June 12, 1962 W. W. DA LEE ET AL 3,038,555

RETRACTABLE SAFETY LANDING FOR AN ACCESS TUBE

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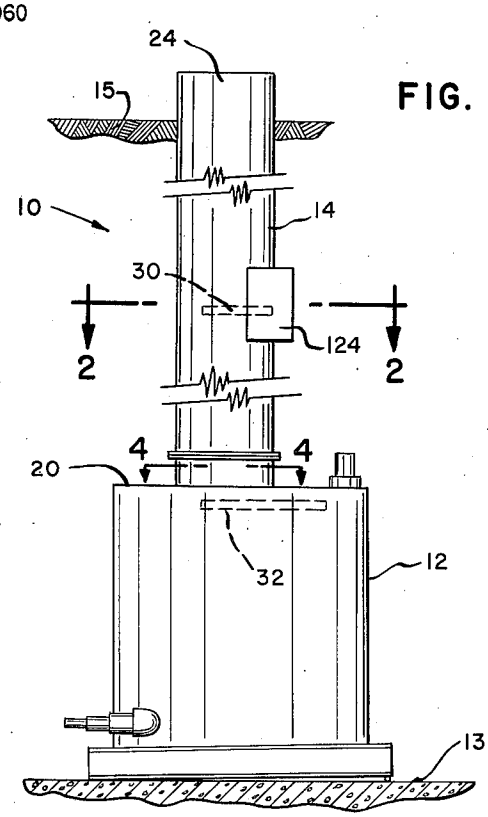


