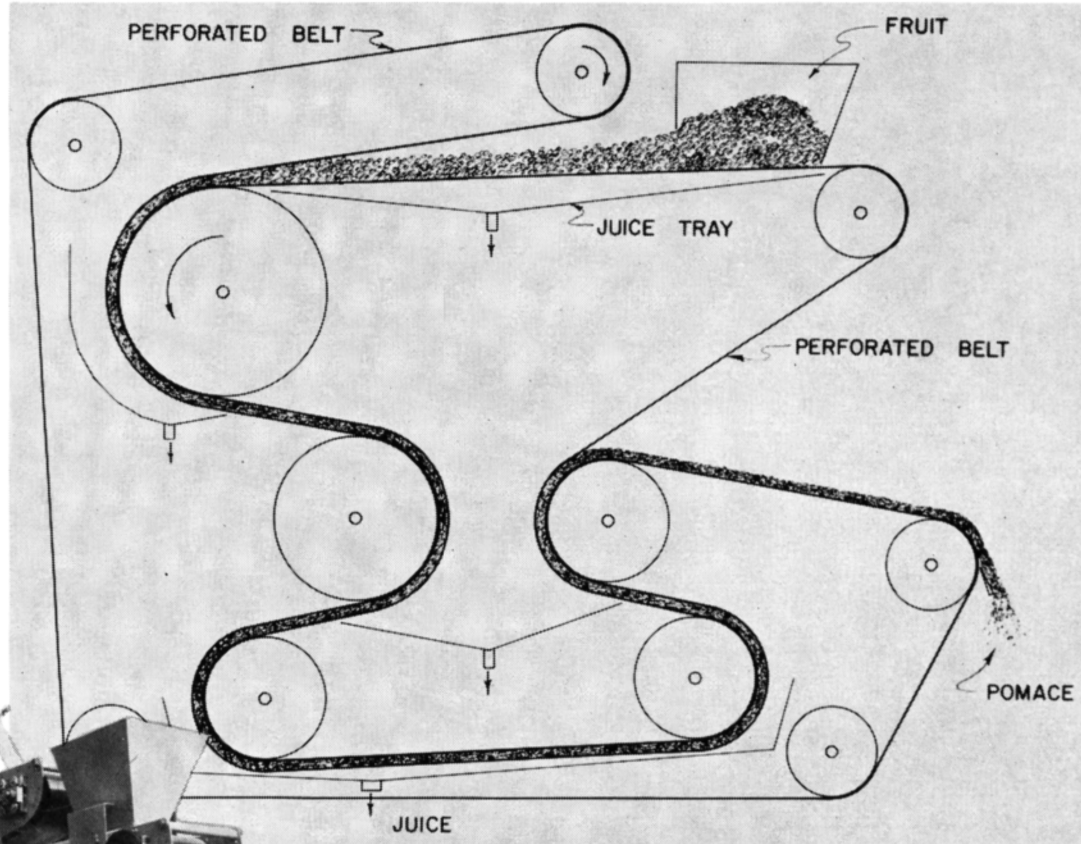

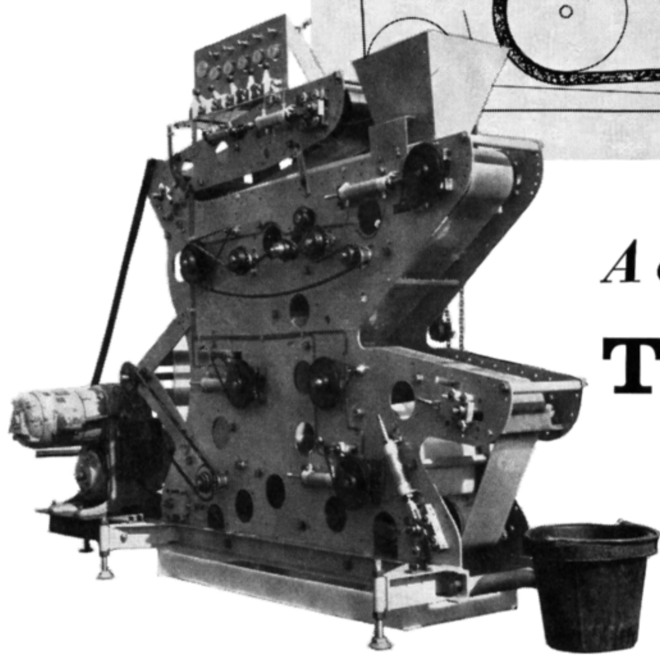

A continuous-crush press for the g

The Serpentine Fruit

R. J. COFFELT

The prototype of the new continuous-flow fruit press described in this report was developed mainly for wineries, but the flexibility of layout, light weight and low power requirements allow the press to be built in a large number of configurations and sizes. The average yields of liquid from grapes increased 9% above the conventional basket-pressing method. A commercial sized machine modeled after the prototype but with 36-inch-wide perforated-plastic belts and nine pressing stages could handle 125 tons of crushed grapes per hour and require only 10 hp—many times less than the power needed for other fruit presses of the same capacity. This machine has been patented and is being produced by commercial manufacturers.

