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MODIFIED RUKUHIA SOIL GRINDER

by

R. J. Day and G. H. Dixon

Calgary, Alberta

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R. J. Day¹ and G. H. Dixon²

INTRODUCTION

In 1955 D.F. Waters and I.C. Sweetman of the Rukuhia Soil Research Station, Hamilton, New Zealand published "The Rukuhia Soil Grinder" in Soil Science. Their note gives the properties and constructional details of an electrically driven 2 mm. soil screen that is effective, rapid and labour saving.

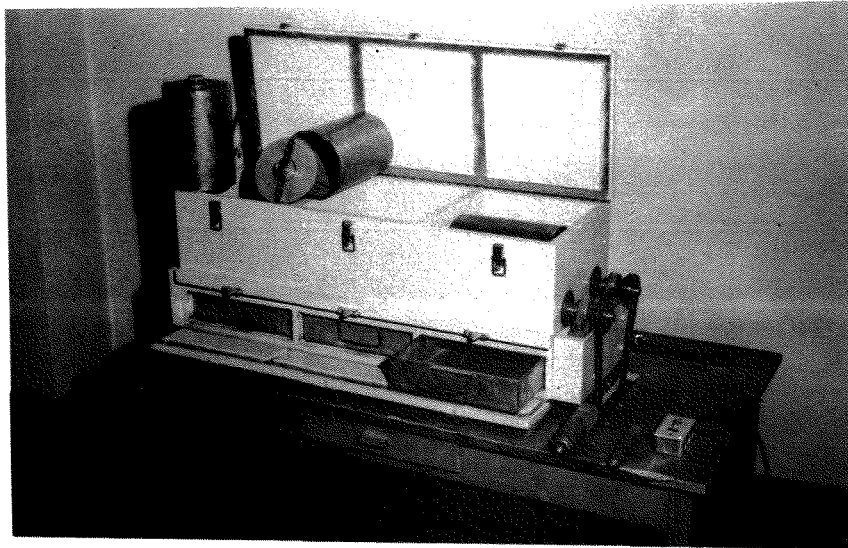


Figure 1. The modified Rukuhia Soil Grinder.

1 Research Officer, Forest Research Branch, Calgary, Alberta

2 Technician, Forest Research Branch, Calgary, Alberta.

In 1962 D. H. Lavery, Supervisor of the Agricultural Soil and Feed Testing Laboratory at the University of Alberta in Edmonton showed the writers the Rukuhia soil grinder that was built in their laboratory for preparation of soil samples for analysis. With his co-operation and advice a modified version of the Rukuhia soil grinder was built in the laboratory of the Forest Research Branch in Calgary, Alberta.

The plan and details of construction for our modified Rukuhia soil grinder are presented in this paper for the information of other laboratories in the Forestry Department. In this model the exhaust ducts and extractor fan have been eliminated and the grinding compartments of the machine have been dustproofed. These modifications eliminate the loss of fine soil, reduce contamination between contemporaneously ground samples, and allow the machine to be moved about and used in the laboratory without undue dust.

The modified Rukuhia soil grinder is illustrated in Figure 1 and the important details of construction are shown in the plan. The modified grinder will crush and screen three samples simultaneously. According to the soil texture from 5 to 10 minutes are needed for complete preparation of three 300 gm. samples. Overgrinding is prevented by the continual removal of the 2 mm. fraction.

Operation

An air- or oven-dry soil sample is placed in each drum with one heavy ($6\frac{3}{4}$ lb.) and one light ($1\frac{3}{4}$ lb.) steel rod. The drums are

closed and are placed on a pair of parallel rubberized rollers that run through the three dustproof compartments. The lid and lower door are fastened and the drums are rotated at 33 rpm. by a reduction geared $\frac{1}{4}$ - horsepower electric motor. The pair of steel rods in each drum tumble over the soil and reduce the aggregates until they fall through the 2 mm. perforations into the respective catch pans.

Construction

The housing is simple to build. All the doors are fitted with 3/8" thick by 3/4" wide foam rubber weather strip. The 3 3/8" holes cut through the three compartments walls are dustproofed with gaskets made from saddler's hair felt. The lid is secured by three large luggage clamps and the lower door by three window sash fasteners. Both types of closure put pressure on the foam rubber weather strip and make a dust-proof seal.

The catch pans are made from 20-gauge galvanised iron sheet. Folding handles are necessary to permit closure of the lower door.

The rubberized rollers are a pair of modified standard 2 $\frac{1}{2}$ " diameter swather rollers. These are shortened, covered with latex cement and lagged with 3" wide rubberized canvas stripping. The stripping is applied spirally with edges butted and is secured to each end of the roller with wood screws. The rollers are mounted on pillow block bearings fitted to the steel shafting that projects from the ends of the rollers. A 3" driving pulley is then fitted to the longer steel shaft on each roller.

