

The Description and Operation of a Machine for Peeling Avocados

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Abstract: The construction and operation of a machine for peeling avocado fruit is described. The machine consists of two drums, both rotating downward toward the nip. One has a solid outside surface, the other has a perforated outside surface. Pitted avocado halves are placed one at a time with the seed cavity toward the perforated drum. As the drums rotate, the solid drum presses the meat of the avocado through the 1/4 inch holes in the perforated drum. A doctor blade mounted inside the perforated drum cuts the meat from the peel, and a doctor blade on the outside of the perforated drum removes the peel.

INTRODUCTION

Avocados selected for fresh market distribution are as a rule choice fruit. Those fruit which do not meet market standards are eliminated at the packing house as culls. Most of the culls contain edible meat, but do not meet fresh market standards because of wind scars, damaged spots, small size or other physical defects.

The United States Department of Agriculture, Agricultural Statistics, (1) shows more than 500 tons of avocados were culled from fruit harvested in 1954, 875 tons in 1955, 1,125 tons in 1956, 545 tons in 1957, 400 tons in 1958, 950 tons in 1959, and 660 tons in 1964.

Products have been recommended (2, 3, 5, 6) which might profitably utilize the cull or surplus fruit, but until recently none of the recommended uses have been developed on a large commercial scale. Urbanek (7) reports that a frozen guacamole dip is being produced and offered in consumer test markets in Phoenix, Arizona, and some cities in Texas. Plans are underway to distribute the product throughout the United States.

The high cost of hand labor necessary to peel the avocado fruit has been one of the reasons for the lack of commercial interest in the development of processed avocado products.

The purpose of this report is to describe the construction and operation of a machine which will, in one operation, separate the peel from the avocado meat and at the same time cut the meat into short pieces suitable for use in salad mixes (guacamole). The machine is similar to the one described by Rathbun (4) which was designed to separate banana pulp from the peel.

DESCRIPTION OF MACHINE

The avocado peeling machine shown in Figures 1 and 2 consists of two rotating drums made of 15 gauge stainless steel, 16 inches in diameter and 4 inches wide. The surface

of one drum is solid and the surface of the opposite drum is perforated with holes 1/4 inch in diameter, with 1/16 inch or less of metal between holes. The holes are round and each hole is slightly leveled on the outside surface of the drum.

The bearings for the two drums are sprocket hubs from two bicycles. Two shafts 3/4 inch in diameter are fitted through the bearings of each hub and a flange about 3 inches in diameter welded to one end of each shaft and a 5 inch V-belt pulley fastened to the opposite end of each shaft. The solid (press) drum is bolted to one flange and the perforated drum bolted to the other.

The hub supporting the perforated drum is mounted stationary on a frame constructed of 1 inch angle iron. The hub supporting the press drum is mounted on a hinged plate and the plate mounted on the frame so the two drums are in line. The hinged plate is held under spring tension and is attached to the frame in such a manner that the clearance between the drums is adjustable from 0 to 1/4 inch. Both drums are attached with V-belts to a variable speed drive so that as the machine is operated the drums rotate downward toward the nip. Doctor blades are mounted both inside and outside the perforated drum as close to the contact area of the two drums as possible. A discharge shoot attached to the inside doctor blade curves down and extends outside the perforated drum. The outside doctor blade is mounted with the cutting edge about 1/3 inch lower on the perforated drum than the cutting edge of the inside doctor blade. A third doctor blade is mounted outside and near the bottom of the press drum to remove pieces of broken peel adhering to the surface. Triangular retaining plates are mounted on either side of the drums extending from the nip to the top of the drums.

