A SAUSAGE LAYERING DEVICE FOR USE IN MEASURING SMOKE FLAVOR PENETRATION

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The difficulty of removing uniformly thin layers of a meat product for use in measuring the depth of smoke penetration was apparent in our smoke research project. When cubes of meat are subjected to heat and smoke as is customary in the U.S.A., the surfaces become distorted and it was impossible for us to obtain satisfactory samples for analysis. A sausage emulsion stuffed into a cellulose casing provided a smooth uniform surface of a geometry that would allow for even smoke application and penetration. In turn, this makes it possible to study the effects of such variables as relative humidity, temperature, air movement, etc. may have on the deposition and penetration of smoke during the process.

The circular surface of the sausage also presented a sampling problem. A device (Figs. 1 and 2) was developed that has proven to be satisfactory for our purposes. It is used with a Hobart meat slicer, Model #410, Hobart Manufacturing Co., Troy, Ohio. The device could be modified to be used with any comparable machine.

In reference to Figures 1 and 2, a 1.27 cm core is taken from the center of a 2.54 cm slice of sausage which is placed over the spindle (#5). The prongs (#7) in washers (8 and 9) engage the sausage (13) to prevent rotation around the spindle. The device is transferred to the meat slicer carriage (12) and secured to it with a suitable clamp. The carriage is so positioned that the sausage slice is centered with the turning blade (10) of the slicer. The movable slicer fence (11) is used to regulate the thickness of the layer to be removed. In operation, the sliding bar (4) is used to keep the sausage firmly against the fence (11) and the sausage slice (13) turned clockwise into the turning blade (10). We have been able to remove uniform 1 mm layers from bologna and thuringer sausages. In order to obtain sufficient sample for analysis, layers may be taken from a number of the sausage slices.

Results and Discussion

The method of Kurko (1959) for the rapid determination of phenols was applied but was not definitive enough for our purposes. Tucker's method (1942) is being used and gives results that appear to be reasonable. Our method in detail is as follows:

A 20 gram sample is placed in a Waring blendor with 100 ml of 1:1 ethyl alcohol and distilled water and mixed at full speed for 5 minutes. The extract is filtered through S and S (Schleicher & Schuell) #560 hand folded filter paper. The filtrate container is covered and allowed to stand for 12-16 hours at 2-4°C. It is then filtered through Whatman No. 2 filter paper in the 2-4°C room. This filtrate may have a yellow color which is used as an estimate of the phenol content in making subsequent dilutions.

The diluted or undiluted samples as well as the standard solutions are transferred to 15 x 180 mm test tubes. The standard is made to contain varying amounts of phenols, generally from 0.0 mg to 0.5 mg per 100 ml. To a 5 ml sample of the diluted or undiluted extracts and the standard tubes 5 ml of a 5% solution of sodium borate ($Na_2 B_4 O_7.10 H_2O$) is added. Color is developed by the addition of 1 ml of a N, 2,6-Trichloro-p-benzoquinoneimine (1-O:C_6H_2-2,6-Cl_2-4-:NCl) solution. This stock solution contains 0.25 g in 30 ml ethyl alcohol. Color is allowed to develop 1 1/2 hr at room temperature.

The samples and standards are prepared for reading in a Bausch and Lomb Spectronic 20 colorimeter by adding them to separatory funnels containing 15 ml of N-butanol. The solutions are shaken and allowed to separate after which the water layers are drawn off and discarded. The butanol layers are transferred to graduated test tubes and brought to 21 ml by adding N-butanol. Finally, 2 ml of N-butanol saturated with NH_3 is added and the contents mixed thoroughly. The solutions are read in the colorimeter at 635 mu.

The results of one series of analyses are presented in Table I. The sausage was a thuringer type that was intermittently smoked for 142 hours in a commercial type air conditioned smoke house. An artificial cellulose casing was used and after process the thuringer had a diameter of 12.4 cm. Twenty seven layers were removed that had an average thickness of 1.24 mm. In addition to the phenol analysis, moisture, ether extract, and protein were determined.

