

ABSTRACT: Describes the attributes of an agitating lift bar that was developed at the Placerville Nursery, Camino, California.

INTRODUCTION

Historically, lifting of seedlings at the Placerville Nursery was done using a solid bar with nonmovable fingers of staggered heights and lengths to break up the soil. The bar was pulled with a crawler tractor on a modified three-point hitch system to give power down to force it into the ground. This system worked relatively well but required constant monitoring and adjusting to do an adequate job of loosening the soil from the roots. Under some conditions it could not be adjusted to do an adequate job resulting in damaged roots during the manual lifting process.

Numerous times during the last 10 to 15 years different types of agitating or shaking lifters were tried with approximately the same unsuccessful results. The problems with the available machines were pulling the bulky drive apparatus through our heavy clay soil, and damaging seedling roots with the underground moving parts.

To solve the problem we decided to design and build a simple, streamlined lifting bar with agitating fingers. Thanks to valuable help from Engineer. Dan Totheroh and Fabricator Earle Trimble, I think we have a mission accomplished.

ATTRIBUTES

1. Cutting bar designed light because it doesn't move independent of tractor and has less strain. The bar is made of 1-inch (2.5cm) by 5-inch (12.7cm) steel and the Shaker fingers are made of 1/2-inch (1.3cm) by 1 1/2-inch (3.8cm) steel mounted on a 3/4-inch (1.9cm) by 4-inch (10.2cm) plate.

2. Shaker fingers powered by a hydraulic motor.

3. The amount of movement and number of underground moving parts held to a minimum to reduce wear and maintenance cost.

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4. Shaker fingers are divided in half and are 180 out of phase with each other to even the motor load and reduce the motor and component size. The hydraulic motor used was the smallest available.

5. The staggered finger lengths were based on the assumption that the narrow spacing was needed to provide adequate soil agitation and the wider spacing at the back end of the fingers would allow more of the loosened soil to fall through.

6. The parts underground were designed so as not to catch or damage seedling roots. There is a smooth flow from the leading edge of the cutting bar to the back of the agitating fingers with no acute angles or lips for seedlings to hang up on.

7. The power arm to shaker fingers follows directly behind the upright cutting arm keeping drag and wear to a minimum.

8. The angle of the shaker fingers to the cutting bar is adjustable.

9. The amplitude was made adjustable to experiment and find the optimum movement.

10. The frequency of movement has wide range of adjustability for fine tuning.

11. We found that the optimum movement was about 1 inch (2.5cm) and the frequency was six to eight movements per second.

For additional understanding refer to figure 1 and figure 2.

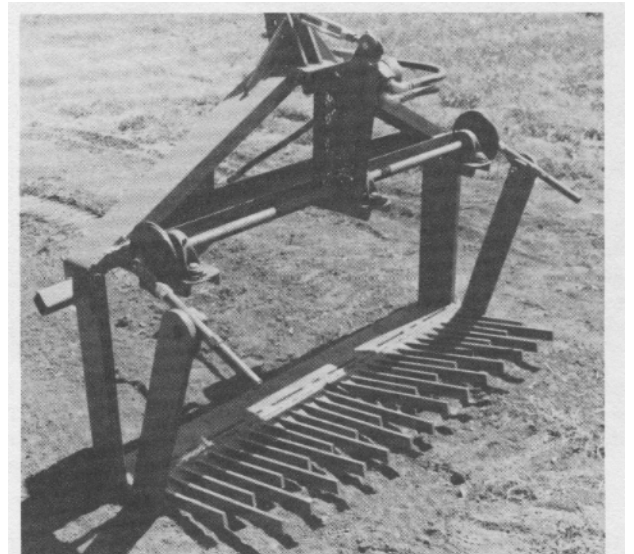


Figure 1.--Placerville Nursery seedling lifting bar.

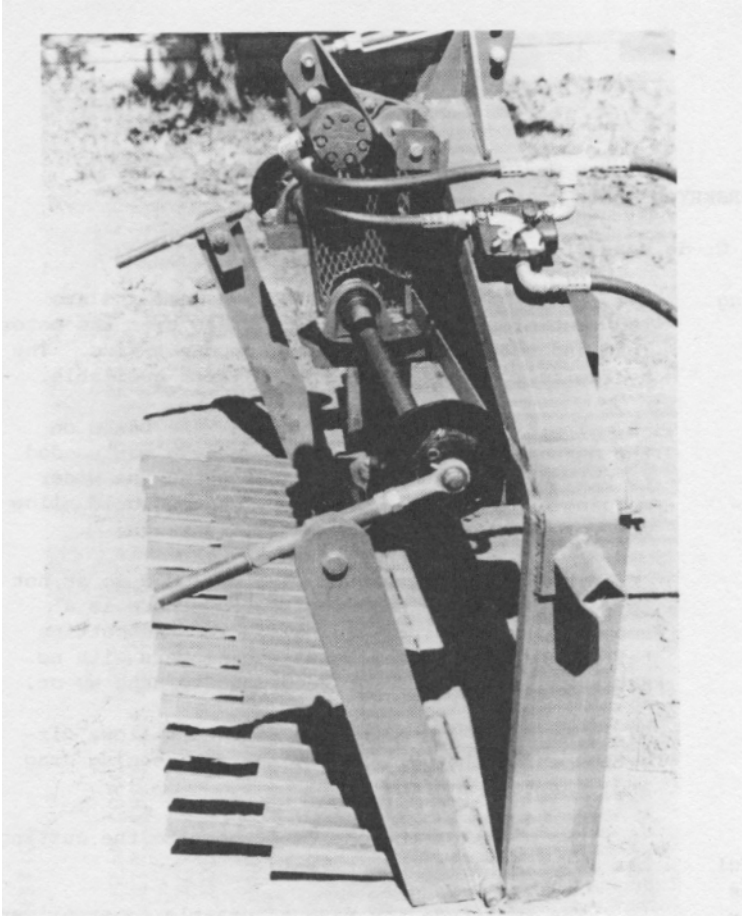


Figure 2.--Side view showing hydraulic motor, speed control, amplitude adjustment, piano type hinge far attaching agitating fingers, and the angle adjustment for agitating fingers.

RESULTS

The lifter was not completed until after the season's production lifting was completed, but several rows of surplus seedlings were left to test it with. In one test the agitation was stopped on one side and not on the other. Then several people hand-lifted the seedlings to see if they could tell the difference. Without exception each person correctly identified which side had the agitation and which side did not.

Roots of seedlings from both sides were examined. Damaged roots, mainly stripped laterals, were easily found from the non-agitated side but were virtually non-existent from the agitated side. Seedlings could be pulled from the ground singly from the agitated side in most cases and still not show signs of root stripping.