

B:11,

I am sending you all the informations on this VLBA 25-m. telescope design. They includes joint coordinates, member connections and 100th scale drawings. They are self-explanatory, and are given in one quadrant only due to symmetry. I hope you can proceed with your cost estimate work. Please call in case you have any questions. There is an agreement that all cost estimates are present in 1980 dollar.

Are you planning to go to this mid-Sept. VLBA workshop in G.B. ? It would be great if you can present the cost estimate in that meeting. Meanwhile, I am working on the cost of the surface panels.

Greetings

Woolly

Item	Estim. weight
Surface plates	12,766 lbs
Backup str.	120,419 lbs
Counter w.c.	23,107 lbs
Subreflector, sterling mt.	2,000 lbs

	158,291 lbs									
Tower	82,400 lbs	}								
2 elev. brgs	1,000 lbs									
Elev. drive	4,000 lbs									
Az. drive	4,000 lbs									
	91,400 lbs									
		<table> <tbody> <tr> <td>158,291</td> <td></td> </tr> <tr> <td>91,400</td> <td></td> </tr> <tr> <td colspan="2"><hr/></td> </tr> <tr> <td>250,000</td> <td></td> </tr> </tbody> </table>	158,291		91,400		<hr/>		250,000	
158,291										
91,400										
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250,000										

Moment of inertia

Dish str. about the elev. axis :

$$82 \times 10^6 \text{ #ft}^2$$

Total structure about the azimuth axis :

