a window while D-rings **106** and **107** are used to steady the cage.

Since in most, if not all cases, evacuation from a roof of a building can take place from a single point, a need to rescue people from windows at other points on the face of a building simply requires moving the load line **30,** the cage **100** and bracket **60** in the manner described with respect to FIGS. 7A, 7B, 8A and 8B.

Under these circumstances, the cage **100** is lowered to the ground and the load line **30** moved and anchored as described with respect to FIGS. 7A and 7B. The bracket **60** and a second roof softener is then moved to the new position and re-anchored in the manner described with respect to FIG. 8A. Once bracket **60** is anchored and properly reeved, and the cage appropriately tagged as previously described, the rescue operations can proceed.

While the method and apparatus of the present invention have been described with respect to the use of light-weight cables and equipment, it is apparent that the use of snap shackles, come-alongs and snatch pulleys lie at the heart of the system in that these features permit the deployment and modification of the system to meet every contingency rapidly, reliably and safely. The entire system may be deployed and, if necessary, expanded in a matter of minutes. There is no requirement for nuts and bolts or the need for time consuming installation of clamps or other fixtures using special tools. Each piece of equipment and all cables and pulleys are prepared and organized for immediate deployment and use on any building regardless of the nature of the structural configuration of the building; there being, in every known case, sufficient structure to which the system may be anchored and, more importantly, regardless of the availability of water pressure, power or emergency equipment in or on the building.

What is claimed is:

1. A portable hoisting system comprising:

an anchoring systemm adapted to be secured to a fixed portion above ground level of a fixed structure, said anchoring system including a first anchor line, a means for temporarily anchoring said first anchor line to said fixed portion, a first pulley, and a means for coupling said first pulley to said first anchor line, said means for coupling including first winch means for adjusting the position of said first pulley relative to said first anchor line;

a load line including means for coupling to a load;

a means for reeving said first pulley with said load line; and

said winch means, load line and anchor line being tensioned to said fixed portion while said system is in use.

2. A system according to claim **1** wherein said means for reeving said first pulley with said load line includes:

a reel of trolling line, said reel including means for paying out and retrieving the trolling line; and

a means for coupling said load line to a payed out length of said trolling line for permitting the fetching of said load line to said first pulley.

3. A system according to claim **1** wherein said load line has a first and a second end, said first end of said load line being coupled to a second winch means and further comprising:

a second anchor line;

a means for anchoring said second anchor line; and

a second pulley coupled to said second anchor line;

said second pulley including a means for reeving said load line between said second winch means and said first pulley.

4. A system according to claim **3** further comprising:

a means for restraining the movement of said second end of said load line relative to a portion of said load line between said first and said second pulleys for preventing the fouling of said load line.

5. A system according to claim **4** wherein said first and said second anchor lines and said load line are flexible cables and said first and said second pulleys are snatch pulleys.

6. A system according to claim **5** wherein said means for restraining the movement of said second end of said load line is a lizard on the line.

7. A system according to claim **1** wherein said anchor line is flexible, and said means for anchoring said first anchor line and said means for coupling said first pulley to said first anchor line include snap shackles for preventing involuntary and rapid voluntary coupling and decoupling of said first pulley and said first anchor line.

8. A system according to claim **1** further comprising:

a cage;

a means for coupling said cage to said load line reeved in said first pulley; and

means for spacing said cage from an adjacent structure for preventing fouling of said cage and said structure when said cage is coupled to said load line.

9. A system according to claim **8** wherein said cage is collapsible.

10. A system according to claim **8** wherein said spacing means comprises:

a bracket; and

a means for removably anchoring said bracket to said structure, said bracket including means for supporting said load line coupled to said cage a distance from said structure.

11. A system according to claim **10** wherein said bracket further includes means spaced from said load line supporting means for receiving and separating said load line to prevent fouling thereof.

12. A system according to claim **8** further comprising:

a ladder; and

means for releasably securing said ladder to a side of said cage spaced from said adjacent structure, said cage including means for permitting entry of said cage from said ladder.

13. A system according to claim **12** further comprising:

a means for anchoring one end of said ladder to said structure, said ladder further including means at its opposite end for adjusting the slope of said ladder.

14. A system according to claim **13** wherein said cage and said ladder include means for preventing involuntary visual observation of objects beyond the immediate vicinity of said cage and said ladder.

15. A system according to claim **13** wherein said means for anchoring said ladder includes means for temporarily anchoring the top portion of said ladder to said structure in a position permitting access to said ladder from said structure and further wherein said means for adjustng the slope of said ladder includes a member coupled to the base of said ladder and adapted to be put in contact with said structure and means near the top of said ladder and accessible from said structure for moving said member into contact with said structure for selectively adjusting the distance between the base of said ladder and said structure.

16. A system according to claim **12** wherein said ladder includes a platform extending from the bottom of said ladder, said platform serving to facilitate entry into said cage.

17. A system according to claim **1** wherein said anchoring system includes a second anchor line;

a means for anchoring said second anchor line at a distance from said first anchor line;

a second pulley;

means for reeving said second pulley with said load line; and

a means for coupling said second pulley to said second anchor line for moving said load line including said means for coupling to a load from a first position corresponding to the position of said first pulley to a second position corresponding to the position of said second pulley.

18. A system according to claim **17** further comprising a means for coupling said load line to a winching apparatus and wherein said load line is led from said winching apparatus through said first pulley to said second pulley and through said second pulley to a load.

19. A system according to claim **18** wherein said load includes:

a cage, said cage including means for coupling said cage to said load line;

and further comprising:

a means for spacing said load line coupled to said cage from an an adjacent structure for preventing fouling of said cage and said structure.

