May 20, 1969 A. F. ABBOTT ET AL 3,444,811

TREE FELLING TECHNIQUE AND SHAPED EXPLOSIVE CHARGE EMPLOYED THEREIN

Filed Aug. 28, 1967

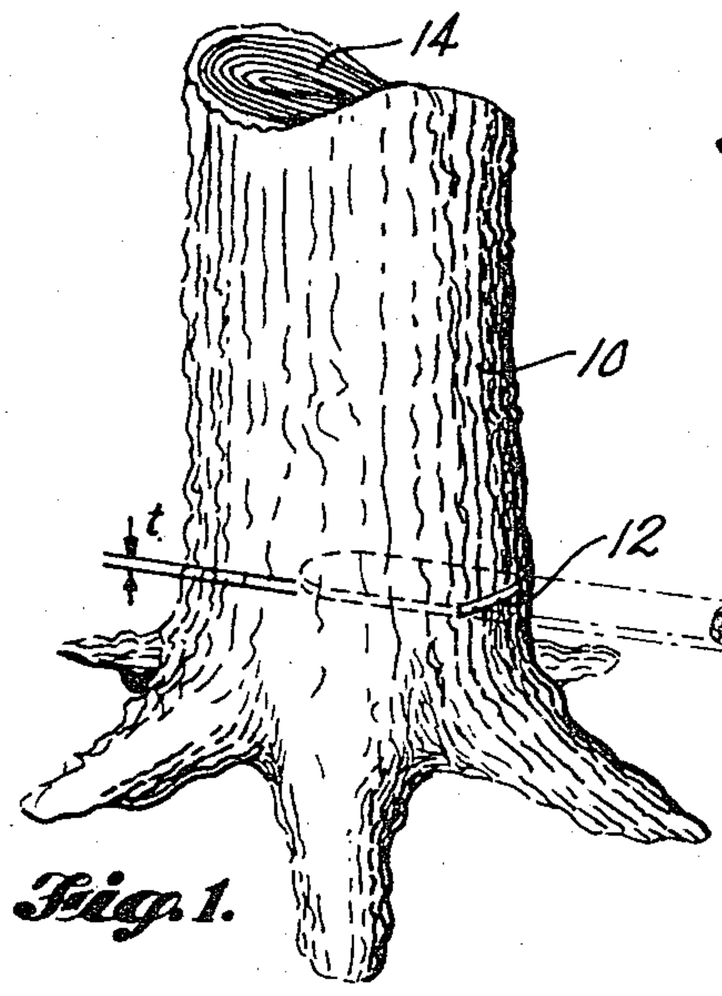


Fig. 1.

Fig. 2.