OPERATION

To operate the machine the speed of the drums is adjusted with the variable speed drive to turn approximately 10 rpm. The avocado fruit is cut in half, the seed removed and each half inspected for damaged and discolored spots. The pitted avocado halves are placed one at a time on the perforated drum with the fleshy meat side of the half toward the perforated surface. As the drums turn, the avocado halves are carried to the press drum and the meat from each half is pressed through the perforated drum. The retaining plates on either side of the drums prevent the avocado halves from falling from the drums. The doctor blade inside the perforated drum cuts the meat from the peel at the contact area where the press drum exerts the greatest pressure on the avocado. The meat moves down the shoot from the inside doctor blade out of the perforated drum and drops into a container. The peels of the avocados are removed from the perforated drum by the outside doctor blade and drop into a second container.

Some avocado meat remains on the peel, as shown in Figure 3. The amount remaining on the peel is determined by the thickness of the metal used to construct the surface of the perforated drum. Numerous batches of avocado halves were peeled with the machine. The percentage of meat remaining on the peel of two 4540 gram batches are presented in Table 1 to show the capability of this machine. The meat remaining on the peel was carefully scraped from the processed peel and the percentage meat remaining on the peel calculated. The 8.4 and the 6.2 percent for the two batches represents that part of the avocado meat which the machine does not remove and will be discarded with the peel. The percentage of peel and meat of the fruit halves discarded by this

operation is 24.5 percent for the first batch and 23.8 percent for the second batch. Stephens, (5), reported a 21 percent loss when the same variety was peeled by hand.