FIG. 1

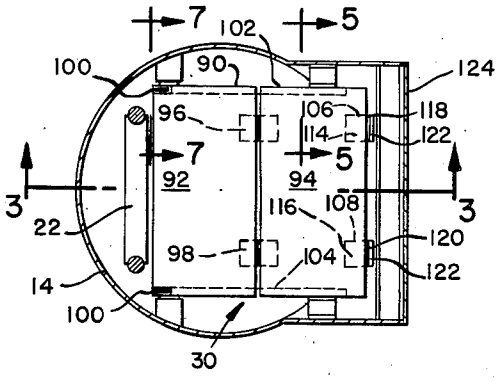


FIG. 2

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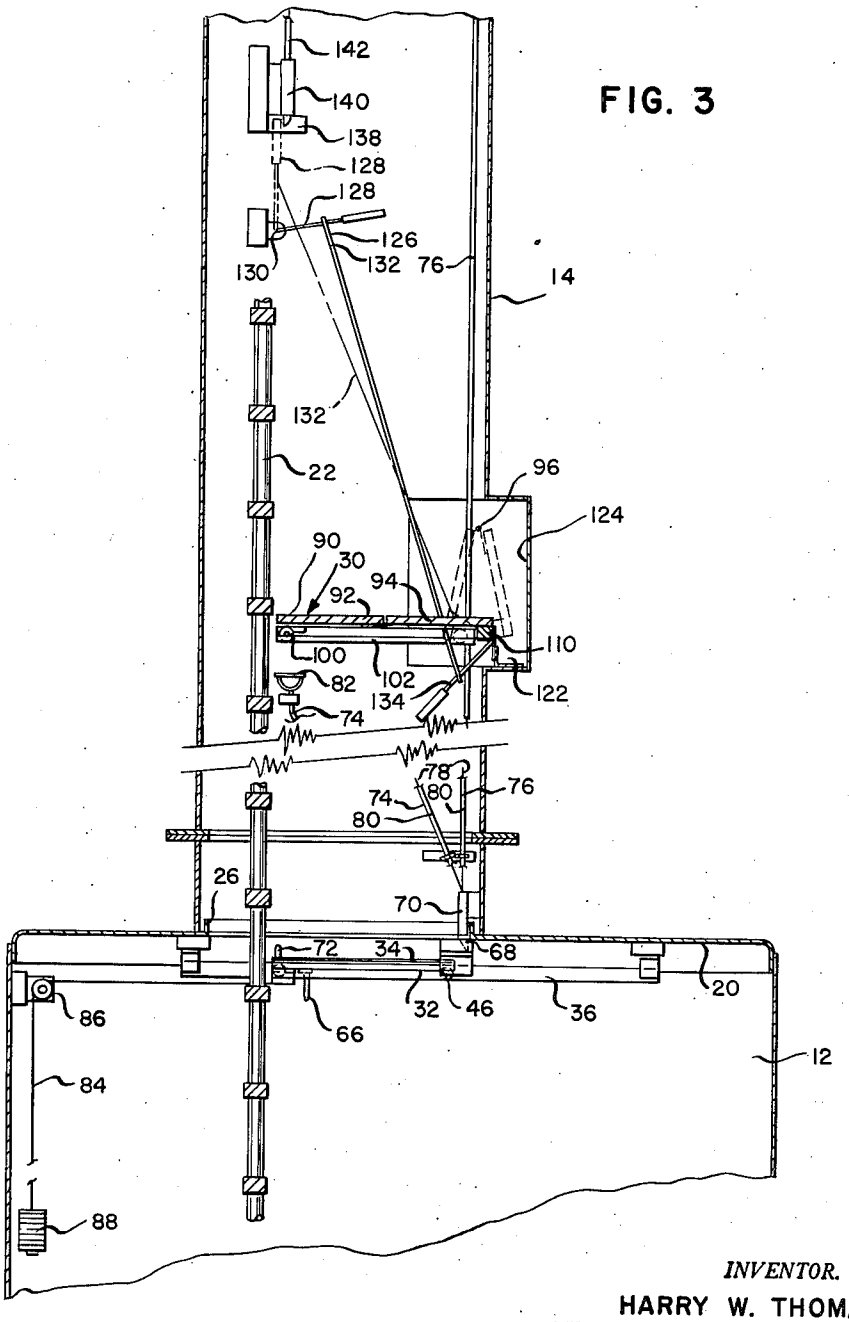
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RETRACTABLE SAFETY LANDING FOR AN ACCESS TUBE

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FIG. 3



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RETRACTABLE SAFETY LANDING FOR AN ACCESS TUBE

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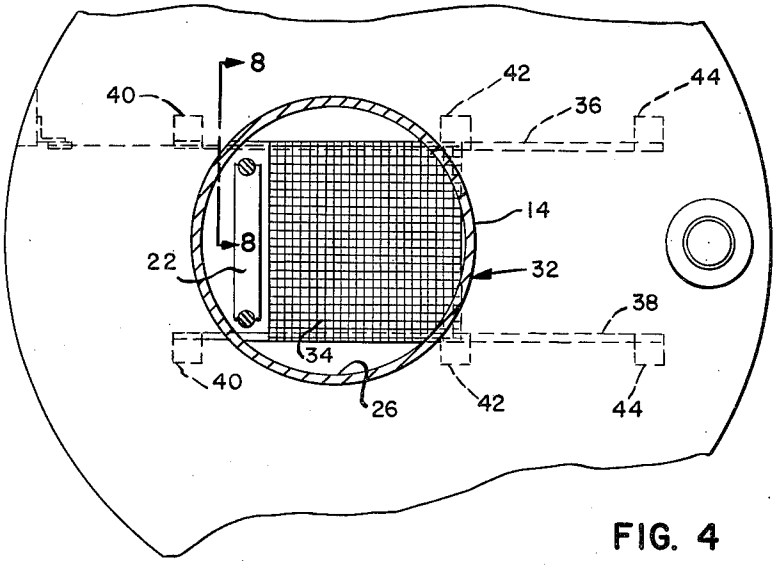


