



US00D408830S

United States Patent [19]

[11] Patent Number: **Des. 408,830**

Nathenson et al.

[45] Date of Patent: ****Apr. 27, 1999**

[54] **PNEUMATIC NOZZLE**

[75] Inventors: **Richard D. Nathenson**, Pittsburgh;
Paul M. Brumbaugh, Trafford, both of Pa.

[73] Assignee: **Concept Engineering Group, Inc.**, Verona, Pa.

4,813,611 3/1989 Fontana 239/589
 5,077,684 12/1991 Parrott 299/81
 5,170,943 12/1992 Artzberger 239/532
 5,170,946 12/1992 Rankin 239/590
 5,212,891 5/1993 Schuermann et al. 37/62
 5,378,048 1/1995 Parrott 299/81
 5,782,414 7/1998 Nathenson 239/589

[**] Term: **14 Years**

[21] Appl. No.: **29/068,056**

[22] Filed: **Mar. 20, 1997**

[51] **LOC (6) Cl.** **15-04**

[52] **U.S. Cl.** **D15/21**

[58] **Field of Search** D32/25, 32, 31,
 D32/33-15, 17; D23/223, 200, 213, 225;
 239/589, 601, 532, 590, 592, 594, DIG. 7,
 DIG. 8, DIG. 22; D15/21, 28, 127, 139;
 175/424, 393; 299/81.1, 81.3, 17

[56] **References Cited**

U.S. PATENT DOCUMENTS

D. 147,125	7/1947	Harvuot	.....	D32/32
D. 269,348	6/1983	Strohmaier	.....	D15/139
D. 269,519	6/1983	Braun	.....	D15/139
D. 269,520	6/1983	Braun	.....	D15/139
D. 275,333	8/1984	Williams et al.	.....	D32/31
D. 308,211	5/1990	Magnera	.....	D15/21
D. 314,848	2/1991	Foldes	.....	D32/31
D. 328,906	8/1992	MacDonald et al.	.....	D15/139
D. 356,853	3/1995	Fowler	.....	D23/213
D. 360,503	7/1995	Lynch et al.	.....	D32/32
D. 369,648	5/1996	Fowler	.....	D23/213
D. 388,914	1/1998	McKnight	.....	D32/32
D. 391,349	2/1998	Chih	.....	D23/229
2,175,160	10/1939	Zobel et al.	.....	158/27.4
2,583,726	1/1952	Chalom	.....	51/282
2,833,353	5/1958	Walton et al.	.....
3,015,336	1/1962	Caples	.....	D32/32
3,550,864	12/1970	East	.....	239/601
3,620,457	11/1971	Pearson	.....	239/589
3,921,915	11/1975	Glenn et al.	.....	239/589
4,300,723	11/1981	Prasthofer	.....	239/499
4,448,354	5/1984	Reznick et al.	.....	239/265.17
4,455,166	6/1984	Brancaz et al.	.....	75/60
4,668,018	5/1987	Demoulin et al.	.....	299/81

OTHER PUBLICATIONS

Ascher H. Shapiro, "The Dynamics and Thermodynamics of Compressible Fluid Flow", Robert E. Krieger Publishing Company, vol. I and II, 1983, pp. 139, 141, 143 and 676-681, 694-695, 700-701.

A. E. Puckett, "Supersonic Nozzle Design", Journal of Applied Mechanics, vol. 13, No. 4, Dec. 1946, pp. A-265-A-270.

K. Foelsch, "The Analytical Design of an Axially Symmetric Laval Nozzle for a Parallel and Uniform Jet", Journal of the Aeronautical Sciences, Mar. 1949, pp. 161-166 and 185.

G.V.R. Rao, "Approximation of Optimum Thrust Nozzle Contour", ARS Journal, vol. 30, No. 6, Jun. 1960, p. 561.

Sinyarev and Doborovolskii, "Zhidkostne Raketne Drigateli", Moscow, 1957 (in Russian), pp. 366-367 and 370-371 and one page of translation.

R.E. Wilson, "Turbulent Boundary Layer Growth with Favorable Static Pressure Gradient at Supersonic Speeds", Proceedings of the Second Midwestern Conference on Fluid Mechanics, The Ohio State University, 1952, pp. 277-289.