The drums are made from 20-gauge stainless steel with 0.078-inch (1.98 mm.) round perforations staggered with 0.16-inches between centers. Sheets of this material that are 21 3/8" x 10" are rolled into 10-inch cylinders with a 3/8" lap. The seam of this cylinder, the stainless steel bottom and mild steel ring that fastens the lid of the drum are fixed in position with argon arc spot welds.

The steel grinding rods are made from 1- and 2-inch shafting.

The drive is from a 1/4-h.p. reduction geared electric motor fitted with a 2" pulley that rotates at 120 rpm. A V-belt transfers the drive to the two 3" driving pulleys at the ends of the 2 3/4" diameter rubberized rollers and gives them a speed of 80 rpm. The drums have more than double the diameter of the rubberized rollers and run at 33 rpm.

Materials and Cost

Local materials were used for construction of the housing, catch pans, rollers, grinding rods and drive. The 20-gauge perforated stainless steel plate for the drums was ordered from the Railway and Power Engineering Corp. Ltd., 10525 - 104th Street, Edmonton, Alberta. A local machine shop fabricated the drums.

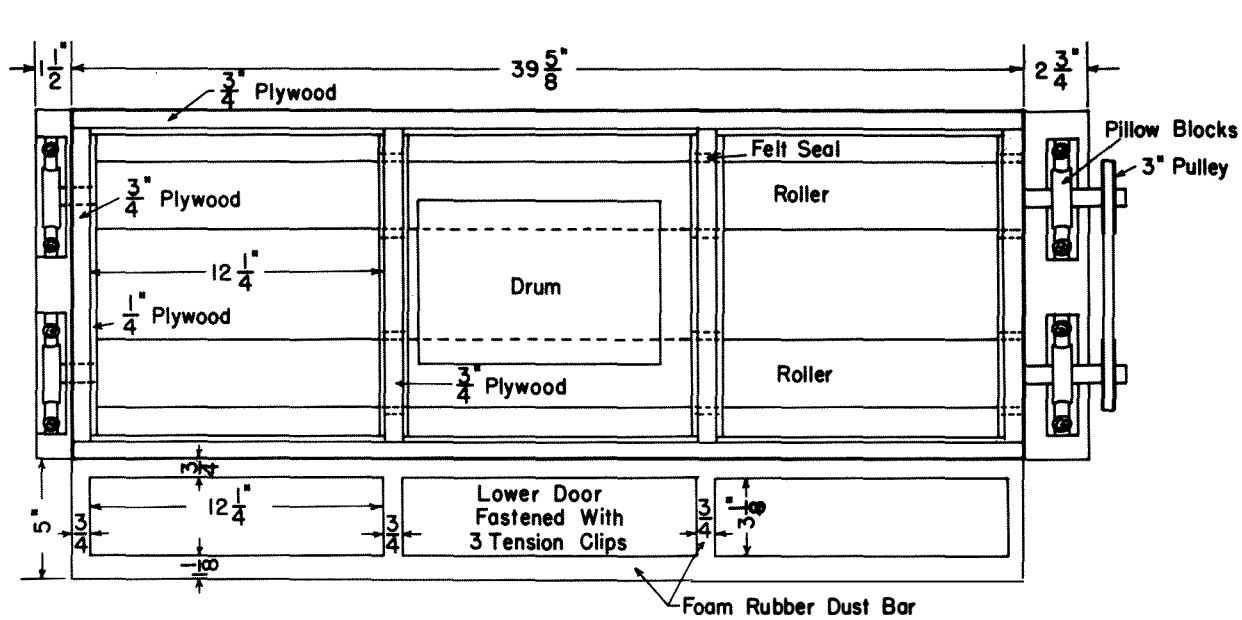
The cost of the modified Rukuhia soil grinder made in Calgary is as follows:

3 - sheets of perforated stainless steel	\$ 65.00
3 - drums, manufacture and materials in addition to the above item	105.00
3 - sets of steel grinding rods.	30.00