FIG. 4

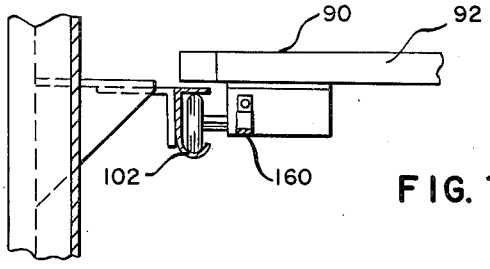


FIG. 7

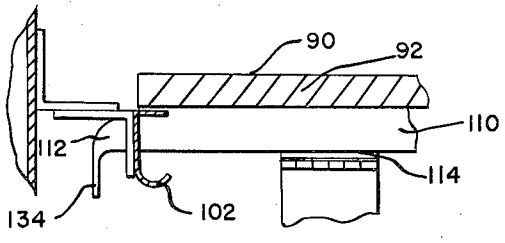


FIG. 5

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RETRACTABLE SAFETY LANDING FOR AN ACCESS TUBE

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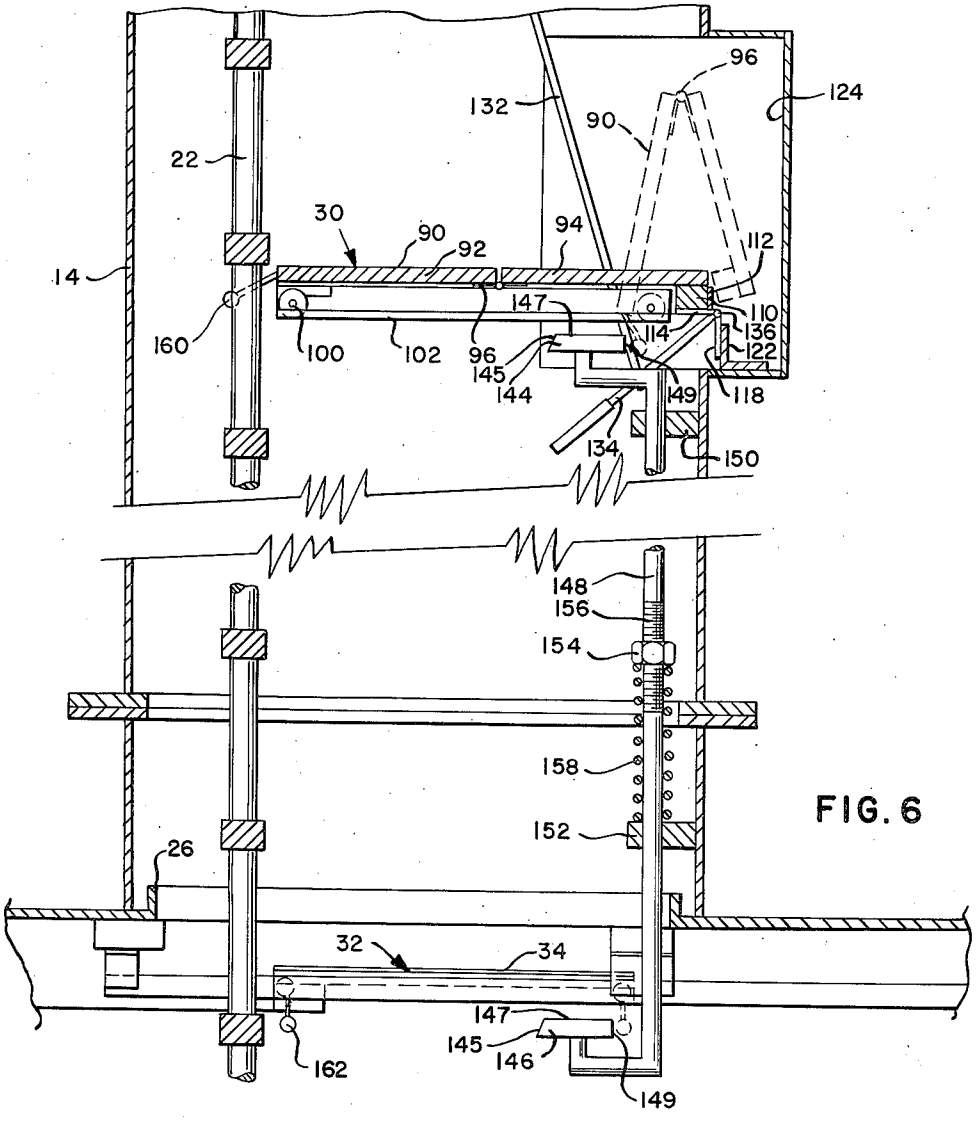