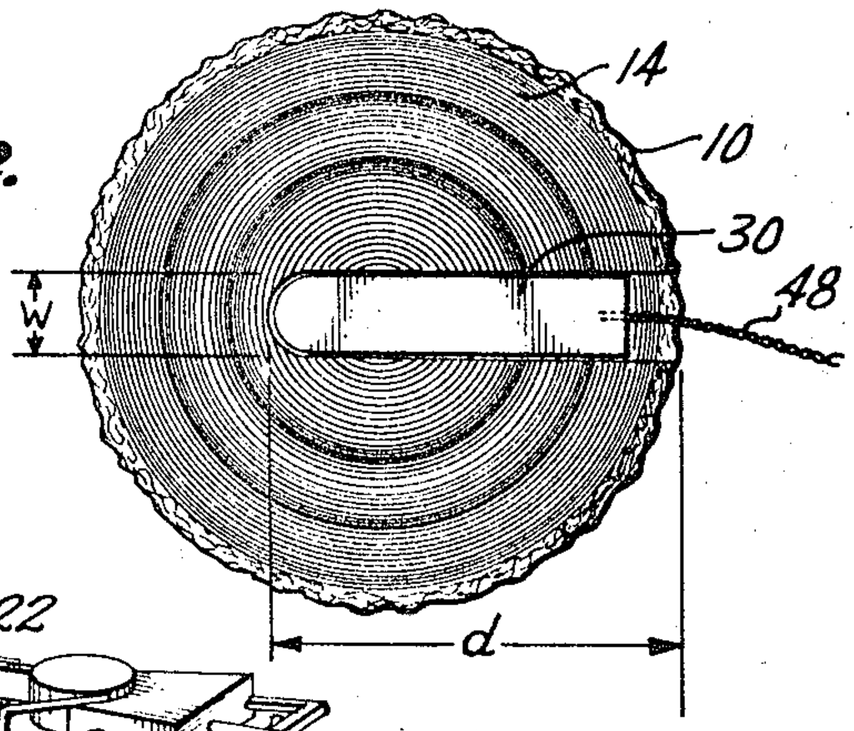


Fig. 3.

Fig. 4.

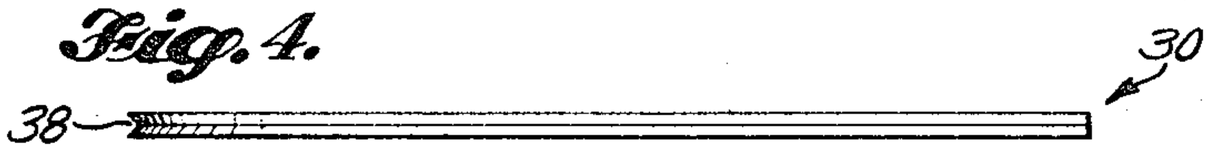


Fig. 5.

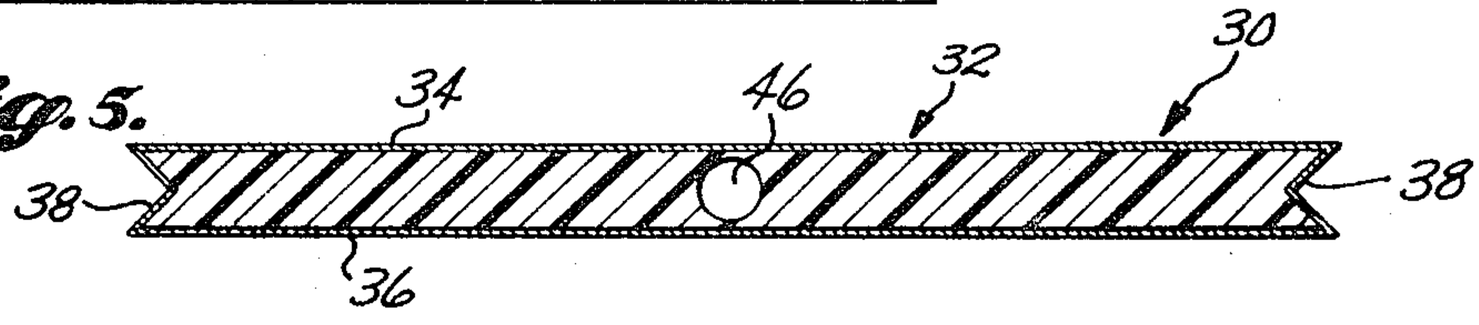


Fig. 6.

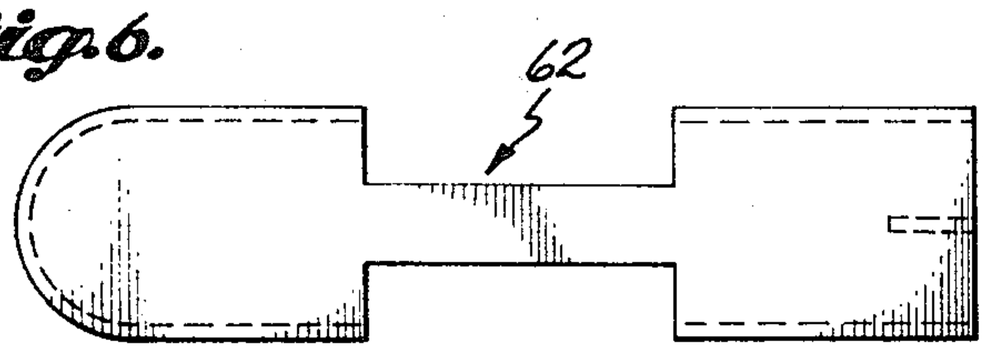
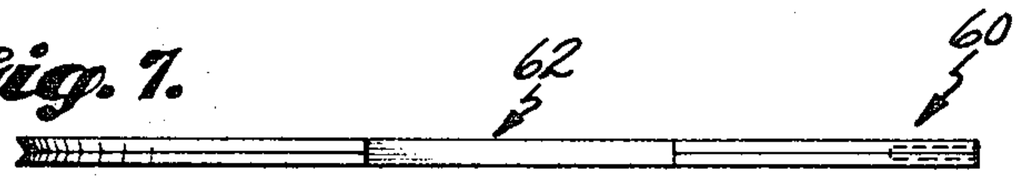