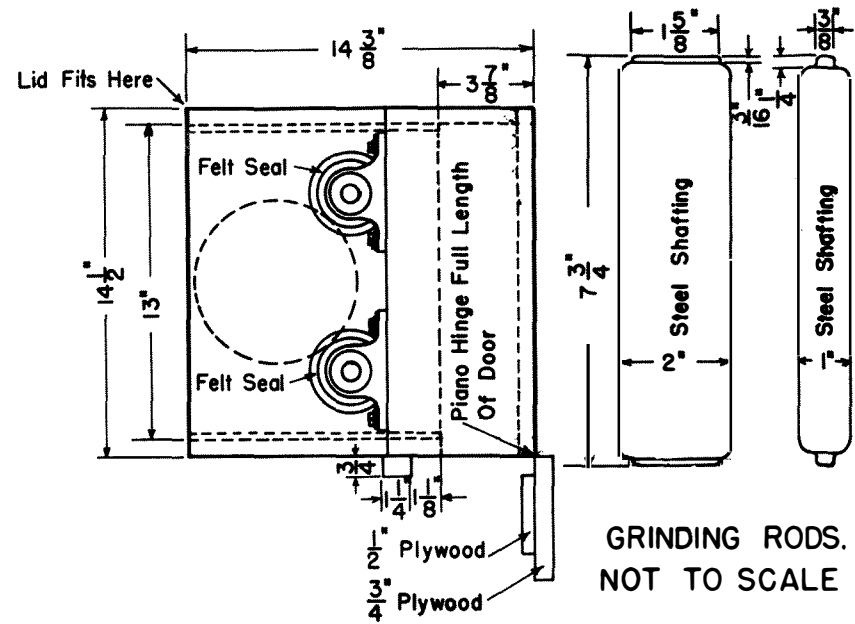
	\$
3 - catch pans	10.00
1 - $\frac{1}{4}$ - h.p. reduction geared electric motor105.00
2 - swather rollers with lagging, pillow blocks pulleys and belt	40.00
- housing and hardware	30.00
	<hr/>
	<u>\$385.00</u>

REFERENCE

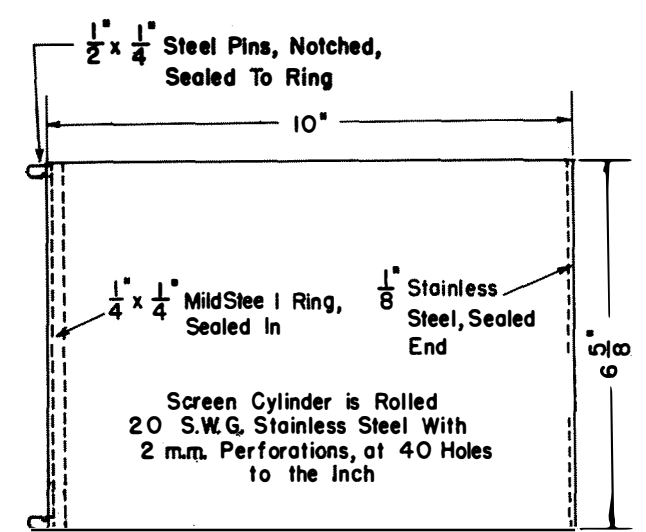
Waters, D.F. and I.C. Sweetman - 1955 - The Rukuhia Soil Grinder.
Soil Science. Vol. 79, No. 5, May, 1955.