FIG. 6

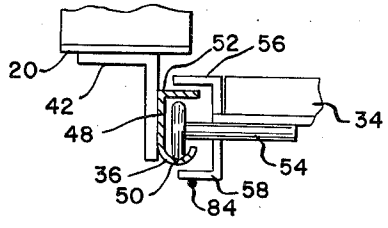


FIG. 8

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3,038,555
RETRACTABLE SAFETY LANDING FOR AN ACCESS TUBE

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Filed Feb. 18, 1960, Ser. No. 9,477
5 Claims. (Cl. 182—83)

This invention relates to a retractable safety landing and more particularly to a safety landing positioned in a downwardly extending access tube to prevent a person within such tube from slipping and falling the entire length of the tube.

As used in the description of the present invention, the term "access tube" refers to the entrance passage or shaft leading from the surface of the ground to an underground facility such as a mine, shelter, sewage lift station, a pumping, metering or junction station for water, natural gas or electricity and the like.

State and local health departments have become increasingly aware of the danger of serious injury involved in accidental falls within access tubes. Due to the human factors involved, falls cannot be entirely eliminated. However, the extent of the injuries resulting from such falls can be greatly reduced if proper preventive safety measures are employed.

One proposed method for reducing the seriousness of falling injuries is to provide platforms at spaced intervals in the tubes so that if a workman does fall, he can only fall a maximum predetermined distance. One proposed platform spacing specification calls for a platform at least every fifteen feet. A fall of fifteen feet is serious, but is not usually as damaging as a fall of twenty-five or thirty feet.

The provision of permanent platforms in the tubes is one obvious expedient. However, in the use of permanent platforms, an opening large enough for a man to pass through must be provided in the platform diametrically opposite the descent ladder to permit passage by the platform. With this technique, if the man does fall off the ladder he will normally fall on the portion of the platform adjacent the ladder. There is, however, some danger that he will travel across the tube, during his fall, to the opposite side of the tube and through the opening of the platform or accidentally fall through the opening when he turns on the platform preparatory to descending to the next level. The use of such platforms requires that the cross-sectional area of the tube be considerably enlarged to provide room for the platform plus opening. A tube having a small cross-sectional area is desirable as it is safer because it acts as a safety enclosure to prevent falls. For example, when a conventional thirty-six inch diameter tube is used, the worker can release his hand hold on the ladder and lean back against the tube wall without falling. Additionally, the fear of falling is considerably reduced when such small tubes are used. This fear is believed to be a contributing cause for many falls.

According to the present invention, a retractable platform is provided which does not require enlargement of the access tube and which will completely eliminate the possibility of falling further than the platform.

It is, therefore, an object of the present invention to provide a retractable safety platform for an access tube.

Another object of the invention is to provide such a platform which is relatively inexpensive and is easily installed.

A further object of the invention is to provide a foldable safety platform which may be positioned intermediate the upper and lower ends of an access tube which requires only a relatively low-cost modification of the tube.

A still further object of the invention is to modify the access tube by the provision of an opening in one side wall intermediate the upper and lower ends for the foldable retractable landing.

A further object of the invention is to provide a second retractable platform usable where two or more platforms are required and which can be moved to a non-obstructing position by use of the foot of one descending in the tube, and which is provided with means for automatic closure to an obstructing position after the workman has passed thereby.

Another object of the invention is to provide catch means to hold the retractable platforms in a non-obstructing position and to provide dual release means whereby the catch may be released as soon as the workman passes thereby or may be released remotely at a point adjacent the entrance opening.

Another object is to provide, in one embodiment, interlock means for a multi-landing installation whereby when one platform is in the open position, the other is automatically moved to the closed position.

Other objects of this invention will appear in the following description and appended claims, reference being had to the accompanying drawings forming a part of this specification wherein like reference characters designate corresponding parts in the several views.