$$293 \times 10^6 \text{ #ft}^2$$

POINT	COORDINATES			RESTRAINTS			POINT LOADS	MU	H	AF %
	Y	X	Z	OMEGA=1 X Y Z	OMEGA=2 X Y Z	OMEGA=6 X Y Z				
1	47.820	0.0	6.630	0 1 0	0 1 0	1 0 1	79.00	2	0.0	1.00
2	0.0	47.820	6.630	1 0 0	0 1 1	1 0 0	79.00	2	0.0	1.00
3	166.006	0.0	-8.508	0 1 0	0 1 0	1 0 1	119.20	2	0.0	1.00
4	117.384	117.384	-8.508	0 0 0	0 0 0	0 0 0	238.40	4	0.0	1.00
5	0.0	166.006	-8.508	1 0 0	0 1 1	1 0 0	119.20	2	0.0	1.00
6	281.029	0.0	-39.317	0 1 0	0 1 0	1 0 1	99.30	2	0.0	1.00
7	259.637	107.545	-39.317	0 0 0	0 0 0	0 0 0	198.70	4	0.0	1.00
8	198.718	198.718	-39.317	0 0 0	0 0 0	0 0 0	198.70	4	0.0	1.00
9	107.545	259.637	-39.317	0 0 0	0 0 0	0 0 0	198.70	4	0.0	1.00
10	0.0	281.029	-39.317	1 0 0	0 1 1	1 0 0	99.30	2	0.0	1.00
11	391.374	0.0	-83.790	0 1 0	0 1 0	1 0 1	112.60	2	0.0	1.00
12	372.219	120.941	-83.790	0 0 0	0 0 0	0 0 0	225.20	4	0.0	1.00
13	316.628	230.044	-83.790	0 0 0	0 0 0	0 0 0	225.20	4	0.0	1.00
14	230.044	316.628	-83.790	0 0 0	0 0 0	0 0 0	225.20	4	0.0	1.00
15	120.941	372.219	-83.790	0 0 0	0 0 0	0 0 0	225.20	4	0.0	1.00
16	0.0	391.374	-83.790	1 0 0	0 1 1	1 0 0	112.60	2	0.0	1.00
17	496.297	0.0	-139.639	0 1 0	0 1 0	1 0 1	53.00	2	0.0	1.00
18	479.386	128.451	-139.639	0 0 0	0 0 0	0 0 0	106.00	4	0.0	1.00
19	429.806	248.149	-139.639	0 0 0	0 0 0	0 0 0	106.00	4	0.0	1.00
20	350.935	350.935	-139.639	0 0 0	0 0 0	0 0 0	106.00	4	0.0	1.00
21	248.149	429.806	-139.639	0 0 0	0 0 0	0 0 0	106.00	4	0.0	1.00
22	128.451	479.386	-139.639	0 0 0	0 0 0	0 0 0	106.00	4	0.0	1.00
23	0.0	496.297	-139.639	1 0 0	0 1 1	1 0 0	53.00	2	0.0	1.00
24	193.676	72.955	60.462	0 0 0	0 0 0	0 0 0	0.0	4		
25	72.955	193.676	60.462	0 0 0	0 0 0	0 0 0	0.0	4		
26	439.879	90.443	-28.547	0 0 0	0 0 0	0 0 0	0.0	4		
27	332.382	163.312	7.475	0 0 0	0 0 0	0 0 0	0.0	4		
28	319.426	319.426	-28.647	0 0 0	0 0 0	0 0 0	0.0	4		
29	163.312	332.382	7.475	0 0 0	0 0 0	0 0 0	0.0	4		
30	90.443	439.879	-28.547	0 0 0	0 0 0	0 0 0	0.0	4		
31	193.676	0.0	60.462	1 1 1	1 1 1	1 0 1	0.0	0		
32	0.0	193.676	60.462	1 1 1	0 1 1	1 1 1	0.0	0		
33	439.879	0.0	-28.547	1 1 1	1 1 1	1 0 1	0.0	0		
34	0.0	439.879	-28.547	1 1 1	0 1 1	1 1 1	0.0	0		
35	307.087	0.0	92.520	0 1 0	0 1 0	1 0 1	0.0	2		
36	217.142	217.142	98.425	0 0 0	0 0 0	0 0 0	0.0	4		
37	0.0	307.087	92.520	1 0 0	0 1 1	1 0 0	0.0	2		
38	0.0	0.0	98.425	1 1 0	0 1 1	1 0 1	0.0	1		
39	0.0	0.0	405.512	1 1 0	1 1 1	1 1 1	5776.69	1		
40	0.0	0.0	-492.126	1 1 0	0 1 1	1 0 1	500.00	1		
41	307.087	0.0	98.425	0 1 0	0 1 0	1 0 1	0.0	2		
42	0.0	307.087	98.425	1 0 1	1 1 1	1 0 1	0.0	2		
43	283.713	0.0	215.941	0 1 0	0 1 0	1 0 1	0.0	2		
44	217.142	0.0	315.567	0 1 0	0 1 0	1 0 1	0.0	2		
45	117.516	0.0	382.138	0 1 0	0 1 0	1 0 1	0.0	2		