Primary Examiner—Ruth McInroy
Attorney, Agent, or Firm—Webb Ziesenheim Bruening Logsdon Orkin & Hanson, P.C.

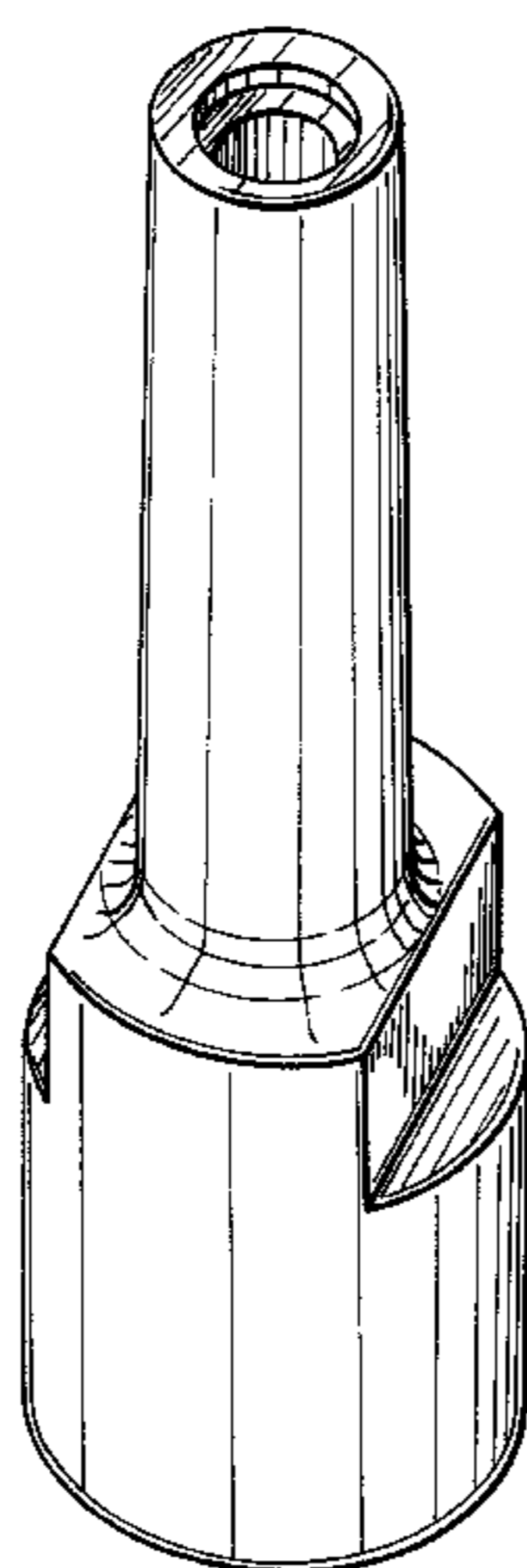
[57] **CLAIM**

The ornamental design for a pneumatic nozzle, as shown.

DESCRIPTION

FIG. 1 is a top perspective view of a pneumatic nozzle showing our new design;
 FIG. 2 is a top plan view thereof;
 FIG. 3 is a left side elevational view thereof;
 FIG. 4 is a front elevational view thereof;
 FIG. 5 is a right side elevational view thereof;
 FIG. 6 is a rear elevational view thereof; and,
 FIG. 7 is a bottom plan view thereof.

