

Long-handled clippers

MIT Humanitarian Demining Course
January 6, 2004

Introduction

Deminers are frequently confronted with vegetation that must be removed before demining operations can continue. Deminers use mechanical vegetation clearance equipment and manual vegetation clearance hand tools to address this challenge. Several hand-held tools are currently used, including garden clippers, shears and saws. Of these, there are no known one-handed clippers in use with long handles. Long handles improve the safety of tools by keeping the operators hands away from a blast during an accident. The long-handled clippers were developed to make available a safer one-handed clipper.

Although two-handed clippers are available with long handles, they do not obviate the need for one-handed clippers. Clippers are designed to cut larger vegetation such as thick stems, small branches and roots, which cannot readily be cut with shears. One-handed clippers are used for medium sized vegetation that does not require the effort of two-handed clippers. They are often used for careful work requiring increased control. Finally, some people show a preference for one-handed clippers and a safer version would make such a preference a safer one.

Design

The long-handled clippers are show in Figure 1. Figure 2 indicates one way the clippers would be held during normal use. The clippers can be held in one hand in various orientations to cut vegetation close to the ground. They may also be used to cut vegetation in other situations, but they are designed primarily for cutting in an area where a blast may occur.



Figure 1. The long-handled clippers including a top view and a side view.



Figure 2. A person holding the long-handled clippers in a position of normal use.

The distance between the operating hand and the tip of the tool is substantially increased over that of conventional clippers, which distances the hand from a potential blast. Furthermore, the orientation of

the tool places the hand low to the ground and significantly away from the cone of a potential blast. This configuration appears to be unique and new to demining. A knife and anvil style cutting head is used to avoid transmitting pulling forces to vegetation. These pulling forces can be created by shear style cutting heads and can potentially set off mines. Mechanical components, such as springs, that are often found in the heads of conventional clippers have been moved to the handle area to prevent them from becoming projectiles that could injure a deminer in the case of an accident.

Testing

The long-handled clippers were tested on stems and roots in the Boston Massachusetts area. The cutters were deemed to be versatile enough to handle the basic tasks accomplished with traditional clippers. They were found to be too heavy and possibly too long, given that the operating hand is close to the ground and out of the way. The handle orientation confounds the hand forces applied to hold the device in place and those applied to actuate the device. As a result, a large spring was needed to keep the clippers from closing while being held, which increased the clipping force and fatigue during repeated actuation.

Manufacture

The frame and fixed handle of the clippers would be made from one piece of metal. It is possible that the anvil could also be incorporated into this part. Additional parts would be needed for the cutting blade, pivots, pull rod, lever and spring, giving a total part count of seven, possibly eight, pieces if integral fasteners are used. A significant number of pieces are attributable to the knife and anvil cutting head. However, there are current clippers that have this type of cutting head that have survived blast testing successfully, so this high part count may not be a limiting aspect of the design. The manufacture of the device is limited to those locations with the ability to produce existing clipper designs. No new materials or technologies are required.

Future work

The next step in the development of the clippers is to get feedback from the demining community. If this feedback is favorable, then further development work should follow, as the design presented here is an initial concept prototype. Issues to be addressed include lowering the weight, improving balance, adjusting the sizing and decoupling positional forces from actuation forces. It is likely that a supporting brace will be needed and possibly a change in handle orientation as well. Alternatives were considered but not implemented in this prototype. Further consideration should be given to the location of the free hand during operation. Deminers may frequently place their free hand near a potential blast area to remove clippings as they are cut. One possibility is a feature that would allow the removal of clippings with the tool in one motion. Some effort should also be made to further reduce the number of parts at the head of the device, or at least to ensure that integral fasteners will be fully feasible.

Credits

Roshan Baliga designed the long-handled clippers in the MIT Humanitarian Demining Course taught in the Spring of 2003 by Andrew Heafitz and Benjamin Linder. Benjamin Linder took the photos and wrote this report.