In the drawings:

FIGURE 1 is a side elevational view of a sewage lift station embodying the retractable landing of the present invention;

FIG. 2 is a top plan sectional view of the intermediate foldable landing of FIG. 1 on an enlarged scale taken substantially along line 2—2 of FIG. 1 looking in the direction of the arrows;

FIG. 3 is a side elevational view in section of the lift station of FIG. 1 taken substantially along line 3—3 of FIG. 2 looking in the direction of the arrows;

FIG. 4 is a top plan sectional view of the lower slidable landing of FIG. 1 on an enlarged scale taken substantially along line 4—4 of FIG. 1 looking in the direction of the arrows;

FIG. 5 is a sectional view of the rear platform hinge mounting taken substantially along line 5—5 of FIG. 2 looking in the direction of the arrows;

FIG. 6 is an enlarged sectional view similar to FIG. 3 showing an embodiment of interlock means;

FIG. 7 is a sectional view of the track and roller arrangement, with interlock structure attached, taken substantially along line 7—7 of FIG. 2 looking in the direction of the arrows;

FIG. 8 is a view of the roller and track arrangement for the slidable landing taken substantially along line 8—8 of FIG. 4 looking in the direction of the arrows.

Before explaining the present invention in detail, it is to be understood that the invention is not limited in its application to the details of construction and arrangement of parts illustrated in the accompanying drawings, since the invention is capable of other embodiments and of being practiced or carried out in various ways. Also, it is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation.

The use of the present invention will be described hereinafter in connection with a sewage lift station 10. It will be readily appreciated, however, that the invention is capable of application to a wide variety of such underground facilities.

Sewage lift stations are provided at predetermined intervals in sewage lines to pump sewage along its way to the terminal sewage disposal station. Such lift stations

comprise a room 12 buried in the ground and supported on a concrete pad 13. The room 12 may contain, for example, motors, pumps, control apparatus, internal piping, valves and fittings, sump pump, blower, de-humidifier, internal lighting, power wiring and the like. In addition to containing this equipment, such rooms are large enough to accommodate a serviceman to permit maintenance and repair functions. Entrance to the underground room 12 is gained by means of an access tube 14 which leads from the surface of the ground 15 to the ceiling 20 of the room. A ladder 22 is secured to one wall of the tube 14 and extends from the tube entrance opening 24, thorugh the tube exit opening 26 and terminates in the room 12. As shown, foldable safety landing 30 is provided intermediate the upper and lower ends of the tube 14 and a second slidable landing 32 is provided at the lower end of the tube 14.

The number of such landings may be as few as one or as many as needed to meet safety regulations. The exact number used depends upon the combined length of the tube 14 and the depth of room 12. The lowermost landing is a slidable landing such as is described in our copending U.S. patent application, Serial No. 842,263 filed September 25, 1959. Such a landing may be used if two or more landings are necessary. However, where only one intermediate landing is required, it is preferred, according to the present invention, to use a foldable landing as will be hereinafter described.

As may best be seen in FIGS. 3 and 4, the lowermost retractable safety landing 32 is positioned on the ceiling 20 of the room 12 and normally extends across the lower opening 26 of the tube 14 to obstruct passage therethrough. The landing 32 includes a trackway which extends across the opening 26 and thence for a distance along the ceiling. The trackway includes a pair of spaced rails 36, 38 which are secured to the ceiling 20 by means of brackets 40, 42, 44. The landing platform 34, which may be a metal grating, is provided with rollers 46 which ride in the rails 36, 38. If desired, other anti-friction means, such as slidable shoes, could be used in place of the rollers 46.

As may be seen in FIG. 8, the rails 36, 38 comprise a sidewall portion 48 which is secured to the brackets 40, 42, 44. A curved portion 50 is provided at the lower end of the portion 48 to carry the rollers 46. An outwardly extending flange 52 is provided at the upper end of the portion 48 to act as a guard. Each roller 46 is rotatably mounted on an axle 54 which is secured to the underside of the platform 34. The platform is provided with a flange 56 which overlaps the rails 36, 38 to carry the weight of the platform in case the axle or rollers break. The flange 56 also prevents snagging of a workman descending the ladder. Stop members (not shown) are provided in the rails 36, 38 to limit movement of the platform 34 therealong. A handle 66 is secured to the underside of the platform 34 to provide for manual opening of the landing.