Table I. Phenol Content (mg/100 g) of 27 Layers and Center Core Section of Thuringer Sausage

	Layer	Phenols	Layer	Phenols
(outer)	A	8.14	P	0.12
	B	3.94	Q	0.12
	C	2.64	R	0.06
	D	2.17	S	0.06
	E	1.64	T	0.52
	F	1.34	U	0.44
	G	0.93	V	0.52
	H	0.82	W	0.02
	I	0.71	X	--
	J	0.60	Y	--
	K	0.45	Z	--
	L	0.42	AA	--
	M	0.29	Center	
	N	0.22	core	--
	0	0.19		

It is planned to use the method to determine the amount of phenols present in sausage as an indicator of smoke flavor that is perceptible to consumers. Studies also are under way to determine the effect of various humidities during the smoking process.

References

1. V. Kurko. 1959. A rapid determination of the smoke phenols penetrating (smoked) sausages. Myasnaga Ind. S.S.S.R. 30 No 1, 17-18. (Translated by E. Wierbicki)

2. I. W. Tucker. 1942. Estimation of phenols in meat and fat. Assn. of Official Agric. Chemists, 25, 3, pp 779.

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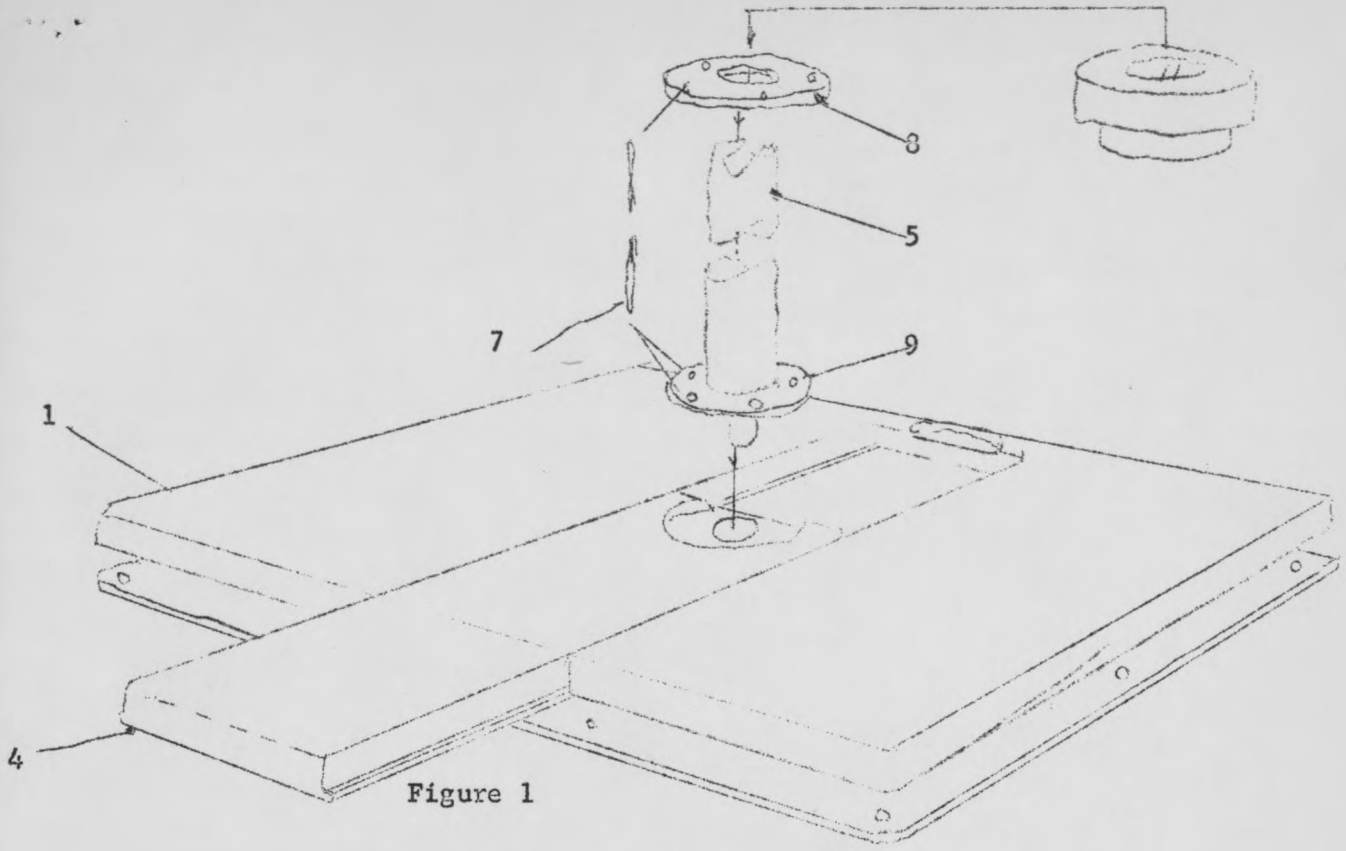