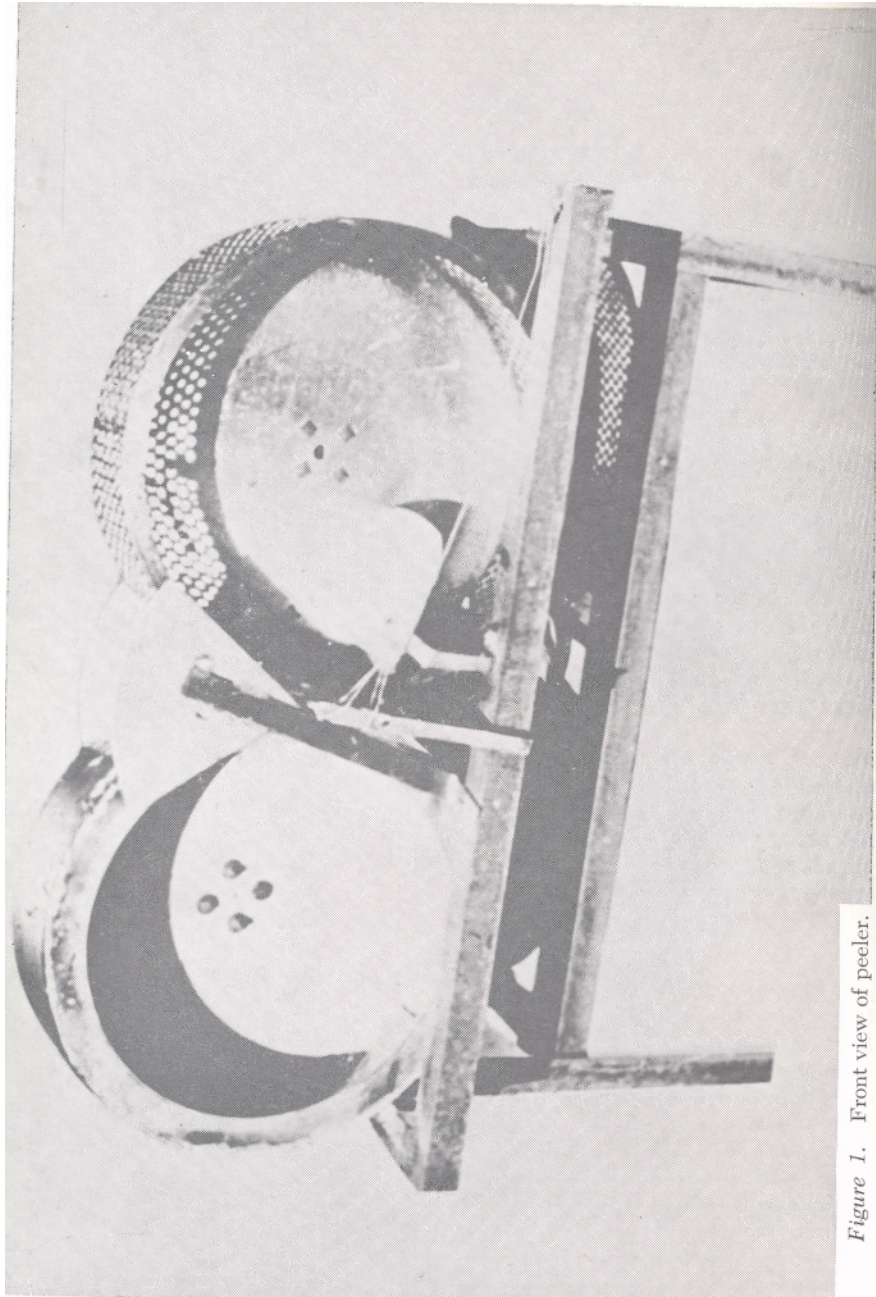


Figure 1. Front view of peeler.