1 Claim, 2 Drawing Sheets



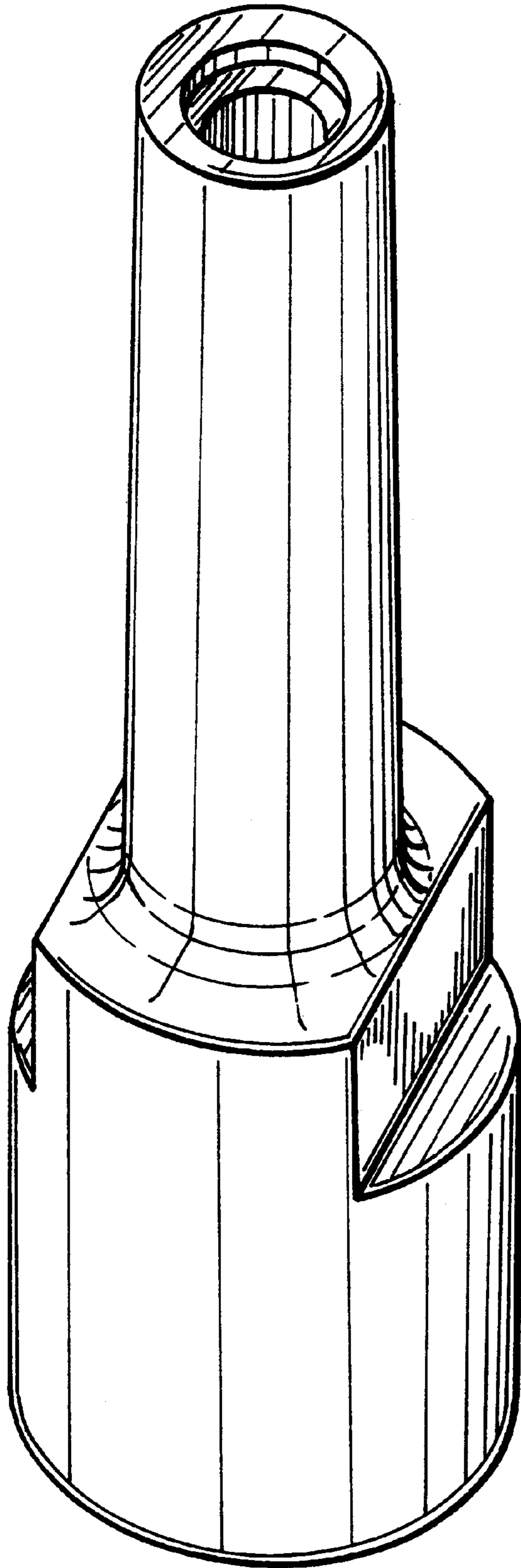


FIG. 1