Fig. 7.



INVENTORS
ALBERT F. ABBOTT
BRUCE J. HASKIN
MARSHALL E. KLOPICH
Gravbeal, Cole & Barnard
ATTORNEYS

United States Patent Office

3,444,811

Patented May 20, 1969

3,444,811

TREE FELLING TECHNIQUE AND SHAPED EXPLOSIVE CHARGE EMPLOYED THEREIN

Albert F. Abbott and Bruce J. Haskin, Seattle, and Marshall E. Klopich, Renton, Wash., assignors to Explosives Corporation of America, Seattle, Wash., a corporation of Washington

Filed Aug. 28, 1967, Ser. No. 663,643

Int. Cl. F42d *1/00*

U.S. Cl. 102—23

21 Claims

ABSTRACT OF THE DISCLOSURE

An improved method and shaped explosive charge for felling trees, which method comprises cutting a thin, flat pocket radially into the tree to be felled, preferably by making a thrust cut into the tree with a chain saw, inserting a shaped explosive charge into the pocket, and thereafter detonating the charge. The shaped explosive charge comprises a generally elongated, thin, flat container defined by a pair of parallel, planar side walls and a concavely-shaped, outwardly facing peripheral edge wall which functions to concentrate and direct the explosive shock wave cross-grain of the tree.

Background of the invention

The present invention relates generally to the art of tree felling, and more particularly to an improved method and shaped explosive charge for felling trees.

Numerous techniques have been devised for utilizing explosives to fell trees, but none has proven to be entirely effective. One such technique comprises strapping an explosive charge to the side of the tree to be felled in the vicinity of its base portion, or in a ring around the periphery of the tree, and thereafter detonating the charge. Although the shock wave from the explosion will propagate through the base portion of the tree to effect severance thereof, the explosive blast also disintegrates a substantial portion of the valuable base portion of the tree and often leaves an unsightly "spike" on the base of the felled tree which must be subsequently cut off. A further disadvantage of this technique is that an excessive amount of explosive material must be employed since much of the explosive blast will be directed into space rather than into the tree.

A somewhat improved known technique comprises wrapping several layers of Primacord, a cord-like explosive, around the tree and covering it with a steel shell overlay prior to detonating the explosive. Another technique comprises boring a cylindrical hole radially into the base portion of the tree, packing the hole with an explosive and thereafter detonating the explosive. While both of these techniques relatively reduce the extent to which the explosive shock wave is dissipated into the surrounding space, they both cause disintegration of a substantial portion of the valuable base portion of the tree and leave an unsightly stump. Moreover, both of these techniques still require a substantial quantity of explosive to fell the tree. For example, approximately six pounds of so-called "C4" explosive are required to effect felling of a tree 2′ in diameter at the point of cut.

Summary of the invention

In view of the foregoing, it is an object of the present invention to provide an improved method for explosively felling trees which forms a relatively clean cut at the base portion of the tree, without disintegrating a significant amount thereof.

A further object of the present invention is to provide an improved method for explosively felling trees which requires only a minimum quantity of explosive material to be utilized.

Another object of this invention is to provide an improved, self-contained explosive charge unit especially adapted to be used in conjunction with the tree felling method of this invention.