Figure 1

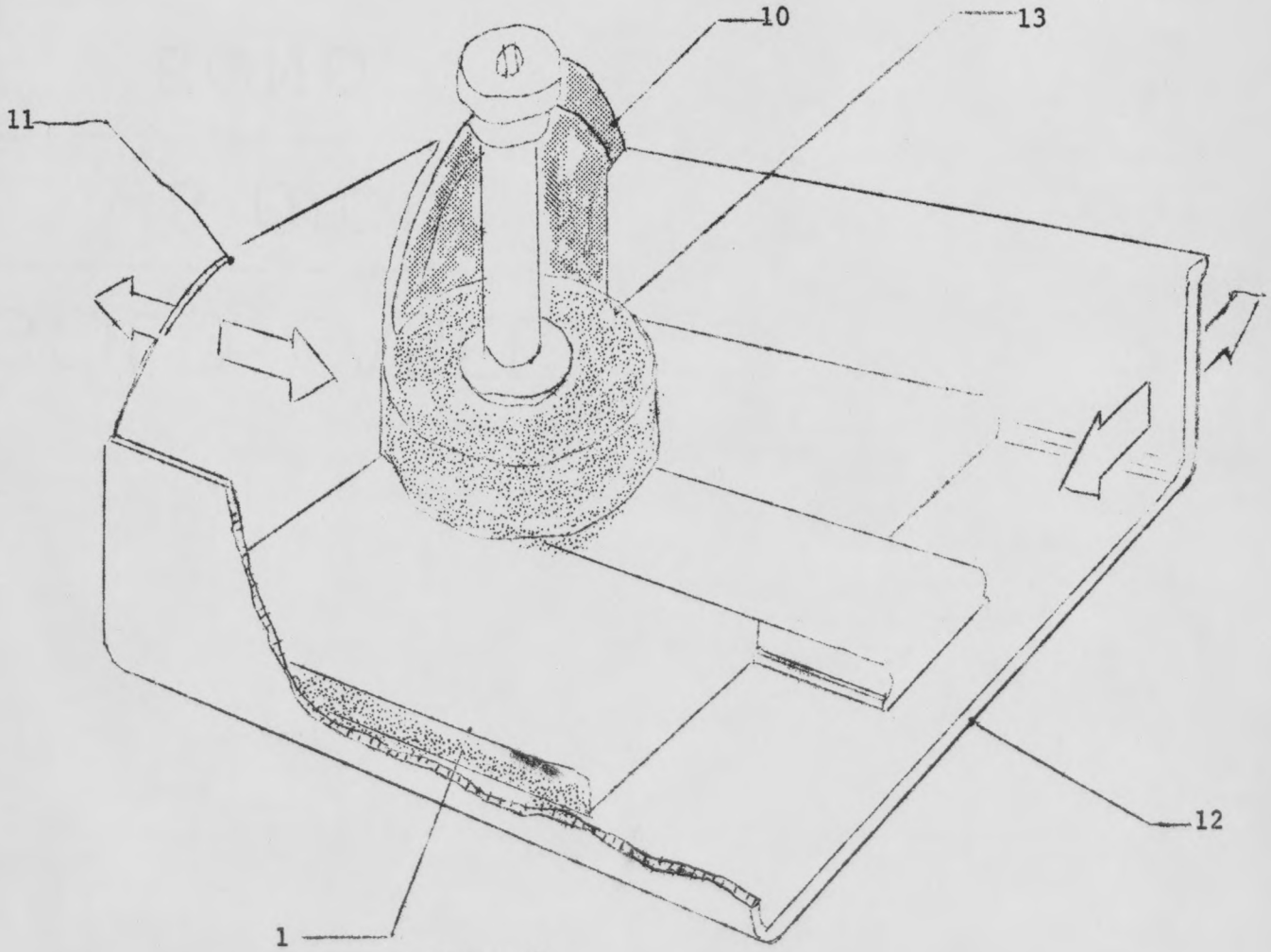

Figure 2