CHAPTER I

A TURFGRASS WEAR SIMULATOR FOR SMALL PLOT INVESTIGATIONS

Abstract

A mechanical turfgrass wear simulator was constructed for small plot investigations. The machine was constructed for uses on experimental units as small as 1 m^2, and of a size and weight to be easily moved by an individual. The machine simulates both foot and tire wear on turf with minimum soil compaction effects.

Introduction

Turfgrass wear results from the weight or pressure of traffic crushing leaf, stem, and crown tissues of the turfgrass plant. The wear tolerance of turf varies, according to (a) turfgrass species, and cultivar, (b) intensity and type of traffic, and (c) the environment, and (d) the intensity of culture practiced (1). Several mechanical wear and compaction simulators have been developed for

investigation of turfgrass wear tolerance (2, 3, 4). In general, these machines have been constructed for use on large experimental units, and are not easily transported from one experimental site to another.

A wear simulator was developed that would meet the following criteria for conducting comparative turfgrass wear tolerance studied:

(a) Provide an action that would separate turfgrass wear aspects from soil compaction.

(b) Operate for extended periods independent of operators.

(c) Operate on experimental units as small as 1 m^2.

(d) Be of a size and weight that can be easily transported from one experimental site to another.

Description

Several models of wear simulators were studied. After considerable discussion and study, one design was adopted for construction. The simulator was constructed in August, 1972. Test runs on various turfs were conducted to develop standard procedures for operation of the machine.

Figures I.1 and I.2 are overall views of the mechanical wear simulator. The machine is constructed to rotate around a pivotal point with an adjustable diameter ranging from 1.0 to 2.7 m. It is anchored by four steel rods (0.75 cm x 75.0 cm) driven through a flat plate (6.25 dm^2) at the base of the pivot assembly. The unit weighs 47.2 kg. The weight of the rotating unit is supported by a 10 x 20 cm pneumatic tire, supplying a pressure of 7.2 kg dm^{-2} on the turf. The tire simulates wear aspects similar to golf carts and maintenance equipment. A weighted sled attached to a tow arm and actuated by a cam was adapted to the wear simulator to simulate the tearing and crushing aspects of foot traffic. The cam operates from a lobe on the axle of the wheel and gives a twisting action to the sled. The sled weighs 14.5 kg and supplies a pressure of 1.45 kg dm^{-2} to the turf.

Electrical power is supplied through a cooperband-brush commutator having a slip-ring assembly at the top of the pivotal rod. A 0.25 HP electrical motor drives the wear simulator. The unit is chain driven with a traveling speed of 1.6 km hr^{-1}. The number of revolutions required to reach a predetermined wear endpoint was recorded on a counting device at the base of the pivotal assembly. Figures I.2, I.3, and I.4 illustrate the basic components and specifications for construction of the turfgrass wear simulator.

Preliminary experiments demonstrated that the wear simulator can effectively separate wear tolerance differentials among both turfgrass species and cultural practices. A wear endpoint, similar to that reported by Youngner (4), was chosen. The turfgrass wear tolerance was determined as the number of revolutions required to reach a point when all leaf blades were shredded from the sheath and only stems and bare soil remained. Differences in reaching this endpoint ranged from 300 to 750 revolutions for the cool-season species evaluated.