The method of the present invention comprises cutting a generally planar pocket into a tree across the grain thereof, loading the pocket with an explosive material, and thereafter detonating the explosive. By virtue of the configuration of the pocket cut in the tree, the shock wave generated upon detonation of the explosive material propagates through the tree along the plane of the pocket to make a relatively clean, smooth cut. Moreover, only a minimal quantity of explosive material is required.

The improved shaped explosive charge package of the invention is especially adapted to fit into the pocket cut in the tree and comprises a generally elongated, thin flat container filled with either liquid or powdered explosive. The peripheral edge wall of the container is preferably V-shaped in cross section and outwardly facing to concentrate the shock wave generated upon detonation of the charge and principally direct the shock wave through the tree along a single plane. The result is a maximum cutting effect from a minimum quantity of explosive.

The foregoing and other objects, features and advantages of the present invention will be apparent from the following more particular description of the preferred embodiment of the invention, as illustrated in the accompanying drawing.

Brief description of the drawing

In the drawing:

FIG. 1 is a perspective view illustrating the manner in which a chain saw is employed in the method of the present invention to cut a pocket in the tree to be felled;

FIG. 2 is a sectional plan view showing the shaped explosive charge of the present invention inserted in the pocket cut in the tree to be felled;

FIG. 3 is an enlarged plan view of one form of the shaped explosive charge of the present invention;

FIG. 4 is a side elevation view of the shaped charge illustrated in FIG. 3;

FIG. 5 is a further enlarged sectional view of the shaped charge illustrated in FIGS. 3 and 4, taken generally along line **5—5** of FIG. 3;

FIG. 6 is a plan view of a modified form of the shaped explosive charge of the present invention, wherein the central portion of the charge is reduced in width; and

FIG. 7 is a side elevation view of the shaped charge illustrated in FIG. 6.

Description of the preferred embodiments

To fell a tree **10** (FIGS. 1 and 2) according to the method of the present invention, a generally flat or planar pocket **12** is first cut in the tree. The pocket **12** has a relatively small thickness *t* compared to its depth *d* and width *w*, and extends radially into the tree **10** across the grain **14**. Thus, the thickness *t* of the pocket extends generally in the direction of the tree grain **14**, and the depth *d* and width *w* extend in directions across the direction of the grain. The pocket should extend at least to the longitudinal center line of the tree, and preferably about two-thirds way through the tree, and preferably has a width less than half its depth. By way of example, to fell a tree which is about 30″ in diameter, the depth, width and thickness of the pocket **12** may be approximately 20″, 4″, and ¼ to ½ of an inch, respectively. Thus, the depth of the pocket is suitably about five times its width, and the width is about eight to sixteen times its thickness.

The pocket **12** may form a right angle with the longitudinal axis of the tree, as shown in FIG. 2, or it may form an acute angle with the axis to control the direction in which the tree will fall when severance is subsequently effected.

While any suitable technique may be employed to cut the pocket **12** into the tree **10**, making a "thrust cut" into the tree with a chain saw **18** (FIG. 1) has proven to be a particularly quick and efficient technique. This is accomplished by simply moving the chain **20** and its carrier **22** radially into the tree **10**, point first, so that the chain cuts across the tree grain **14**. The cut pocket **12** consequently has dimensions (depth, width and thickness) corresponding to the dimensions of the portions of the saw chain **20** and chain carrier **22** which penetrate the tree. As noted above, the angle that the pocket **12** forms with the longitudinal axis of the tree, and hence the angle that the chain saw carrier **22** forms with the tree's axis when cutting the pockets, aids in determining the direction in which the tree will fall when severance is subsequently effected.

After the pocket is formed, explosive material is inserted into the pocket **12** of the tree **10** and is thereafter detonated. Due to the configuration of the pocket **12**, the shock wave from the explosive blast travels through the tree principally in a direction parallel to the depth-width plane of the pocket to sever the tree. Very little of the tree is disintegrated in the process.