LOADING AND WEIGHT ON 4 QUADRANTS

BAR	PCINT	N	R	L	AREA	DA	C	STRESS						MAX. STRESS	L/R	Q	T	T'
								1	2	3	4	5	6					
1	1-	3	3	0.28	119.15	1.34	0.0	0.57	0.36	0.05	1.35	0.29	0.0	1.35	88	0.11	1	
2	3-	6	3	0.28	119.08	1.34	0.0	0.55	0.45	0.05	1.29	0.47	0.0	1.29	88	0.11	1	
3	6-	11	3	0.28	118.97	1.34	0.0	0.29	0.28	0.02	0.66	0.54	0.0	0.83	88	0.08	1	
4	11-	17	3	0.28	118.86	1.34	0.0	0.23	0.18	0.02	0.57	0.36	0.0	0.59	88	0.06	1	
5	2-	5	3	0.28	119.15	1.34	0.0	0.70	0.0	0.05	1.54	0.0	0.30	1.54	88	0.13	1	
6	5-	10	3	0.28	119.08	1.34	0.0	0.61	0.0	0.05	1.39	0.0	0.47	1.39	88	0.12	1	
7	10-	16	3	0.28	118.97	1.34	0.0	0.42	0.0	0.03	0.86	0.0	0.55	0.97	88	0.09	1	
8	16-	23	3	0.28	118.86	1.34	0.0	0.34	0.0	0.03	0.73	0.0	0.37	0.73	88	0.07	1	
9	1-	4	4	0.28	137.29	2.68	0.0	0.55	-0.19	0.04	1.19	-0.28	0.19	1.19	102	0.12	1	
10	2-	4	4	0.28	137.29	2.68	0.0	0.45	-0.13	0.04	1.04	0.21	-0.26	1.04	102	0.11	1	
11	3-	7	4	0.28	145.88	2.68	0.0	0.29	-0.08	0.02	0.65	-0.14	0.59	0.90	108	0.10	1	
12	4-	7	4	0.28	145.88	2.68	0.0	0.42	0.52	0.03	0.94	0.70	-0.42	1.24	108	0.13	1	
13	4-	8	4	0.28	119.08	2.68	0.0	0.74	0.02	0.06	1.62	0.04	0.03	1.62	88	0.13	1	
14	4-	9	4	0.28	145.88	2.68	0.0	0.44	-0.26	0.03	0.97	-0.46	0.67	1.25	108	0.13	1	
15	5-	9	4	0.28	145.88	2.68	0.0	0.29	0.39	0.02	0.65	0.63	-0.13	0.94	108	0.11	1	
16	6-	12	4	0.28	157.86	2.68	0.0	0.03	-0.06	0.01	0.16	-0.07	0.54	0.62	117	0.09	1	
17	7-	12	4	0.28	121.79	2.68	0.0	0.66	0.40	0.05	1.48	0.62	0.20	1.48	90	0.12	1	
18	7-	13	4	0.28	142.24	2.68	0.0	0.06	-0.24	0.00	0.13	-0.30	0.44	0.60	106	0.08	1	
19	8-	13	4	0.28	129.85	2.68	0.0	0.27	0.37	0.02	0.55	0.58	-0.23	0.89	96	0.09	1	
20	8-	14	4	0.28	129.85	2.68	0.0	0.24	-0.13	0.02	0.51	-0.24	0.56	0.85	96	0.09	1	
21	9-	14	4	0.28	142.24	2.68	0.0	0.07	0.28	0.00	0.15	0.47	-0.29	0.62	106	0.08	1	
22	9-	15	4	0.28	121.79	2.68	0.0	0.70	0.23	0.05	1.54	0.18	0.61	1.54	90	0.13	1	
23	10-	15	4	0.28	157.86	2.68	0.0	0.12	0.32	0.01	0.23	0.56	-0.05	0.68	117	0.10	1	
24	11-	18	4	0.28	165.42	2.68	0.0	0.08	-0.05	0.01	0.24	-0.04	0.42	0.50	123	0.09	1	
25	12-	18	4	0.28	121.08	2.68	0.0	0.14	0.22	0.01	0.30	0.38	-0.39	0.68	90	0.07	1	