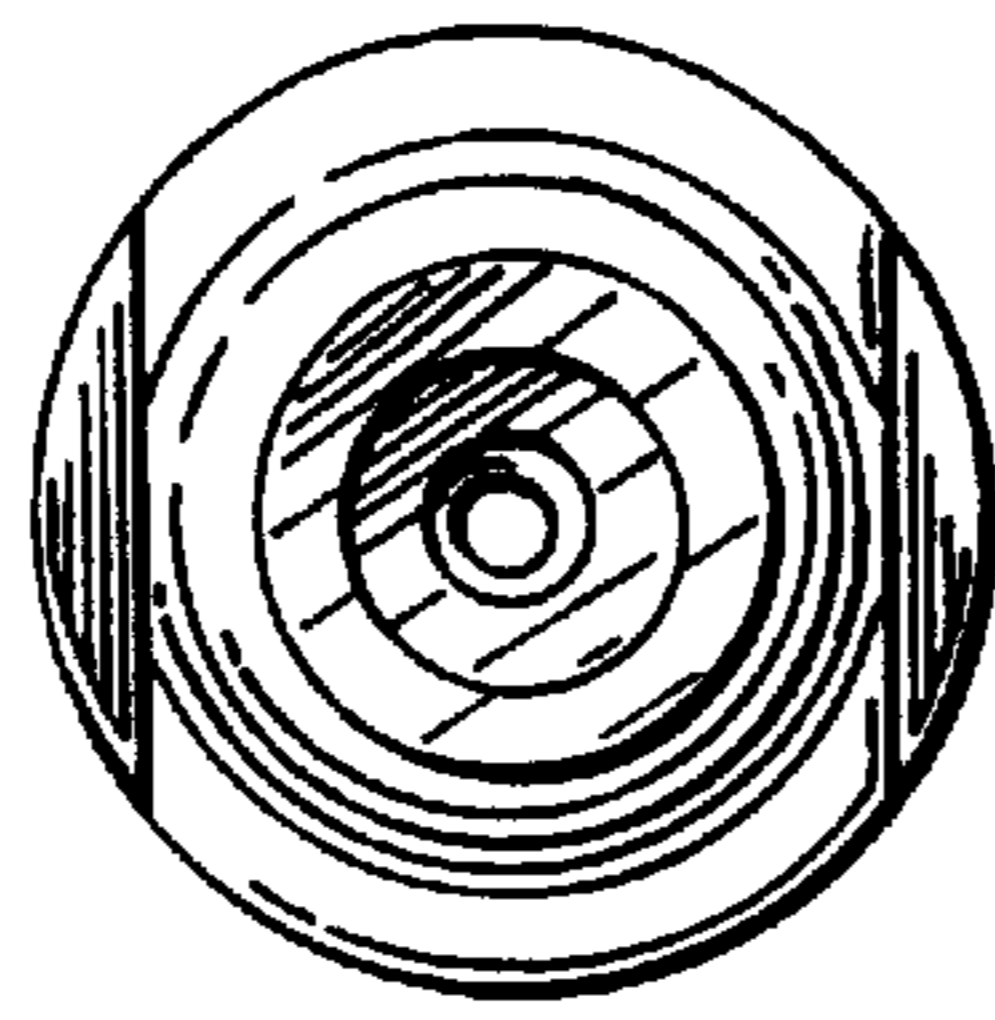


FIG. 2

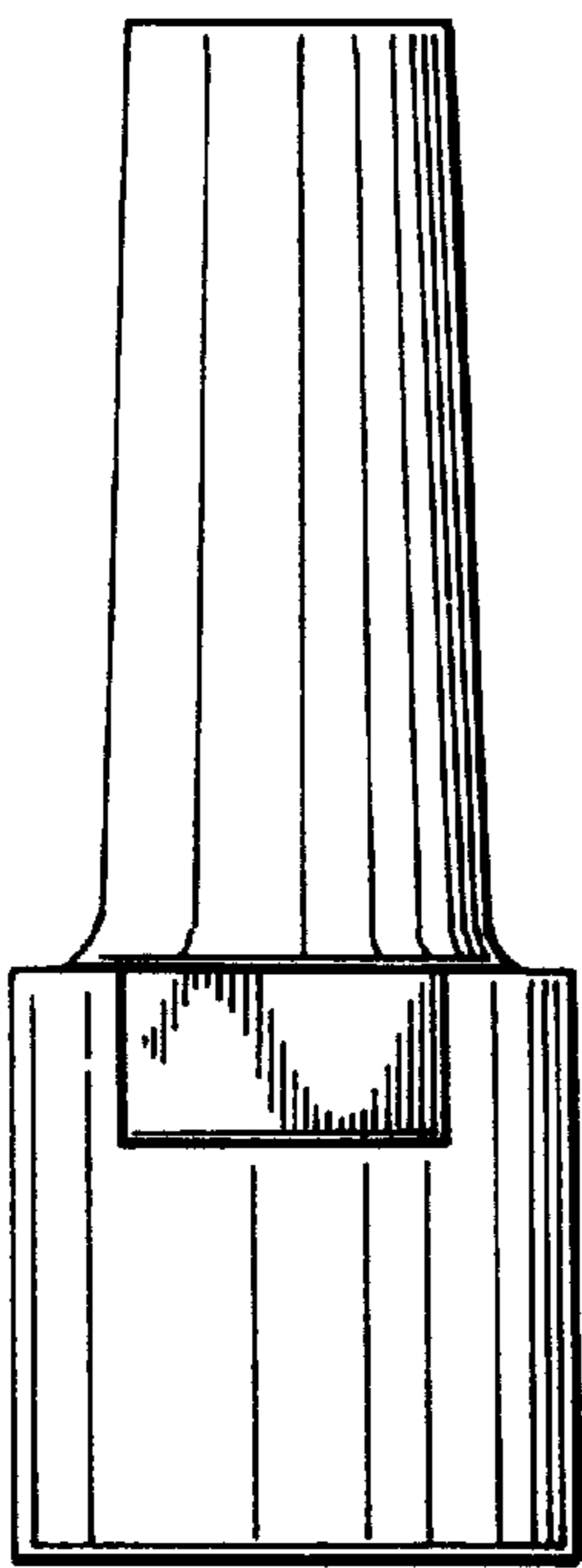