Safety lock means comprising a spring-loaded plunger 68 mounted in a casing 70 are secured to the lower end of the tube 14 at a point just above the platform 34. A cooperating lug 72 projects upwardly from the platform 34. When the platform 34 is moved to a non-obstructing position along the rails 36, 38, the plunger 68 will engage the lug 72 and hold the platform in the non-obstructing position. Release means, comprising a pair of cables 74, 76, extend upwardly from the plunger 68 to permit disengagement of the lug 72 after climbing above the platform 34. Each cable 74, 76 includes a pull cable 78 enclosed in a length of tubing 80 and having a pull ring 82 at the upper end thereof. One of the release cables 74 leads to a point above the retractable landing 32 a sufficient distance to permit actuation thereof by a workman whose feet are at approximately the same level as the retractable landing. This permits one who has just climbed above the landing 32 to release the catch means. The second release cable 76 leads to a point adjacent to the access tube entrance opening 24 to permit remote release of the catch means. The second cable 76 is provided to permit closing of the landing 32 without descending the tube 14. Such use is desirable for the instance where a workman has forgotten to close the landing after leaving the tube or where a second workman wishes to enter the tube after the passage of a first workman.

Counterweight means are provided to constantly urge the platform 34 to the obstructing position. The counterweight means comprises a cable 84 which is secured to an arm 58 on the underside of the platform 34 and wound around a pulley 86. The cable 84 is weighted at its lower end by means of a weight 88. In operation, when the catch means is released, the counterweight 88 is operative ot move the landing 32 to its obstructing position. As will be readily appreciated, other suitable closure means, such as a spring, may be used in place of a counterweight. Additionally, the platform may be power operated to open and close by a motor or pneumatic or hydraulic power means.

The intermediate landing 30, as may be seen in FIGS. 2, 3 and 6, comprises a platform 90 constructed in two sections 92, 94 pivotally secured together by hinges 96, 98. The sections 92, 94 may be fabricated from any suitable material, however, a desirable combination of lightness and strength was found in the use of a reinforced fiber glass material or structural aluminum.

The front platform section 92 is provided with rollers 100 which ride in a pair of rails 102, 104 secured to the tube 14. As may be seen in FIGS. 5 and 7, the rails 102, 104 are substantially the same shape as the rails for the lowermost landing 32. The rear platform section 94 is provided with a laterally extending elongated member 110 to which leaves 114, 116 of hinges 106, 108 are secured. The other hinge leaves 118, 120 of hinges 106, 108 are secured to brackets 122 mounted in the outwardly projecting recess 124 of the tube 14.

In operation, as may be seen in FIG. 3, the landing 30 normally assumes a blocking position as illustrated in solid lines. When it is desired to pass thereby, the platform sections 92, 94 are folded upwardly and into and out-of-the-way position into the recess 124 as shown in dotted lines.

The folding movement is accomplished by means of a platform control mechanism 126. The mechanism 126 comprises a control handle 128 pivotally mounted at one end to a bracket 130 positioned approximately shoulder-high above the landing 30. A connecting rod 132 is pivotally secured intermediate the ends of handle 128 and extends down one side of the tube 14 to a point beneath the landing 30 at which point it is pivotally secured intermediate the ends of a control arm 134. The arm 134 extends upwardly at an angle to the elongated member 110 and has a right angle portion 112 which is secured to the backside thereof. The angle between the arm 134 and member 110 is consequently fixed and does not vary as the landing 30 is folded up or down.

In operation, the landing 30 is folded to a non-obstructing position by an upward push on handle 128 which is effective, via the connecting rod 132, to pivot the arm 134 upwardly. The arm 134, acting through the member 110, pivots the platform section 94 which in turn carries the section 92 in a rolling action along the rails 102, 104 to a folded position in the recess 124.