26	12-	19	4	0.28	150.39	2.68	0.0	-0.00	-0.11	0.00	0.03	-0.15	0.22	0.27	112	0.05	1	
27	13-	19	4	0.28	127.50	2.68	0.0	0.37	0.27	0.03	0.84	0.42	-0.08	0.84	95	0.08	1	
28	13-	20	4	0.28	137.52	2.68	0.0	0.03	-0.09	0.00	0.07	-0.17	0.26	0.34	102	0.05	1	
29	14-	20	4	0.28	137.52	2.68	0.0	0.10	0.07	0.01	0.18	0.28	-0.16	0.42	102	0.06	1	
30	14-	21	4	0.28	127.50	2.68	0.0	0.40	-0.02	0.03	0.90	-0.08	0.41	0.90	95	0.09	1	
31	15-	21	4	0.28	150.39	2.68	0.0	-0.02	0.11	0.00	-0.00	0.23	-0.15	0.30	112	0.06	1	
32	15-	22	4	0.28	121.08	2.68	0.0	0.26	-0.31	0.01	0.48	-0.39	0.39	0.81	90	0.08	1	
33	16-	22	4	0.28	165.42	2.68	0.0	0.07	0.25	0.01	0.22	0.42	-0.04	0.49	123	0.09	1	
34	1-	2	4	0.28	67.63	2.68	0.0	0.82	0.25	0.05	1.53	0.17	0.19	1.53	50	0.09	1	
35	3-	4	4	0.28	127.06	2.68	0.0	0.43	0.28	0.03	0.87	0.38	0.91	1.41	94	0.13	1	
36	4-	5	4	0.28	127.06	2.68	0.0	0.35	0.90	0.03	0.75	0.89	0.39	1.31	94	0.12	1	
37	6-	7	4	0.28	109.65	2.68	0.0	0.36	0.28	0.03	0.85	0.27	0.52	0.94	81	0.06	1	
38	7-	8	4	0.28	109.65	2.68	0.0	0.41	0.33	0.04	0.97	0.37	0.49	1.03	81	0.08	1	
39	8-	9	4	0.28	109.65	2.68	0.0	0.32	0.48	0.03	0.83	0.47	0.38	0.93	81	0.08	1	
40	9-	10	4	0.28	109.65	2.68	0.0	0.25	0.49	0.03	0.69	0.49	0.28	0.82	81	0.07	1	
41	11-	12	4	0.28	122.45	2.68	0.0	-0.42	0.06	-0.02	-0.76	0.06	-0.06	0.76	91	0.07	1	
42	12-	13	4	0.28	122.45	2.68	0.0	0.28	0.19	0.03	0.82	0.28	0.74	1.06	91	0.10	1	
43	13-	14	4	0.28	122.45	2.68	0.0	0.23	0.42	0.03	0.72	0.49	0.51	0.94	91	0.09	1	
44	14-	15	4	0.28	122.45	2.68	0.0	0.08	0.58	0.03	0.52	0.70	0.27	0.83	91	0.08	1	
45	15-	16	4	0.28	122.45	2.68	0.0	-0.58	0.01	-0.03	-1.00	-0.07	0.05	1.00	91	0.09	1	
46	17-	18	4	0.28	129.56	2.68	0.0	-0.30	0.08	-0.00	-0.38	0.24	0.37	0.75	96	0.08	1	
47	13-	19	4	0.28	129.56	2.68	0.0	-0.33	0.02	-0.01	-0.46	0.19	0.42	0.79	96	0.08	1	
48	15-	20	4	0.28	129.56	2.68	0.0	-0.09	0.38	0.02	0.21	0.53	0.56	0.86	96	0.09	1	
49	20-	21	4	0.28	129.56	2.68	0.0	-0.12	0.40	0.02	0.16	0.54	0.54	0.88	96	0.09	1	
50	21-	22	4	0.28	129.56	2.68	0.0	-0.63	0.44	-0.02	-0.91	0.40	0.16	1.07	96	0.10	1	