FIG. 3

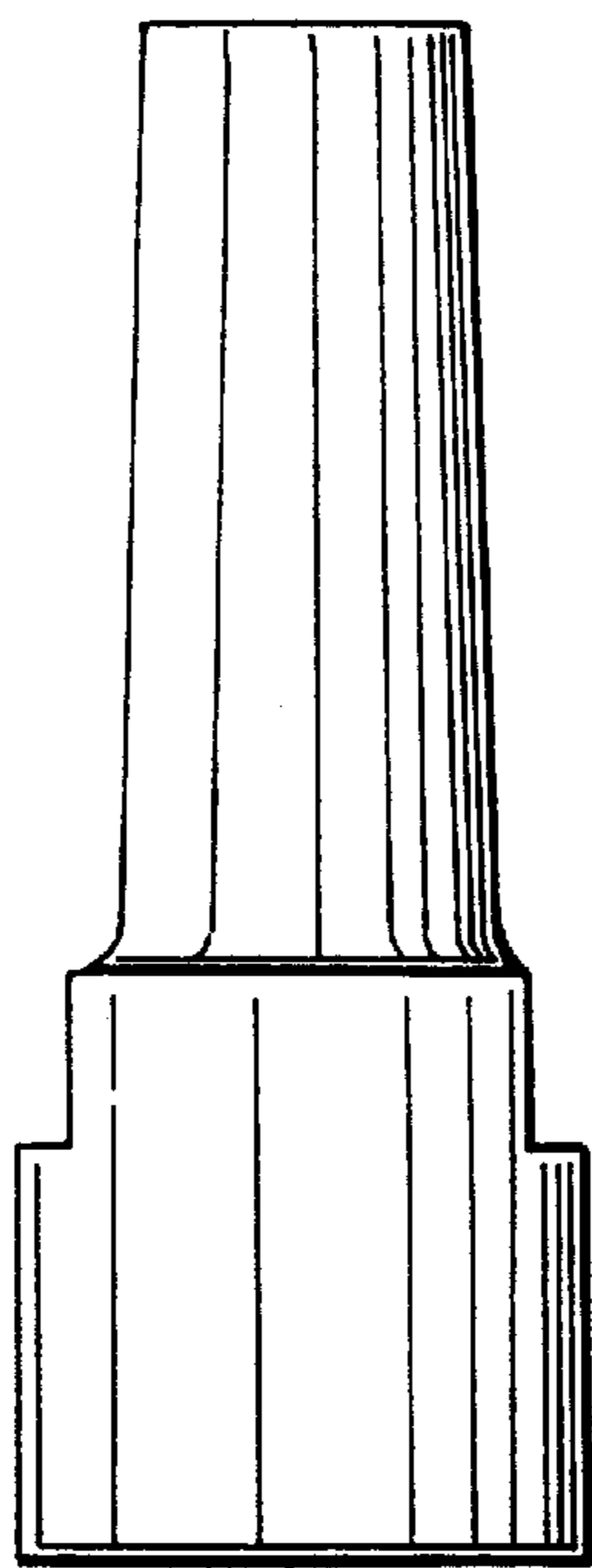


FIG. 4