It will be noted that the arm 134 is offset from the section 94 by the member 110. The function of the offsetting member 110 is to provide a lever arm about the hinge point 136 whereby the applied force will be translated into a moment sufficient to pivot the platform sections 92, 94. As will be readily appreciated, if the section 94 was not offset the turning force would be applied almost directly at the hinge point 136 and would be ineffective to fold the platforms.

The platform 90 is maintained in the folded-open posi-

tion by the platform control mechanism **126**. The handle **128** is received, in its upper position, in a bracket **138** and is held there by a spring loaded catch **140**. The catch **140** is provided with a release cable **142** which is operative in a manner similar to the cables **74**, **76** provided for the catch on the lowermost landing **32**.

Upon release of the catch **140**, the platform **90** will return to an obstructing position as the result of the force of gravity. As will be noted in FIG. 6, the platform **90** is never folded to a point where the rollers **100** pass under the hinges **96**, **98**. If the rollers did travel beyond this point, the platform would be "locked in" and on external force would have to be applied for its return to an obstructing position.

FIGS. 6 and 7 illustrate an embodiment of interlock means which may be provided if desired to correlate the opening and closing of the two landings **30**, **32** so that when one landing is open, the other must be closed.

The interlock system includes a pair of stop members **144**, **146** each position beneath a landing **30**, **32** at one end thereof. The forward end **145** of the members **144**, **146** is tapered, the top surface **147** is relatively flat, and the rearward end **149** is also relatively flat. The members **144**, **146** are interconnected by a rod **148** which extends along one side of the landings **30**, **32**. The rod **148** is supported and directed in guides **150**, **152**. A nut **154** is received on threaded portion **156** provided above the lower guide **152**. A compression spring **158** is positioned between the nut **154** and guide **152** to constantly urge the rod **148** upwardly. Each platform **34**, **90** is provided at its front end with a roller member **160**, **162** depending therefrom. The roller **160** of the foldable platform **90** depends at an angle forwardly therefrom so that it will assume a substantially vertical positionment when the platform is folded to a non-obstructing position.

In operation, when the platform **90** is folded to the dotted line position shown in FIG. 6, the roller **160** will ride up the tapered face **145** of stop member **144**, causing the rod **148** to be depressed and compressing spring **158**. The roller **160** will then ride over the top surface **147** to a point beyond the rearward end **149**. When the roller **160** has passed over the stop member **144**, the spring **158** will cause the rod **148** to rise, whereby the rearward end **149** of stop member **144** will abut against roller **160** and hold platform **90** in the open position. As will be readily appreciated, the same locking action will occur when the lower platform **34** is moved to the open position.

Depression of the rod **148** during movement of one of the platforms **34**, **90** to an open position will cause both stop members **144**, **146** to be depressed and will thus act to release the other platform if it is locked open at the time. Upon release, the platforms will each automatically return to a closed position as a result, respectively, of the counterweight **88** or the spreading of platform **90**.

As may be readily appreciated, other forms of interlocking means may be provided if desired. For example, electric, hydraulic or pneumatic means could be used. However, the mechanical system shown is preferred from the standpoint of cost and simplicity of installation and operation.

Having thus described our invention, we claim:

1. In combination, a downwardly extending access tube having an entrance opening at the upper end for passage of a person therethrough; a ladder positioned in the tube; the wall of the tube being provided with a fluid-tight outwardly extending recess at a point below said entrance opening; a foldable safety landing normally extending across the tube at the level of said recess; said landing including a platform having two sections pivotally secured together; one of said sections extending into said recess and being pivotally supported therewithin; a trackway extending beneath the platform and across the tube; the other of said platform sections having anti-friction means which ride in said trackway; lever means having an operating handle positioned above the platform and an operating handle positioned below the platform; said lever means being operatively connected to said first section to pivot said section upwardly; said platform being received within said recess when in its folded condition; means to releasably lock said lever means in a position where said platform is folded to a non-obstructing position permitting passage thereby; the folded position of said platform being such that the anti-friction means of said second platform section does not pass beneath the pivotal connection between the platform sections whereby said platform will return to its obstructing position by the force of gravity upon release of the lever means.