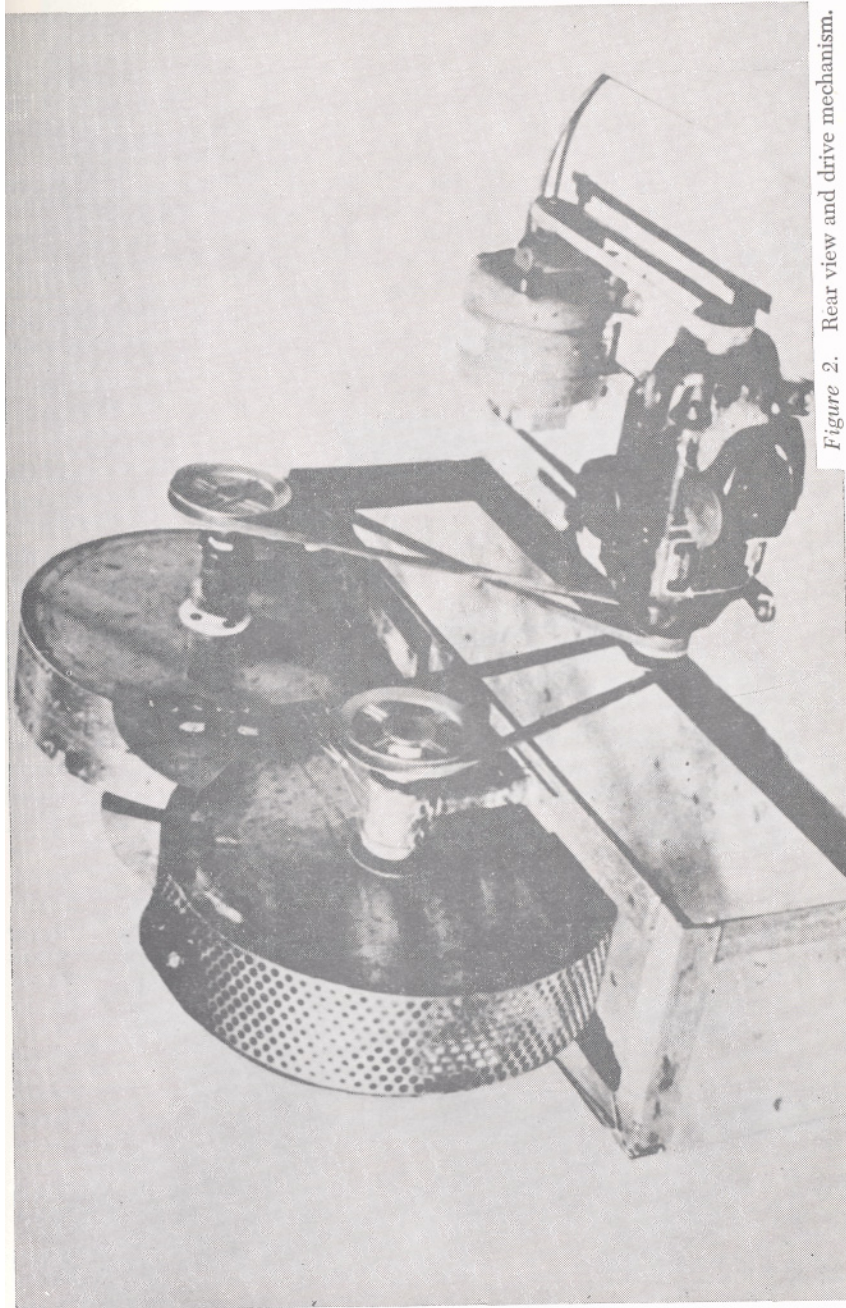


Figure 2. Rear view and drive mechanism.

There are a few precautions which should be considered in the event a similar machine is constructed. The round holes in the perforated drums should be beveled on the side next to the avocado meat to allow the peel to slide over the surface of the perforated drum as the avocado half is flattened by the press drum. The surface of the perforated drum should be constructed of thin metal to reduce the quantity of meat which may remain on the peel. The drums should be at least 16 inches in diameter or larger so the angle at the nip will not be too abrupt. If the drums are too small the avocado halves slip and will not be forced between the drums. The press drum should be mounted on a

hinged plate held under spring tension so it can move away from the perforated drum to prevent green halves or seed which might accidentally be placed in the machine from damaging the perforated drum. The use of heavier bearings than bicycle hubs is recommended.

ACKNOWLEDGEMENT

The author wishes to thank H. W. Tobóla, Shop Foreman, for the construction of the machine, and personnel of the Food Crops Utilization Research Laboratory for their assistance.

LITERATURE CITED

1. Agricultural Statistics. 1966. United States Department of Agriculture, Government Printing Office, Washington D C. p. 223.
2. Cruess, W. V., Anna Gibson and John Brekke. 1951. Avocado Products Experiments. Canner 112(2): 11-12, 18; (3): 14
3. McCulloch, R. J., B. W. Nielson, and E. A. Beavens. 1951. A New Frozen Avocado Product. USDA Bur. Agri. Ind. Chem. Mimeo Circ. Ser. AIC-305. 3 pages.
4. Rathbun, W. L. 1915. Banana Peeler and Method of Peeling Bananas. U. S. Patent No. 1,143,135.
5. Stephens, T. S., B. J. Lime, and F. P. Griffiths. 1957. Preparation of a Frozen Avocado Mixture for Guacamole. J. Rio Grande Valley Hort. Soc. 11: 82-89.
6. Stephens, T. S, and F. P. Griffiths. 1961. Guacamole Salad. Texas Farming and Citriculture 38(2): 7A, 8A.
7. Urbanek, J. 1966. Delicate Avocado Yields to Liquid Nitrogen Freezing Process. Canner/Packer 135(5): 31-33.



Figure 3. The peel as it is removed from the machine.

Table 1. Percent meat removed and the percent remaining on the peel of Lulu variety avocados.

<i>Wt. of avocado halves</i>	<i>Wt. of meat recovered</i>	<i>Meat recovered</i>	<i>Wt. of peel from machine</i>	<i>Wt. of avocado meat scraped from processed peel</i>	<i>Wt. of hand cleaned peel</i>	<i>Meat which remains on peel and is lost</i>
<i>gms</i>	<i>gms</i>	<i>%</i>	<i>gms</i>	<i>gms</i>	<i>%</i>	<i>%</i>
4540	3480	75.5	1110	880	730	8.4
4540	3458	76.2	1082	281	801	6.2