While various types of explosive materials, including explosive liquids and particulate materials, may be packed into the pocket **12** and detonated to effect felling of the tree **10**, the novel shaped charge **30** shown in FIGS. 3–5 is particularly effective when used in conjunction with the method described herein. The charge comprises a flexible container **32** (suitably fabricated from a metal such as aluminum sheet or from a molded plastic such as polyethylene) defined by a pair of generally planar, parallel side walls **34**, **36** and a peripheral edge wall **38** filled with explosive material **40**.

The peripheral edge wall **38** is concavely-shaped, preferably V-shaped, and outwardly facing. When the charge is detonated, this configuration of the peripheral edge wall **38** directs and concentrates the shock wave generated along a plane which extends through the V or center of the charge, thereby giving maximum severing effect to the explosive shock wave and permitting a minimum quantity of explosive material to be employed for any given size and specie of tree.

While the flexible container **32** may be packed or loaded with any suitable liquid, slurry, particulate, or cast explosive composition, a liquid explosive composed of nitromethane, sensitized with 2–5% ethylenediamine has proven to be effective. The flexible container preferably should be thin-walled, particularly along its peripheral edge wall **38**.

The tail end **44** of the shaped charge **30** is provided with a recess **46** preferably sized to snugly receive a conventional blast detonator **48** (FIG. 2). The forward end **50** of the charge is preferably curved to fit the forward end of the pocket **12** cut by the chain saw **18** (FIGS. 1 and 2). This curved shape of the forward end of the charge also functions to spread the explosive shock wave therefrom through a 180° azimuthal angle when the charge is detonated.

In use, a conventional blast detonator **48** is initially placed in the recess **46** in the tail end of the shaped charge **30**, and the charge is inserted into the pocket **12** cut in the tree **10** to be severed. The charge is then detonated in a conventional manner, and the shock wave generated is concentrated and principally directed through the tree **10** by the concave configuration of the peripheral edge wall **38** to effect severing of the tree. The cut surfaces of the tree are relatively nonshattered, and very little of the tree is disintegrated by the blast.

As can be seen from the foregoing, the shaped charge **30** constitutes a self-contained unit which may be fabricated beforehand rather than at the tree site.

The modified shaped explosive charge **60** shown in FIGS. 6 and 7 is designed for use in felling trees having a soft center core, and differs from the charge **30** of FIGS. 3–5 in only one respect. The width dimension of the charge is reduced in its central portion **62**. This configuration reduces the amount of explosive material used in the charge, thereby reducing its cost. The shaped charge **60** is identical to the shaped charge **30** of FIGS. 3–5 in all other respects. When the charge **60** is inserted into the pocket cut in a soft core tree and detonated, the shock wave from the forward and rear portions of the charge will be sufficient to effect severance of the tree.

While the foregoing description is principally directed to the felling of live trees by an explosive shearing action near ground level, it will be understood that the disclosed method and the flat, elongate explosive charge also have like utility for tree topping and/or severing other tree-like bodies, such as logs, pilings, poles or large cut timbers, simply by way of further example.

What is claimed is:

1. A method of severing a tree or the like having a longitudinal center line, comprising the steps of:

cutting a cross-grain, generally planar pocket into the tree at a substantial angle relative to the center line thereof, said pocket having a relatively small thickness extending generally along the direction of the grain of the tree, and having a depth and width extending generally in directions across the grain of the tree, the depth of the pocket being at least about equal to the radius of the tree in the area of the pocket, the width of the pocket being less than half of the depth of the pocket and at least about eight times the thickness of the pocket;

loading the pocket with an explosive material; and

detonating the explosive material.

2. The method of severing a tree or the like according to claim **1**, wherein the step of cutting the pocket in the tree comprises cutting the pocket to a depth equal to at least about two-thirds of the diameter of the tree in the area of the pocket.

3. The method of severing a tree or the like according to claim **1**, wherein the step of cutting the pocket in the tree comprises cutting the pocket to extend into the tree along a plane generally perpendicular to the longitudinal center line of the tree.

