United States Patent [19]

Sewell et al.

[11] **3,720,166**

[45] **March 13, 1973**

[54] APPARATUS AND METHOD FOR TERRAIN CLEARANCE

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[73] Assignee: **The United States of America as represented by the Secretary of the Navy**

[22] Filed: **Aug. 2, 1971**

[21] Appl. No.: **168,358**

[52] **U.S. Cl.**.....**102/22,** 102/24 R, 102/67

[51] **Int. Cl.**.....**F42b 3/60**

[58] **Field of Search**.....102/22–24, 67

[56] **References Cited**

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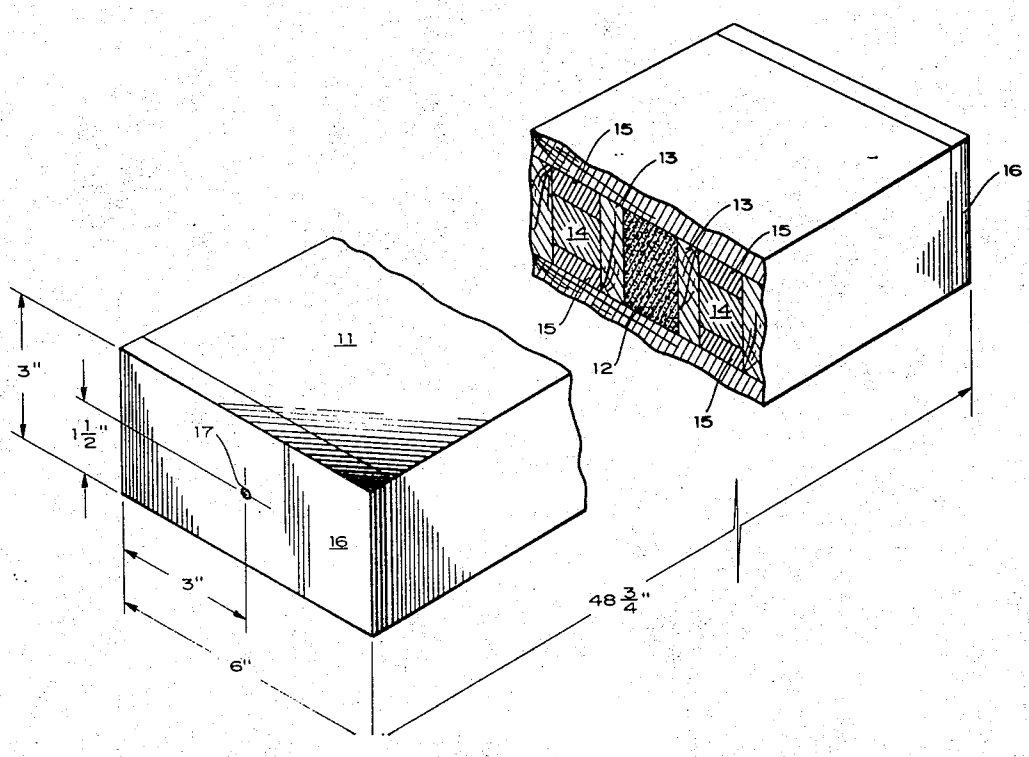
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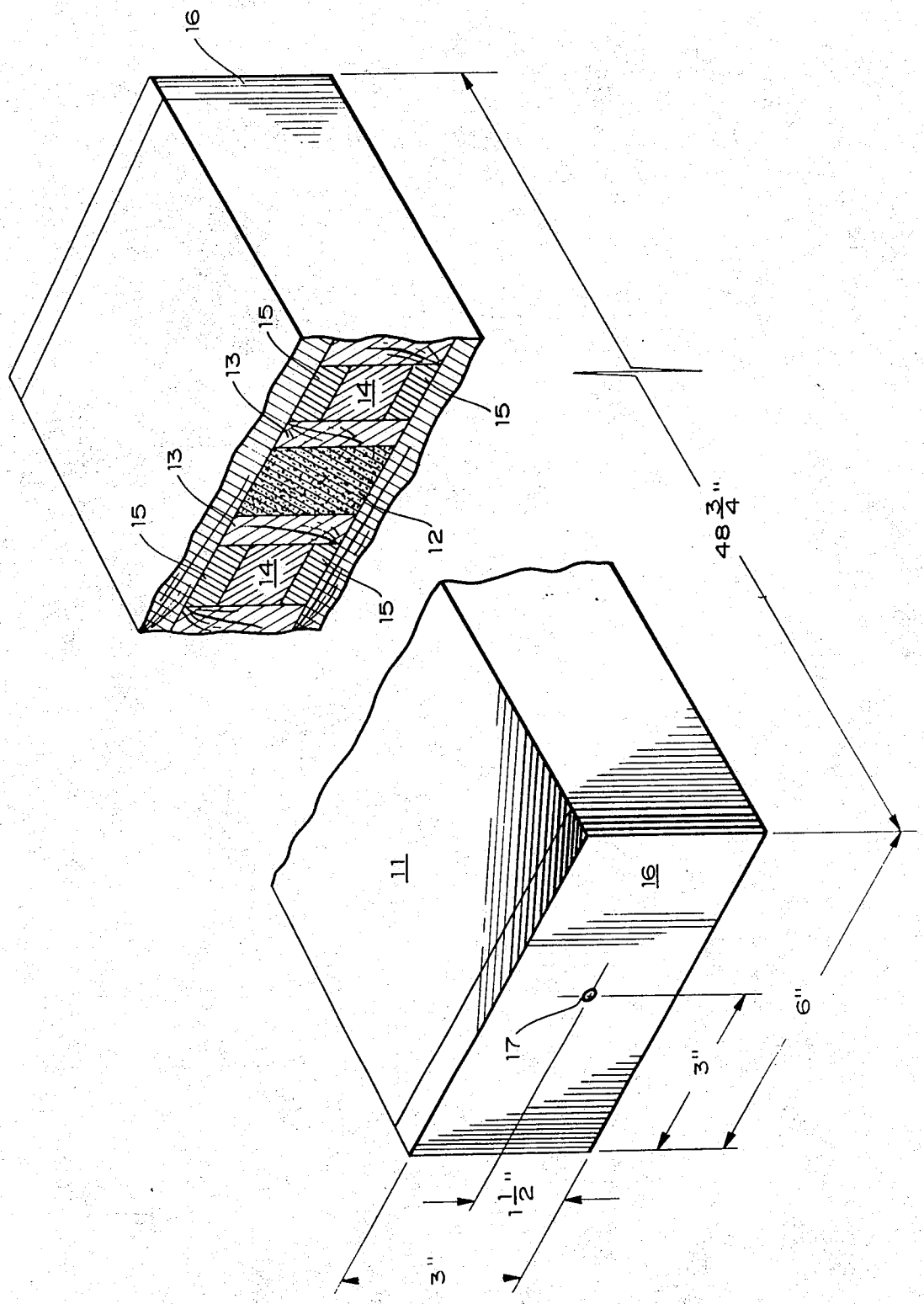
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[57] **ABSTRACT**

