ABSTRACT

A tie-down apparatus for a mobile home or the like having a diagonal, inboard ground anchor, in addition to a vertical ground anchor and vertical and diagonal inboard straps above ground. The diagonal ground anchor acts in compression to oppose wind forces acting inward against the adjacent side of the mobile home.

11 Claims, 2 Drawing Figures
GROUND ANCHOR TIE-DOWN APPARATUS

BACKGROUND OF THE INVENTION

Various tie-down arrangements have been proposed heretofore for anchoring mobile homes to the ground. Typically such tie-down arrangements have included, at different locations around the periphery of the mobile home:

1. a vertically disposed ground anchor that resists tension forces tending to pull it up out of the ground;
2. an adjustable tensioning head attached to the upper end of the vertical ground anchor, usually just above ground;
3. a vertical strap or cable extending up from the tensioning head to the underside of the mobile home and under tension that is adjustable by the tensioning head; and
4. a diagonal strap or cable extending upward and inboard of the mobile home for attachment to an I-beam on the bottom of the mobile home and under tension that is adjustable by the tensioning head.

Such tie-down arrangements have not been entirely satisfactory during unusually high winds, such as in hurricanes, tornadoes and heavy wind storms. Such winds may exert sufficiently heavy lateral forces against one side or the other of the mobile home to break or loosen the straps or cables there, thereby removing the restraint against sideward movement or tipping over of the mobile home. Incidents of this nature have alerted federal, state and local governmental authorities to consider imposing more stringent safety regulations on mobile home tie-downs.

SUMMARY OF THE INVENTION

The present invention is directed to a ground anchor tie-down apparatus having an improvement constituted by a diagonal, inboard ground anchor which acts in compression to resist wind forces against the side of the above-ground structure, such as a mobile home, where that tie-down apparatus is located.

Accordingly, it is an object of this invention to provide a novel ground anchor tie-down apparatus having a diagonal, inboard ground anchor for improving the capacity of the tie-down apparatus to withstand lateral wind forces on the above-ground structure which that tie-down apparatus anchors, such as a mobile home.

Another object of this invention is to provide such a tie-down apparatus in which the diagonal, inboard ground anchor acts in compression in the ground to assist a tensioned, above-ground, diagonal strap or cable to resist such lateral wind forces.

Further objects and advantages of this invention will be apparent from the following detailed description of a presently preferred embodiment thereof, which is illustrated in the accompanying drawing, in which:

FIG. 1 is an elevational view of the present tie-down apparatus, attached at its upper end to a mobile home and anchored in the ground at its lower end; and

FIG. 2 is a fragmentary perspective view of this tie-down apparatus.

Before explaining the disclosed embodiment of the present invention in detail, it is to be understood that the invention is not limited in its application to the details of the particular arrangement shown, since the invention is capable of other embodiments. Also, the terminology used herein is for the purpose of description and not of limitation.

Referring first to FIG. 1, the complete tie-down apparatus comprises the following previously used elements:

1. a vertical ground anchor 10, comprising a rigid, elongated, vertical rod 11, preferably about 48 inches long, and a rigid, flat, horizontally disposed plate 12 attached rigidly to the lower end of the rod;
2. a tensioning head 13 rigidly attached to the upper end of the rod 11 above ground;
3. a flexible vertical strap 14 extending up from the tensioning head and rigidly attached to the underside of the mobile home 15 at one side of the latter; and
4. a flexible strap 16 extending diagonally up from the tensioning head in a direction inboard of the mobile home (i.e., laterally inward from the side of the mobile home where the vertical strap 14 is attached) and rigidly attached at its upper end to a horizontal I-beam 17 on which the mobile home is mounted.

As shown in FIG. 1, the upper end of the diagonal above-ground strap 16 is wrapped around the I-beam 17 and is rigidly fastened to it by a suitable clamp C.

The tensioning head 13 may take various forms, but in the preferred embodiment it comprises a rigid U-shaped body 18 and a pair of adjustable tensioning bolts 19 and 20, one for each strap 14 and 16. These bolts extend horizontally and rotatably through the opposite, upstanding legs of the U-shaped body, and between these legs they present narrow slots 19a and 20a, respectively, for snugly receiving the lower ends of the respective straps. Each bolt has a hexagonal head on one end which is normally seated snugly in a corresponding downwardly facing, semi-hexagonal recess formed on the outside of one leg of the U-shaped body by offsetting it laterally at 19b and 20b in FIG. 2. The opposite end of the bolt extends rotatably through the opposite leg of the U-shaped body and is screw-threaded to receive a respective clamping nut 21 or 22 at the outside of this leg.

In the use of this tensioning head, after first loosening the respective clamping nut 21 or 22, the bolt 19 or 20 may be retracted axially outward far enough to disengage its head 19b or 20b from the respective semi-hexagonal recess on the U-shaped body 18, and then the bolt may be turned to provide the desired tension on the respective strap 14 or 16. Then this bolt may be moved axially inward to seat its head 19b or 20b in the respective semi-hexagonal recess on the U-shaped body 18, and the respective clamping nut may be tightened to hold it in this axial position.