4. The method of severing a tree or the like according to claim **1**, wherein the step of cutting the pocket in the tree comprises cutting the pocket to extend into the tree along a plane which forms an acute angle with the longitudinal center line of the tree.

5. The method of severing a tree or the like according to claim **1**, wherein the step of cutting the pocket in the tree comprises making a thrust cut into the tree with a chain saw.

6. The method of severing a tree or the like according to claim **1**, wherein the step of loading the pocket with explosive material comprises substantially filling the pocket with a liquid explosive.

7. The method of severing a tree or the like according to claim **1**, wherein the pocket cut into the tree is defined by two substantially parallel side walls and a peripheral edge wall; and wherein the step of loading the pocket with an explosive material comprises inserting a shaped explosive charge into the pocket; the shaped explosive charge having generally flat side walls contiguous to the side walls of the pocket and a concavely-shaped peripheral edge wall contiguous to the peripheral edge wall generally of the pocket.

8. An explosive charge package especially adapted to fit in a cross-grain, generally planar pocket in a tree or the like to effect the severing thereof upon detonation of the explosive charge, said charge comprising:

an elongate container defined by two substantially parallel, substantially planar side walls, a substantially semicircular end, and a peripheral edge wall, the depth of the container being at least about twice the width of the container and the width of the container is at least about eight times the thickness of the container;

explosive material in said container; and

means in said container for receiving a blast detonator.

9. An explosive charge package according to claim **8**, wherein at least a portion of the peripheral edge wall of the container is thin-walled and cross-sectionally concave along its outer face.

10. An explosive charge package according to claim **9**, wherein the peripheral edge wall of the container is V-shaped in cross sectional configuration.

11. An explosive charge package according to claim **8**, wherein said container is substantially filled with liquid explosive material.

12. An explosive charge package according to claim **8**, wherein said explosive material at least principally comprises nitromethane.

13. An explosive charge package according to claim **8**, wherein said means for receiving a blast detonator comprises a recess in the rear end of the container.

14. An explosive charge package according to claim **8**, wherein said container is fabricated of molded plastic.

15. The method of severing a tree or the like, comprising: forming a hole in the tree near the base thereof the configuration of the hole being with a thickness dimension extending generally along the direction of the grain of the tree, and with depth and width dimensions extending generally in directions across the grain of the tree, the depth of the hole extending at least about half of the way through the tree and the width of the hole being less than half the depth of the hole and at least about eight times the thickness of the hole; emplacing a cavitated explosive charge in the hole with cavitated portion(s) of the charge facing generally cross-grain of the tree; and detonating the explosive charge.

16. The method of claim **15**, wherein said cavitated charge comprises an edge of relatively small dimension

extending generally parallel to the grain of the tree when the charge is emplaced, and said edge is of generally concave shape.

17. In combination with a standing tree or the like; a sawn hole in the tree near the base thereof, said hole having a thickness dimension extending generally along the direction of the grain of the tree and having depth and width dimensions extending generally in directions across the grain of the tree, the depth of the hole extending at least about half way through the tree and the width of the hole being less than half the depth of the hole and at least about eight times the thickness of the hole; and an explosive charge substantially filling said hole.

18. The combination of claim **17**, wherein said hole is a chain saw thrust cut.

19. The combination of claim **17**, wherein said explosive charge is contained in a thin-walled container, configured to snugly fit in the hole.

20. The combination of claim **19**, wherein said container has a peripheral edge wall of substantially V-shaped cross sectional configuration, facing generally cross-grain of the tree.

21. The combination of claim **19**, wherein the explosive charge in said container is in liquid form.

References Cited

UNITED STATES PATENTS

2,109,435	2/1938	Sawyer	102—26
2,587,243	2/1952	Sweetman	102—24
2,638,323	5/1953	Bannon	102—24
2,833,214	5/1958	Spencer	102—24
2,839,997	6/1958	Church et al.	102—24
3,169,479	2/1965	Bryan	102—24
3,244,104	5/1966	Mills et al.	102—24

VERLIN R. PENDEGRASS, *Primary Examiner.*

U.S. Cl. X.R.

102—24