20. A system according to claim **19** further comprising:

a ladder; and

means for releasably securing said ladder to said cage, said cage further including means for permitting entry of said cage from said ladder.

21. A system according to claim **20** further comprising:

a means for anchoring an end of said ladder to an adjacent structure, said ladder further including means selectively extendable from the base of said ladder for adjusting the distance between said base of said ladder and said structure.

22. A method of rigging a portable hoisting system comprising the steps of:

temporarily securing a first flexible anchor line to a fixed portion above ground level of a fixed structure;

thereafter coupling a first pulley to said first anchor line;

fetching a relatively heavy load line from a distance to said anchored first pulley by connecting the load line to a relatively light line on a reel and reeling the light line and heavy line to the vicinity of the fixed structure;

reeving said first pulley with said load line after said load line is brought to said first pulley; and

adjusting the position of said first pulley relative to said first anchor line.

23. A method according to claim **22** further comprising the steps of:

coupling one end of said load line to a winching apparatus;

coupling a bracket and a cage to said load line, said bracket prededing said cage along said load line;

winching said bracket and said cage to said first pulley;

removing said bracket from said load line; and

placing said bracket between said load line and said structure for spacing said load line from said structure for preventing the fouling of said cage and said structure.

24. A method according to claim **23** further comprising the steps of:

coupling a ladder to said load line, said ladder being coupled to said load line intermediate said bracket and said cage;

winching said ladder to said first pulley with said bracket, said ladder and said cage arriving at said pulley in successive order;

temporarily securing said ladder to said structure after placing said bracket between said load line and said structure;

adjusting the slope of said ladder relative to said structure; and

releasably securing said ladder to said cage for facilitating entry of said cage from said ladder.

25. A method according to claim **22** further comprising the steps of:

temporarily securing, at a distance removed from said first anchor line, a second flexible anchor line to a structure;

reeving a second pulley with said load line; and

coupling said second pulley to said second anchor line for moving said load line from a first position corresponding to the position of said first pulley to a second position a distance removed from said first pulley.

26. A method according to claim **25** further comprising the step of coupling a cage to said load line, and wherein said moving of said load line from said first position to said second position serves to move said cage from a first position to a second position relative to said first pulley.

27. A method according to claim **26** further comprising the step of coupling said load line to a winching apparatus for raising and lowering said cage at said second position.

28. A portable hoisting system comprising:
a first flexible anchor sling;
means for releasably anchoring said sling to a fixed portion of a fixed structure at a first location above ground level;
a first pulley for receiving a load line;
a means for releasably coupling said first pulley to said first anchor sling;
a reel means for fetching said load line from ground level to said first pulley;
means for releasably coupling said fetching means to said anchor sling during fetching of said load line and for decoupling said fetching means from said anchor sling when said load line is reeved in said first pulley;
a means for reeving said first pulley in a bight of said load line; and
a means adapted to be coupled to said load line for overhauling said load line to ground level.

29. A portable hoisting system according to claim 28 wherein said means for releasably coupling said first pulley to said first anchor sling includes means for controllably adjusting the position of said first pulley relative to said structure.

30. A portable hoisting system comprising:
a first portable anchoring system adapted to be secured on a fixed portion above ground level of a fixed structure, said first anchoring system including a first anchor line terminated by a first snap shackle, said first snap shackle including means for releasably anchoring said first anchor line to the fixed portion using said snap shackle;
a first pulley, said first pulley having a second snap shackle;
a means for coupling said first pulley to said first anchor line using said snap shackles, said means for coupling including winch means for adjusting the position of said first pulley relative to said anchor line; and
said winch means and anchor line being tensioned to said fixed portion while said system is in use.

31. A portable hoisting system according to claim 30 further comprising:
a load line and wherein said first pulley includes a means for reeving said first pulley with said load line intermediate the ends of said load line.

32. A portable hoisting system according to claim 31 further comprising:
a second portable anchoring system, said second anchoring including a second anchor line terminated by a snap shackle, said snap shackle including means for releasably anchoring said second anchor line to a fixed object using said snap shackle;
a second pulley, said second pulley including means for coupling said second pulley to said second anchor line; and
a means for coupling said load line to a winching apparatus, said second pulley including means for reeving said second pulley with said load line intermediate the ends of said load line.

33. A portable hoisting system according to claim 32 wherein said means for coupling said first pulley to said first anchor line includes a pig-tail and further comprising a means for receiving and supporting said pig-tail, said means including an arcuate member over which said pig-tail is caused to ride for preventing cutting of said pig-tail by sharp objects.

34. A portable hoisting system according to claim 33 further comprising:
a cage;
a means for coupling said cage to said load line; and
a bracket, said bracket including means for supporting said load line coupled to said cage a predetermined distance from adjacent objects for preventing fouling of said cage with said objects.

35. A portable hoisting system according to claim 34 further comprising:
a third pulley, said third pulley including means for reeving said load line coupled to said cage intermediate the ends of said load line; and
a means for anchoring said third pulley and wherein said supporting means included in said bracket includes an arcuate member for receiving and supporting said third pulley anchoring means.

36. A portable hoisting system according to claim 35 wherein said bracket further includes means for deploying said bracket over said means for preventing the cutting of said pig-tail coupled to said first pulley and means for receiving said first and said third pulleys for fixing their position in space, said first and said third pulley when fixed in space serving as a spreader for said load line for preventing the fouling thereof.

37. A portable hoisting system according to claim 36 further comprising:
a ladder;
a means for releasably securing said ladder to said cage; and
a means for adjusting the slope of said ladder for facilitating entry of said cage therefrom.

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