It is to be understood that a cable or other flexible tensioning element may be used in place of either or both straps 14 and 16. In accordance with the present invention, a diagonal, inboard ground anchor 25 is provided in the tie-down apparatus for improving its capacity to withstand lateral wind forces against the side of the mobile home where that tie-down apparatus is located.

In the preferred embodiment, this diagonal ground anchor comprises an elongated, rigid rod 26 (preferably about 18 inches long) and a vertically disposed, rigid plate 27 on the lower end of this rod. The rod 26 extends inboard of the mobile home at a suitable acute
angle in the ground, preferably about 45° to the vertical. The plate 27 preferably is oblong, with a greater dimension horizontally than vertically. For example, it may be a rectangle about 12 inches wide and 6 inches high, welded at the center to the lower end of the rod 26.

The upper end of the rod is welded to the middle of a flat, vertical clamp plate 28, which engages the inboard side of the rod 21 in the vertical ground anchor immediately below the tensioning head 13. A second flat, vertical clamp plate 29 engages the opposite, outboard side of this rod 11. Upper end lower U-bolts 30, with clamp nuts 31 on each end, extend through the clamp plates 28, 29 and around the upper end of rod 11. This clamp arrangement 28-31 enables the upper end of the diagonal, inboard ground anchor to be releasably attached rigidly to the upper end of the vertical ground anchor immediately below the tensioning head 13, just above ground.

After the tie-down apparatus has been installed, as shown in FIG. 1, wind forces to the right in FIG. 1 tend to force the diagonal, inboard ground anchor to the right in the ground. To so move, the broad-area end plate 27 on this ground anchor would have to compact the earth to the right of it. Since the earth is extremely resistant to such compaction (much more so than to a tensile pull on a ground anchor), this inboard, diagonal ground anchor greatly enhances the capacity of the tie-down apparatus, of which it is a part, to withstand such lateral wind forces on the mobile home.

While the present invention has been disclosed herein as used with a mobile home, it is to be understood that it may be used also to provide a ground anchor tie-down for various above ground structures other than mobile homes.

1. A tie-down apparatus for a mobile home or the like comprising a first ground anchor extending substantially vertically down into the ground, a first, flexible, above-ground tensioning element attached at its upper end to the mobile home and extending downward therefrom substantially vertically, a tensioning head connected to the upper end of said ground anchor and operatively coupled to said first flexible tensioning element to apply a selected tension thereon, and a second, flexible above-ground tensioning element operatively coupled to said head and extending diagonally upward therefrom inboard of the mobile home and attached at its upper end to a support beam at the bottom of the mobile home, the improvement which comprises:

a second ground anchor having an elongated rigid rod operatively connected at its upper end to said tensioning head and extending diagonally downward therefrom inboard of the mobile home, and
a transverse ground plate on said rod.

2. A tie-down apparatus according to claim 1, wherein said transverse ground plate is rigidly connected to said rod and extends substantially vertical.

3. A tie-down apparatus according to claim 2, wherein said transverse ground plate is on the lower end of said rod.

4. A tie-down apparatus according to claim 1, and further comprising means for attaching the upper end of said rod on the second ground anchor to the upper end of the first ground anchor directly beneath said tensioning head.

5. A tie-down apparatus according to claim 4, wherein said ground plate is on the lower end of said rod in the second ground anchor and extends substantially vertical.

6. A tie-down apparatus according to claim 5, wherein said first ground anchor has a rigid rod extending down from said tensioning head, and said means for attaching the upper end of said rod on the second ground anchor to the upper end of the first ground anchor comprises clamp means attached to the upper end of said rod on the second ground anchor and releasably embracing the rod on the first ground anchor immediately below said tensioning head.

7. A tie-down apparatus according to claim 6, wherein said clamp means comprises a first vertical plate rigidly attached to the upper end of said rod on the second ground anchor and engaging the inboard side of said rod on the first ground anchor, a second vertical plate engaging the outboard side of said rod on the first ground anchor, a pair of horizontal U-bolts extending through said first and second vertical plates and around said rod on the first ground anchor, and clamping nuts threaded on the ends of said U-bolts against the outside of one of said last-mentioned plates.

8. A tie-down apparatus according to claim 5, wherein said ground plate in the second ground anchor is oblong, with a substantially greater dimension horizontally than vertically.

9. In a ground-anchored tie-down apparatus for an above-ground structure, the improvement which comprises a ground anchor having a rigid rod extending diagonally down into the ground inboard of said above-ground structure, rigid means attached to said rod and providing a broad surface area extending transverse to the diagonal extent of said rod for acting in compression against the soil to resist displacement of said above-ground structure laterally in said inboard direction by wind forces, and clamp means on the upper end of said rod for attaching it rigidly to another part of the tie-down apparatus, said clamp means comprising a first plate attached rigidly to the upper end of said rod, a second plate in confronting relationship to said first plate, U-bolts extending through said first and second plates, and nuts threaded onto the ends of said U-bolts at the outside of one of said plates.

10. A tie-down apparatus according to claim 9, wherein said means attached to said rod is a substantially vertical plate attached rigidly to the rod at its lower end.

11. A tie-down apparatus according to claim 10, wherein said plate has a substantially greater dimension horizontally than vertically.

* * * * *