TOP VIEW

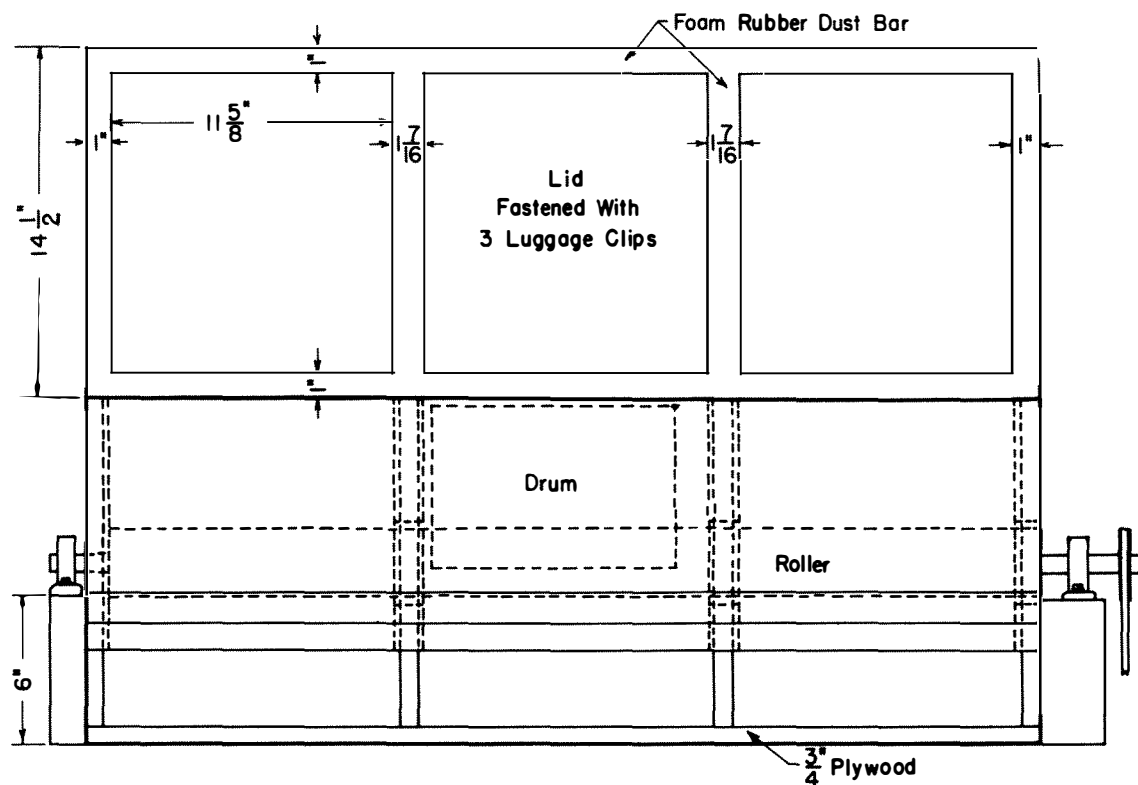


SIDE VIEW

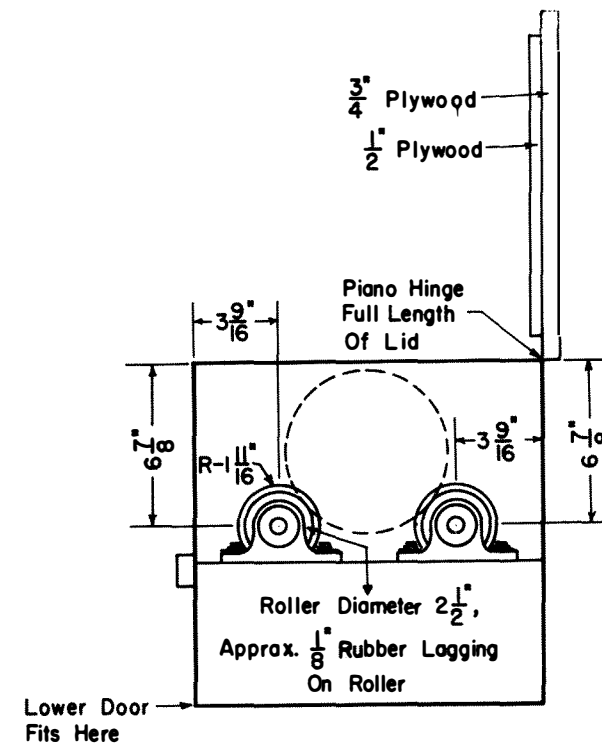


DRUM NOT TO SCALE

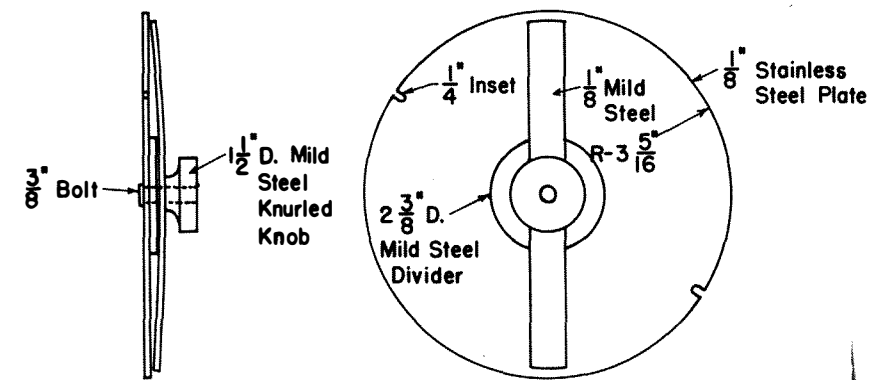
MODIFIED "RUKUHIA" SOIL GRINDER



FRONT VIEW

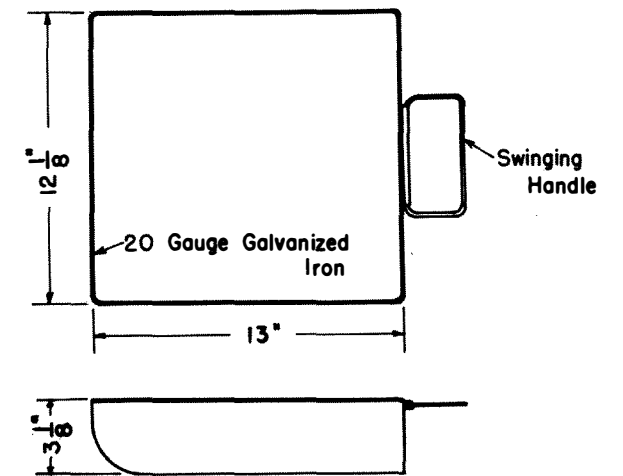


SIDE VIEW



SIDE VIEW DRUM LID NOT TO SCALE

TOP VIEW - DETACHABLE DRUM LID NOT TO SCALE



SOIL CATCH PAN