fig. 1a
+
fig. 1b

51	22-	23	4	0.28	129.56	2.68	0.0	-0.56	0.35	-0.01	-0.77	0.36	0.22	0.98	96	0.10	1
52	1-	24	4	0.28	171.74	2.68	0.0	0.02	0.01	-0.02	-0.23	-0.04	-1.04	1.06	128	0.16	1
53	3-	24	4	0.28	104.14	2.68	0.0	-0.03	0.03	-0.01	-0.14	0.02	-2.03	2.05	77	0.15	1
54	24	4	0.28	112.03	2.68	0.0	-0.03	0.03	0.0	0.1	0.26	0.33	0.4	0.7	0.15	1	

51	22	23	4	0.28	129.56	2.68	0.0	-0.56	0.35	-0.01	-0.77	0.36	0.22	0.98	96	0.10	1
52	1-	24	4	0.28	171.74	2.68	0.0	0.02	0.01	-0.02	-0.23	-0.04	-1.04	1.06	128	0.16	1
53	3-	24	4	0.28	104.14	2.68	0.0	-0.03	0.03	-0.01	-0.14	0.02	-2.03	2.05	77	0.15	1
54	4-	24	4	0.28	112.03	2.68	0.0	-0.05	-0.01	-0.01	-0.14	-0.26	0.33	0.47	83	0.05	1
55	6-	24	4	0.28	151.36	2.68	0.0	-0.15	-0.06	-0.01	-0.38	0.03	-1.34	1.49	112	0.16	1
56	7-	24	4	0.28	124.51	2.68	0.0	-0.16	-0.07	-0.02	-0.49	0.02	0.28	0.49	92	0.06	1
57	8-	24	4	0.28	160.62	2.68	0.0	-0.39	-0.19	-0.03	-0.84	-0.30	0.53	0.99	119	0.13	1
58	2-	25	4	0.28	171.74	2.68	0.0	0.01	-0.90	-0.02	-0.24	-1.06	-0.03	1.07	128	0.16	1
59	4-	25	4	0.28	112.03	2.68	0.0	0.06	0.12	-0.00	0.02	0.37	-0.22	0.49	83	0.05	1
60	5-	25	4	0.28	104.14	2.68	0.0	-0.03	-1.76	-0.01	-0.14	-2.04	0.02	2.07	77	0.15	1
61	8-	25	4	0.28	160.62	2.68	0.0	-0.12	0.36	-0.02	-0.43	0.56	-0.27	0.74	119	0.11	1
62	9-	25	4	0.28	124.51	2.68	0.0	-0.11	0.21	-0.02	-0.42	0.28	0.02	0.42	92	0.05	1
63	10-	25	4	0.28	151.36	2.68	0.0	-0.14	-1.11	-0.01	-0.36	-1.35	0.04	1.49	112	0.16	1
64	6-	26	4	0.28	183.11	2.68	0.0	0.16	-0.05	0.01	0.36	-0.07	0.27	0.45	136	0.10	1
65	11-	26	4	0.28	116.55	2.68	0.0	-0.18	-0.06	-0.02	-0.46	-0.06	-0.53	0.72	86	0.07	1
66	12-	26	4	0.28	92.52	2.68	0.0	0.54	0.00	0.04	1.22	0.04	0.97	1.51	68	0.10	1
67	17-	26	4	0.28	153.96	2.68	0.0	-0.17	-0.06	-0.02	-0.55	-0.12	-0.88	1.06	114	0.13	1
68	19-	26	4	0.28	123.88	2.68	0.0	-0.25	-0.09	-0.04	-0.83	-0.18	0.05	0.83	92	0.08	1
69	19-	26	4	0.28	193.17	2.68	0.0	0.19	0.24	0.02	0.48	0.26	0.37	0.63	144	0.14	1
70	6-	27	4	0.28	177.48	2.68	0.0	-0.26	0.08	-0.01	-0.49	0.01	-0.60	0.86	132	0.15	1
71	7-	27	4	0.28	102.91	2.68	0.0	0.05	0.08	0.00	0.05	0.00	-0.11	0.16	76	0.02	1
72	8-	27	4	0.28	145.93	2.68	0.0	0.05	-0.04	0.00	0.12	-0.10	-0.04	0.16	108	0.04	1
73	12-	27	4	0.28	108.22	2.68	0.0	-0.89	-0.08	-0.08	-2.12	-0.14	-1.07	2.12	80	0.15	1