CONCEIVED AS the solution to one part of a project to improve materials flow and handling in wineries, this continuous-flow fruit press lends itself easily to being constructed in a large number of configurations and sizes. Light weight, low power requirements, and feeding flexibility make it possible to place this machine in any part of a processing line without disrupting the present layout. If desired, it can be built elongated instead of in the present compact vertical style and used as a conveying and pressing machine and perhaps suspended from a ceiling away from normal traffic. Fruit

Hand feeding crushed grapes onto the plastic belt of the Serpentine Fruit Press.

rape industry . . .

Press

can be fed into the machine from the top, as shown in the photo above to right, or from the bottom by reversing belts.

The prototype press has a capacity of five tons per hour of crushed fruit and somewhat less with whole fruit such as clusters of grapes or whole berries. This capacity is based on the present machine with its 6-inch-wide perforated-plastic belts moving at a velocity of 200 feet per minute and carrying a 4-inch-wide by ½-inch thick layer of crushed fruit with a density of 60 lbs per cubic foot. The present machine, with its five pressing stages, can be operated with a 1 hp motor.

Commercial size machines may be built with 12-, 24- or 36-inch wide belts and with from five to 15 pressing stages. A typical press having a 36-inch wide belt and nine pressing stages could be expected to handle 125 tons of crushed grapes per hour and would require only a 10 hp motor—which is many times less power than other fruit presses of the same capacity.

To date the press has been used to obtain juice from crushed apples, crushed and stemmed grapes, clusters of grapes and to de-water spinach. Nine lots of grapes (five varieties) have been pressed. Average yields of liquid from these grapes was 109% compared to basket pressing at 100%. The average solids content of the Serpentine press yield of liquid was 2.4% more than the basket-pressed control. Taste testing of the wines made from both the basket-pressed juice and the Serpentine press juice were almost equal in scoring with the wines processed from basket pressed juice scoring higher in some cases and those from the Serpentine press scoring higher in others.

Nonabsorbent plastic belts and juice trays and a baked epoxy coating on most of the metal parts allows easy cleaning and sanitary operation.

The material from which the liquid is to be expressed is gravity fed from the hopper onto the moving feed belt. As the material rides on the belt into the press, guides and scrapers shape it to a height of ¾-inch and to a width of 2 inches less than the belt width, leaving a margin of 1 inch on each side. In the case of the prototype, the belt width is 6 inches and the material width is held to 4 inches before it enters the first pressing station.

If the free run liquid from the crushed fruit has not been drained previous to entering the hopper then much of it will drain through the perforated feed belt into the juice tray as the fruit travels into the press from the hopper. As the material moves into the throat, the upper belt which has the same perforations as the lower feed belt and which is moving at the same velocity as the lower belt makes contact with the upper surface of the material. At this moment of contact, pressing begins.

As the belts continue to move and rotate around the first pressing stage pulley, the material between the belts has a tendency to spread out toward the edges of the belts. Extrusion of the material at the edges of the belts is prevented by two factors which keep it confined. (1) The perforations in the belts hold the layers of material nearest the belt surface and exert some lateral restraining force throughout the thickness of the material. (2) The upper belt like the lower is of plastic and is slightly resilient. Thus it tends to curve over the mass of material and in so doing the upper and lower belts "kiss" at their outer edges sealing the material between the belts into what amounts to an oval, plastic, perforated tube carrying material for the subsequent pressing operations.

The compressive force for liquid expression at all stages comes from tension in the belts which tries to force them closer to the pulley surface. The material to be pressed is between the belts and the compressive force of the outside belt trying to force itself to the pulley surface is transmitted through the material. This compressive force acting on the material is what expresses the liquid. The actual pressing force obtained in the prototype press is from five to seven pounds per square inch. Much greater pressures could be exerted through the pneumatic control system activators, but this has not been necessary for materials handled to date.

Passing around the first pulley, liquid is expressed through the perforations of the outside belt and into a juice tray. Liquid is prevented from going through the perforations of the inside belt by the intimate contact this belt makes with the pulley. The belts, with what is now the press cake between them, travel on to the next pressing stage. At this stage liquid is expressed from the cake through the perforations of the belt that was nearest the pulley on the preceding stage. Stage by stage the liquid is forced from the cake, first from one surface and then the other. Between stages the pressure is lessened and the cake has a chance to relax and open up new channels for the escape of liquid. The alternate flexing of the cake as it bends first one direction on one pulley and then the opposite direction on the next pulley also helps to open up new channels for the escape of liquid.

This coming fruit season, further evaluations of the press are planned with grapes and a variety of other products.

Robert J. Coffelt is Assistant Research Engineer, Department of Agricultural Engineering, University of California, Davis. *Testing and evaluation of the press was done in cooperation with Department of Viticulture and Enology, Davis. Patent No. 3,130,667, Serpentine Fruit Press, R. J. Coffelt, April 28, 1964, has been assigned to The Regents of the University of California.*