Literature Cited

1. Beard, J. B. 1973. Turfgrass: Science and Culture. Prentice Hall, Inc., New York. pp. 368-369.

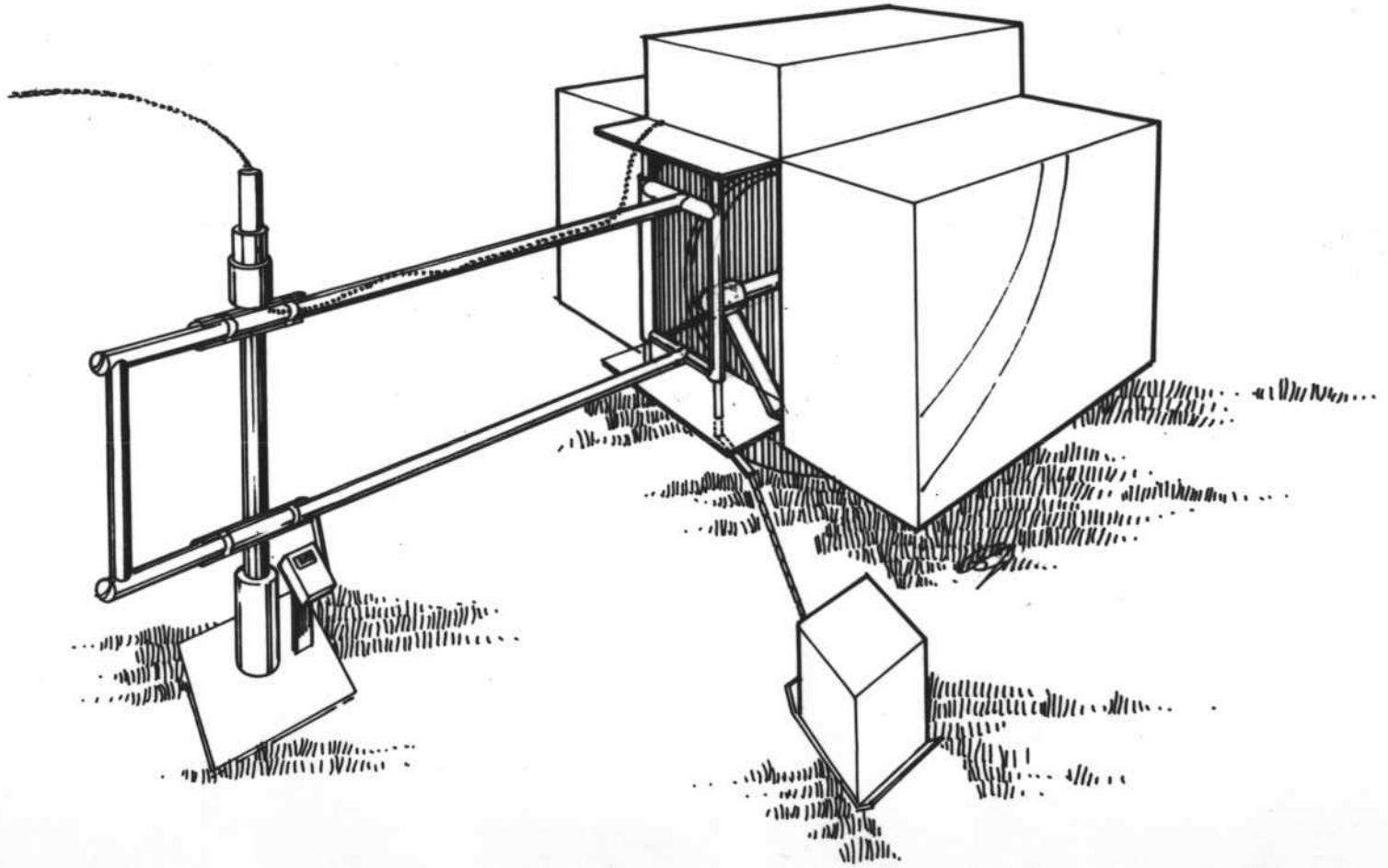
2. Goss, R. L. and J. Roberts. 1964. A compaction machine for turfgrass areas. Agronomy Journal. 56:522.