2. In combination, a downwardly existing access tube having an entrance opening at the upper end and an exit opening at the lower end for passage of a person therethrough; said access tube leading into a space at the lower end thereof; a ladder extending from the entrance opening into the space; a retractable safety landing positioned across the lower end of the tube to normally obstruct passage thereby; said landing including a trackway which extends across the tube exit opening and has a portion extending outside the periphery of the tube; a platform having anti-friction means which ride in said trackway; said platform being movable from the normal obstructing postiion to a non-obstructing position on the portion of the trackway outside the tube; latch means to hold the platform in said non-obstructing position; and closure means constantly urging the platform to its obstructing position; a second platform provided intermediate the entrance and exit openings of the access tube; said landing comprising a foldable platform including a pair of sections pivotally secured together; a first one of said sections being pivotally supported adjacent one wall of said access tube; a trackway extending beneath the platform and across the tube; the second of said sections having anti-friction means which ride in said trackway; and lever means positioned above said intermediate platform and operatively connected to said first platform sections to pivot said platform to a non-obstructing position; said lever means being releasably lockable to hold said platform in its non-obstruction position; said platform being operative by the force of gravity to return to its obstructing position upon release of said lever means.

3. A device as claimed in claim 2 is further characterized in the provision of release cables operatively connected to the locking means for said two landings; said release cables extending to points above the landings to permit remote release of the landings.

4. The combination comprising a downwardly extending access tbe having an entrance opening at the upper end and an exit opening at the lower end for passage of a person therethrough; said access tube leading into a space at the lower end thereof; a ladder extending from the entrance opening into the space; a first retractable safety landing normally extending across the lower end of the tube to obstruct passage thereby; said landing including a trackway which extends across the tube and has a portion extending outside the periphery of the tube; a platform having anti-friction means which ride in said trackway; said platform being movable from the normal obstructing position to a non-obstructing position on the portion of the trackway outside the tube; first latching means to hold the platform in said non-obstructing position; and closure means constantly urging the platform to its obstructing position; at least one second landing positioned intermediate the entrance and exit openings of the access tube; said second landing comprising a foldable platform normally extending across the tube to obstruct passage thereby; a trackway extending beneath the foldable platform and across the tube; said platform in-

cluding first and second sections pivotally secured together; the first section being pivotally supported adjacent one wall of said access tube; the second of said sections having anti-friction means which ride in said trackway; lever means operatively connected to said first section to fold said platform into a non-obstructing position; second latch means to maintain said intermediate platform in the folded condition said platform being operative to return to its obstructing position by the force of gravity upon release of said second latch means; said first and second latch means being interconnected by a resilient member constantly urging said latch means to a locking position; a catch member provided on each platform to pass over and depress its respective latch means when its respective platform is moved to a non-obstructive position; the passage of one catch member with consequent depression of its latch means being effective to release said other platform to return to its normal obstruction position.

5. In combination, a downwardly extending access tube having an entrance opening at the upper end for passage of a person therethrough; a ladder positioned in the tube; and a foldable safety landing normally extending across the tube at a point below said entrance opening to normally obstruct passage thereby; said landing including a platform having two sections pivotally secured together; one of said sections being pivotally supported adjacent one wall of said access tube; a trackway extending beneath the platform and across the tube; the other of said platform sections having anti-friction means which ride in said trackways; lever means positioned above the platform and operatively connected to said first section to pivot said section upwardly; said lever means comprising an operating handle pivotally secured above the landing; linkage connecting said operating handle to a support member secured to said first platform section at a point adjacent the pivotal connection of said first section to the access tube; said support member being offset from the first platform section whereby the lever means is operable to exert an effective movement on the first platform section to cause folding of the platform; the wall of the tube adjacent the first of said sections having provided with a fluid-tight recess to receive the platform in its folded condition; means to releasably lock said lever means in a position where said platform is folded to a non-obstructing position permitting passage thereby; the folded position of said platform being such that the anti-friction means of said second platform section does not pass beneath the pivotal connection between the platform sections whereby said platform will return to its obstructing position by the force of gravity upon release of the lever means.

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