Rod expelling explosive apparatus is used to clear bushes and trees from foliage covered terrain. The apparatus comprises a box containing a linear explosive charge and at least one rod which is forcefully expelled at high velocity when the charge is detonated. The method involves placing rod expelling apparatus on the ground in a position such that the rod or rods will be expelled in a predetermined desired direction at a trajectory just above ground level and detonating the charge.

6 Claims, 1 Drawing Figure




16
15
13
14
15
13
15
14
15
12
48 3/4"
11
16
17
3"
6"
1 1/2"
3"

APPARATUS AND METHOD FOR TERRAIN CLEARANCE

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to apparatus and a method for terrain clearance. More particularly, this invention relates to rod expelling explosive apparatus and its use in clearing bushes and trees from foliage covered terrain.

2. Description of the Prior Art

In both the military arts and the fire fighting arts it is often desirable to clear the terrain of bushes and trees. The various branches of the military wish to clear the terrain to create areas where a clear field of vision may be had or areas which may be used as helicopter landing zones, etc. Fire fighters wish to quickly clear certain areas to create lanes along which fire fighting equipment may pass or cleared areas which will prevent the spread of fire. Such cleared areas are called fire lanes and fire breaks.

Both the military and fire fighters make extensive use of large machinery such as bulldozers in terrain clearance. Both also utilize all of the usual tree removal equipment such as chain saws, etc. However, especially in the case of a spreading forest fire, the use of bulldozers and chain saws is often either impossible because of the proximity of the fire, or too time consuming, or both. Therefore, there has been and will continue to be a demand for faster and more efficient ways to clear terrain of foliage.

The military has made extensive use of blast bombs in terrain clearance. In blast bomb clearance, a large explosive device is detonated above the area to be cleared and the resulting blast removes most of the immediately surrounding foliage. However, since blast bombs are detonated above the surface of the ground and since woody plants are remarkably tough and resilient, blast bombs often merely flatten foliage rather than severing it. Further, blast bombs create large pits or depressions in the cleared area which render it unsuitable for use as a fire lane along which vehicles must pass. Still further, blast bombs are prohibitively expensive for use in fire fighting.

SUMMARY OF THE INVENTION

An inexpensive and efficient way to clear bushes and trees from the terrain has now been found. The apparatus of this invention comprises rod expelling explosive devices which, when detonated, expel at least one rod which effectively clears bushes and small trees from the terrain for distances up to 50 feet from where the detonation occurs. The rod expelling devices of this invention utilize only relatively small amounts of explosive when compared to a blast bomb and, consequently, do not create large pits in the ground. The rod expelling devices of this invention are especially useful in clearing foliage because they sever the foliage at or near the surface of the ground rather than merely flattening it.

BRIEF DESCRIPTION OF THE DRAWING

The single FIGURE is a perspective view in cross section of rod expelling explosive apparatus according to this invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

METHOD

The method of this invention involves placing rod expelling explosive apparatus of the type described below on the ground so that the rod or rods will be expelled in a desirable direction when the apparatus is exploded and then exploding the apparatus. That is, the apparatus is placed so that the rod or rods will be expelled parallel to the ground when it is exploded. It may be placed by any convenient means such as with a winch or by hand. Since hand placing may often be the most convenient means for getting the device in a desired location, it is generally preferred that its total weight be less than about 100 pounds and most preferably about 50 pounds.

Detonation of the apparatus causes at least one steel rod to be forcefully expelled and travel through the air at a trajectory parallel to and near the surface of the ground. When the rod strikes trees or bushes it passes through, severing the foliage, and continues on to repeat the action on more trees and bushes thus clearing the terrain. Rods expelled from the below described devices travel through the air at speeds in excess of 1500 feet per second.

APPARATUS

The single FIGURE of the drawing is a perspective view in cross section of apparatus according to this invention showing a box 11 and two end plates 16. One of the end plates has a small opening 17 drilled therein to permit the insertion of detonating wires and/or apparatus. The apparatus includes a centrally disposed linear explosive charge 12 within the box, two wooden or plastic partitions 13 within the box and adjacent to the explosive charge to contain it and separate it from two steel rods 14 positioned adjacent to the partitions on opposite sides of the explosive charge. Four aluminum bars 15 are positioned within the box adjacent to the partitions so that two bars are immediately below the steel rods and two are immediately above the steel rods when the device is lying on its side in detonating position.

The box is constructed of any convenient material such as wood or plastic and is either nailed or glued together. Since the detonation will cause the steel rods to be expelled through the walls of the box, it is preferred that the walls be not more than about 1 inch thick and preferably about ½ inch thick. The same thickness is preferred for the partitians. The partitions perform the function of acting as a shock attenuator when the explosive charge is detonated. If the partitions are omitted, detonation of the explosive charge causes the rods to spall and break up. Tests conducted without the partitions revealed that steel rods are literally torn apart by the shock waves when an adjacent explosive material is detonated.