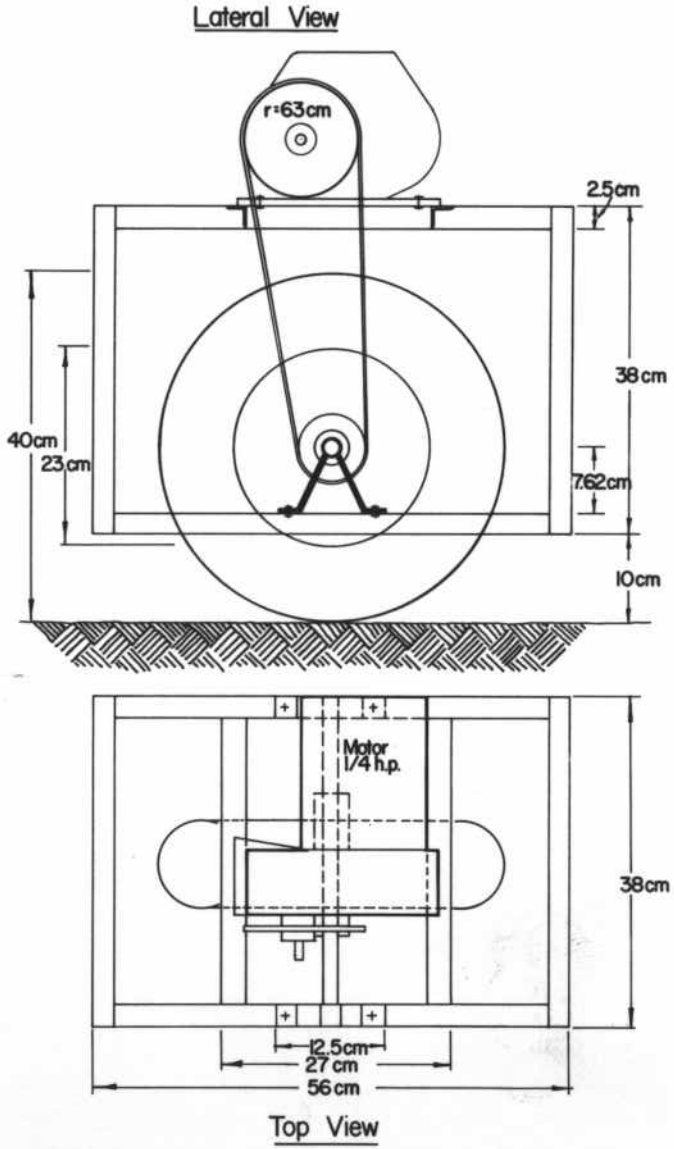
3. Shildrick, J. P. 1971. Grass variety trials. Journal of Sports Turf Research Institute. 47:86-113.

4. Youngner, V. B. 1961. Accelerated wear tests on turfgrasses. Agronomy Journal. 53:217-218.

Fig. I.1.--An overall view of the wear simulator showing the two aspects of wear simulated.

Fig. I.2.—A diagrammatic view of the wear simulator showing pivotal assembly and frame connection.





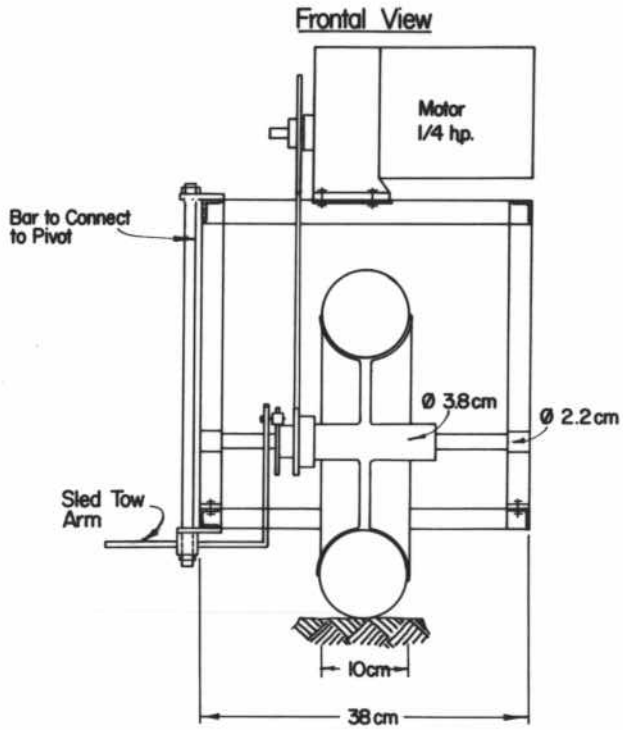


Fig. I.3.--Illustration of the basic components and specifications of the turfgrass wear simulator.

Fig. I.4.--View of the pivotal assembly and frame connection for the turfgrass wear simulator.