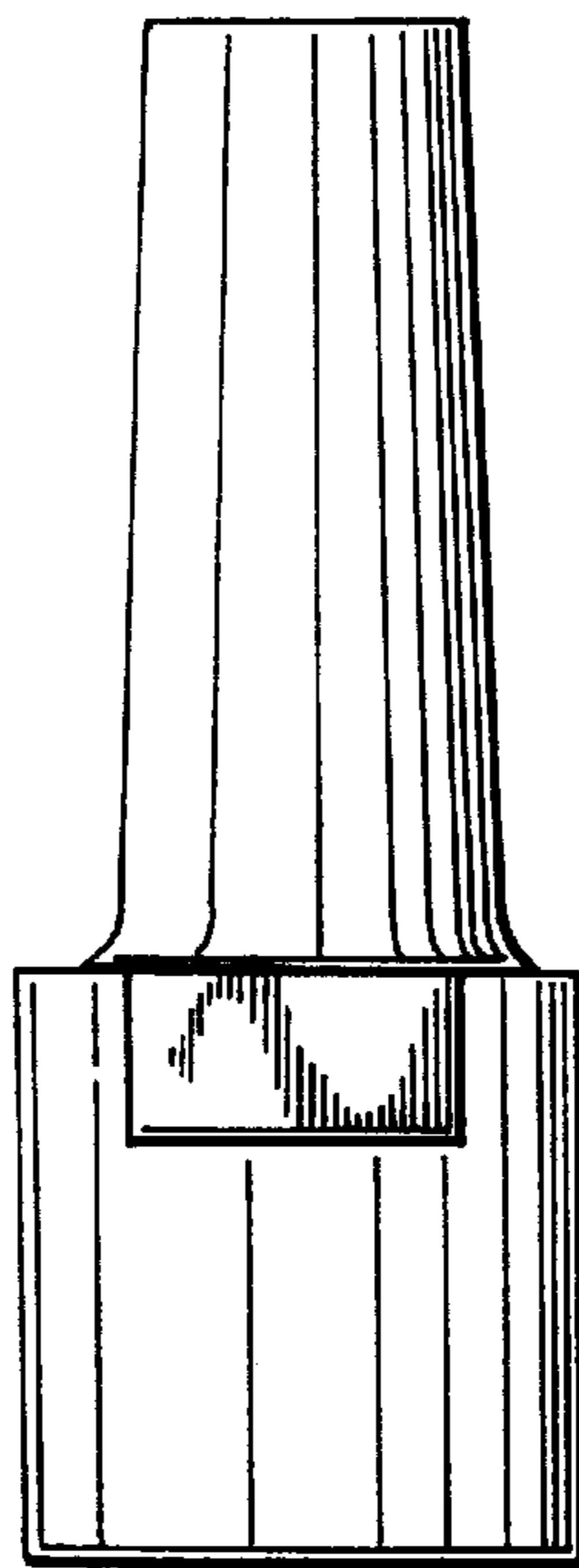


FIG. 5

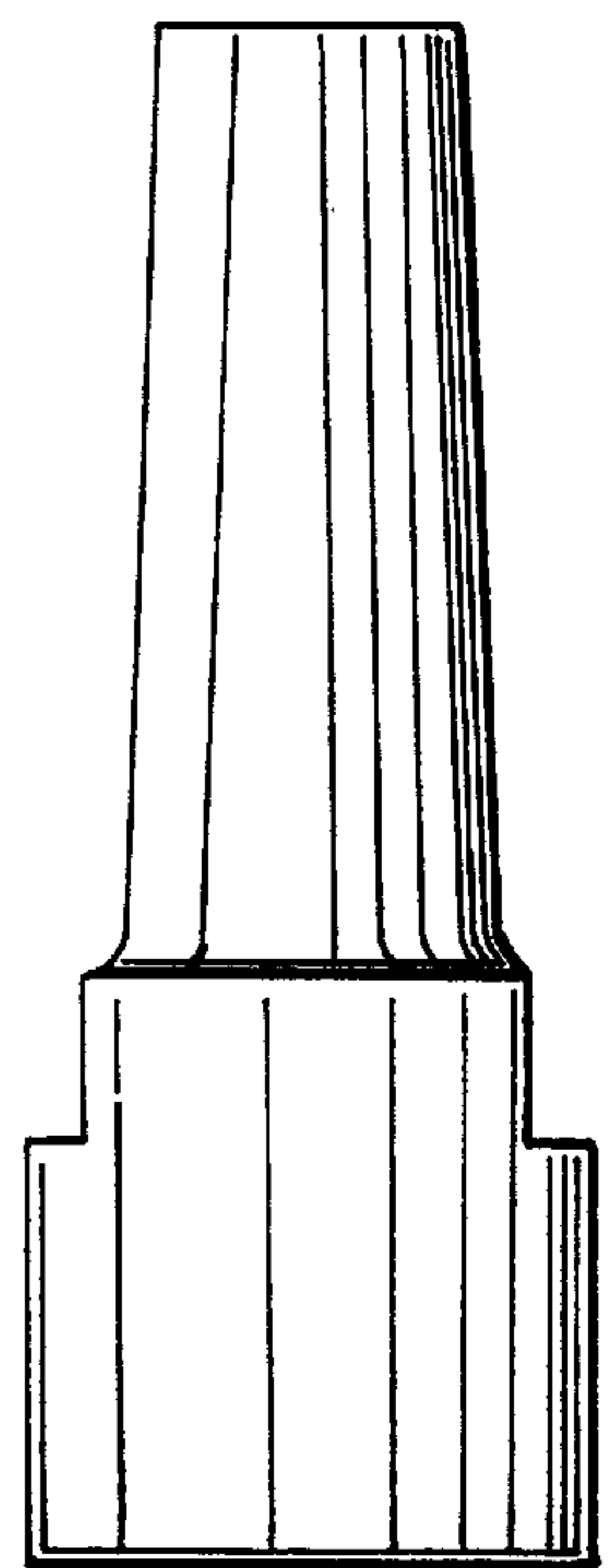