The steel rods are advantageously fabricated from a non-brittle, high strength steel such as 1020 steel in order to prevent them from fracturing when they strike foliage.

The aluminum bars assist in controlling the trajectory of the expelled rods. More importantly, they confine

the rods and prevent central tensile failure when the explosive charge is detonated. Tests have revealed that omission of the rods like omission of the partitions results in the rods breaking up upon detonation of the charge. The aluminum bars may however, be replaced with some other metal such as steel or with shaped explosive charges. For example, 1020 steel is a suitable material from which to fabricate the bars as well as the rods. Aluminum is the preferred material because it is light and strong. Its' lightness assists in keeping the total weight of the apparatus down.

The explosive charge utilized is any well known explosive such as composition C–3, C–4, B, or any of the plastic bonded explosives. Any well known means for detonating explosives is suitable for detonating the charge. The amount of explosive used depends upon the size and number of trees to be severed and upon the total weight desired for the device. A square charge of C–3, C–4, B or plastic bonded explosive having cross sectional dimensions of about 2 inches by 2 inches and a length equal to or slightly greater than that of the rods will expell two 1 inch by 1 inch steel rods at speeds in excess of 1500 feet per second. Rods expelled at such speeds clear paths up to 100 feet in length (50 feet in each of two directions from the device shown in the drawing) through trees having diameters of up to 6 inches and a density of about 40 to 50 trees in the 100 feet of path.

In order to keep the weight of the apparatus low, it is advantageous to use rods having a length of from about 4 to about 6 feet. However, longer rods are permissable. Rods having lengths of up to 20 feet and longer give excellent results. If the apparatus is to be machine placed, such lengths are preferred because they will clear a wider area.

The preferred cross-sectional rod dimensions are 1 inch by 1 inch. However, rods having other dimensions may be used. For example, rods of up to 2 ½ inches by 2 ½ inches cross sectional dimensions have also been found to produce excellent results as long as the charge is of sufficient size to expel them at sufficient speed. Also, while the drawing shows apparatus which will expel two rods, it should be recognized that devices which expel either one or more than two rods can be used. That is, one of the two single rods of the drawing may be removed or the single rods may be replaced with stacks of smaller rods without radically altering the apparatus.

Dimensions are shown in the drawing. It is to be understood that the dimensions shown are typical and not limiting. Apparatus having the dimensions shown will weigh approximately 50 pounds and will, therefore, be light enough to be easily hand carried to the detonation site.

What is claimed is:

1. Rod expelling apparatus for clearing the terrain which comprises:
   a. a box;
   b. at least one partition disposed within said box extending substantially the length thereof;
   c. a linear explosive charge disposed within said box adjacent to one side of said partition;
   d. at least one rectangular rod disposed within said box adjacent to the other side of said partition, bounded on its side opposite the partition by a wall of the box and on its other two sides by bars; and
   e. means for detonating said explosive charge.

2. Apparatus according to claim 1 wherein said linear explosive charge is composition B explosive.

3. Apparatus according to claim 2 wherein said rod is steel and said bars are aluminum.

4. Apparatus according to claim 3 wherein said box is wood.

5. A method for clearing terrain which comprises:
   a. placing apparatus described in claim 1 in a horizontal position on the ground so that said rod will be expelled horizontal to the ground when said explosive charge is detonated; and
   b. actuating said detonating means to detonate said explosive charge.

6. Rod expelling apparatus comprising:
   a. a container;
   b. at least one dividing means disposed within said container extending substantially the length thereof;
   c. a linear explosive charge disposed within said container adjacent to one surface of said dividing means;
   d. at least one rod disposed within said container adjacent to the other surface of said dividing means bounded on one surface opposite the dividing means by a wall of the container and on two other surfaces by confining members; and
   e. means for detonating said explosive charge.

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