FIG. 6

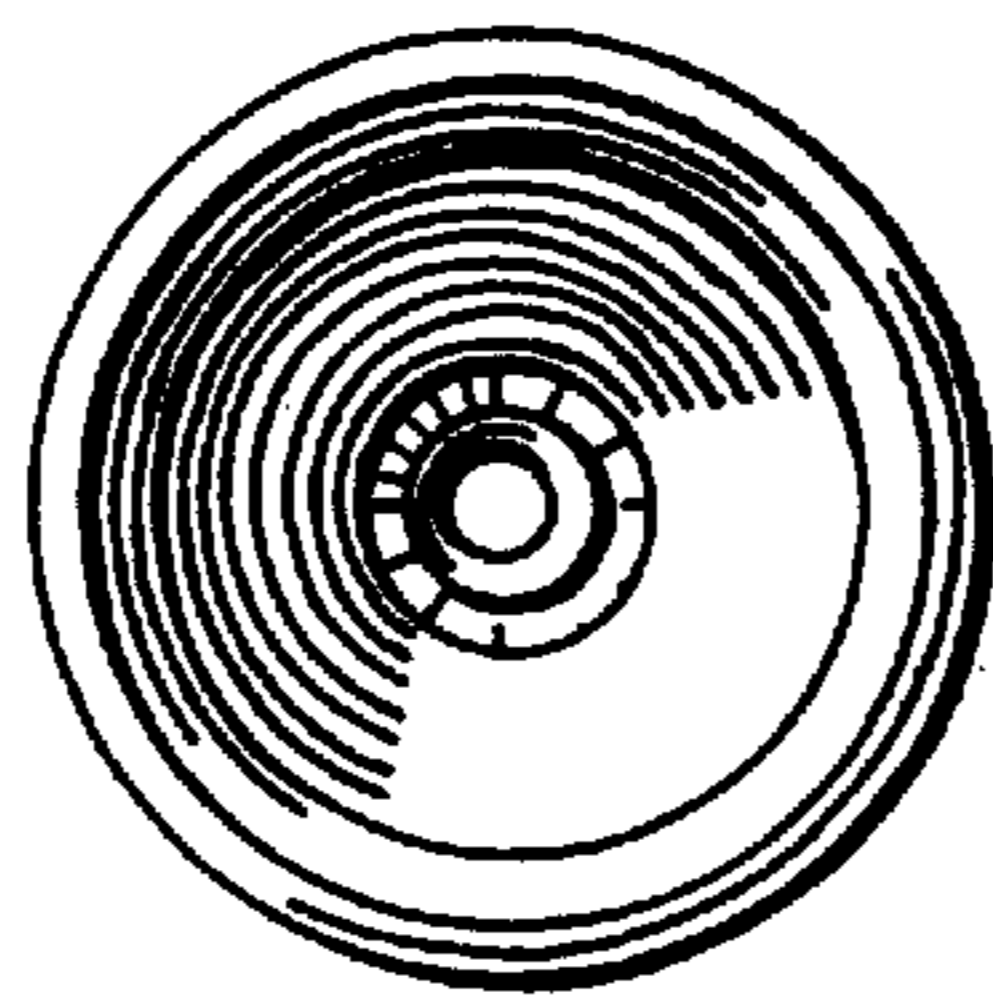


FIG. 7