74	13-	27	4	0.28	114.15	2.68	0.0	-0.21	0.14	-0.02	-0.53	0.07	-0.04	0.53	85	0.05	1
75	19-	27	4	0.28	195.78	2.68	0.0	-0.29	0.01	-0.03	-0.82	-0.07	-0.31	0.82	146	0.18	1
76	8-	28	4	0.28	171.04	2.68	0.0	0.12	-0.07	0.01	0.25	-0.06	-0.06	0.25	127	0.07	1
77	13-	28	4	0.28	105.06	2.68	0.0	0.01	-0.15	-0.00	-0.04	-0.10	0.09	0.14	78	0.02	1
78	14-	28	4	0.28	105.06	2.68	0.0	-0.16	0.17	-0.01	-0.29	0.08	-0.11	0.30	78	0.03	1
79	19-	28	4	0.28	172.00	2.68	0.0	-0.33	-0.34	-0.04	-0.98	-0.34	-0.04	0.98	128	0.15	1
80	20-	28	4	0.28	119.60	2.68	0.0	-0.20	0.01	-0.03	-0.68	-0.05	-0.04	0.68	89	0.07	1
81	21-	28	4	0.28	172.00	2.68	0.0	-0.64	0.10	-0.05	-1.37	-0.04	-0.36	1.37	128	0.20	1
82	8-	29	4	0.28	145.98	2.68	0.0	0.01	-0.04	0.00	0.05	-0.05	-0.11	0.13	108	0.04	1
83	9-	29	4	0.28	102.91	2.68	0.0	0.00	-0.06	-0.00	-0.02	-0.11	-0.00	0.11	76	0.02	1
84	10-	29	4	0.28	177.48	2.68	0.0	-0.16	-0.52	-0.01	-0.34	-0.58	0.03	0.74	132	0.13	1
85	14-	29	4	0.28	114.15	2.68	0.0	-0.04	-0.14	-0.02	-0.28	-0.04	0.09	0.28	85	0.04	1
86	15-	29	4	0.28	108.22	2.68	0.0	-0.80	-0.91	-0.08	-1.99	-1.04	-0.12	1.99	80	0.15	1
87	21-	29	4	0.28	195.78	2.68	0.0	-0.18	-0.31	-0.03	-0.66	-0.30	-0.06	0.66	146	0.15	1
88	10-	30	4	0.28	183.11	2.68	0.0	0.05	0.24	0.01	0.19	0.27	-0.09	0.34	136	0.09	1
89	15-	30	4	0.28	92.52	2.68	0.0	0.46	0.82	0.04	1.09	0.94	0.03	1.39	68	0.10	1
90	16-	30	4	0.28	116.55	2.68	0.0	-0.19	-0.40	-0.02	-0.48	-0.52	-0.06	0.72	86	0.07	1
91	21-	30	4	0.28	193.17	2.68	0.0	0.32	0.23	0.02	0.69	0.35	0.27	0.77	144	0.16	1
92	22-	30	4	0.28	123.88	2.68	0.0	-0.31	0.07	-0.04	-0.92	0.04	-0.18	0.92	92	0.09	1
93	23-	30	4	0.28	153.96	2.68	0.0	-0.20	-0.71	-0.03	-0.61	-0.86	-0.12	1.07	114	0.13	1
94	24-	31	2	0.28	72.95	2.68	0.0	-0.03	0.00	-0.01	-0.17	-0.56	0.0	0.59	108	0.08	1
95	24-	25	4	0.28	170.73	2.68	0.0	1.11	0.45	0.08	2.33	0.37	0.36	2.33	127	0.30	1
96	25-	32	2	0.28	72.95	2.68	0.0	1.41	0.00	0.04	2.01	0.00	-0.33	2.01	108	0.20	1
97	24-	27	4	0.28	173.81	2.68	0.0	1.39	0.33	0.10	2.89	0.32	1.35	2.89	129	0.39	1
98	25-	29	4	0.28	173.81	2.68	0.0	1.35	1.33	0.10	2.82	1.33	0.31	2.82	129	0.38	1
99	26-	33	2	0.28	90.44	2.68	0.0	-0.04	0.62	0.01	0.10	0.49	0.00	0.53	134	0.11	1
100	26-	27	4	0.28	134.77	2.68	0.0	-0.81	0.45	-0.07	-1.82	0.12	-1.98	2.79	100	0.24	1

fig 2a
+
fig 2b

fig 3a
+
fig 3b

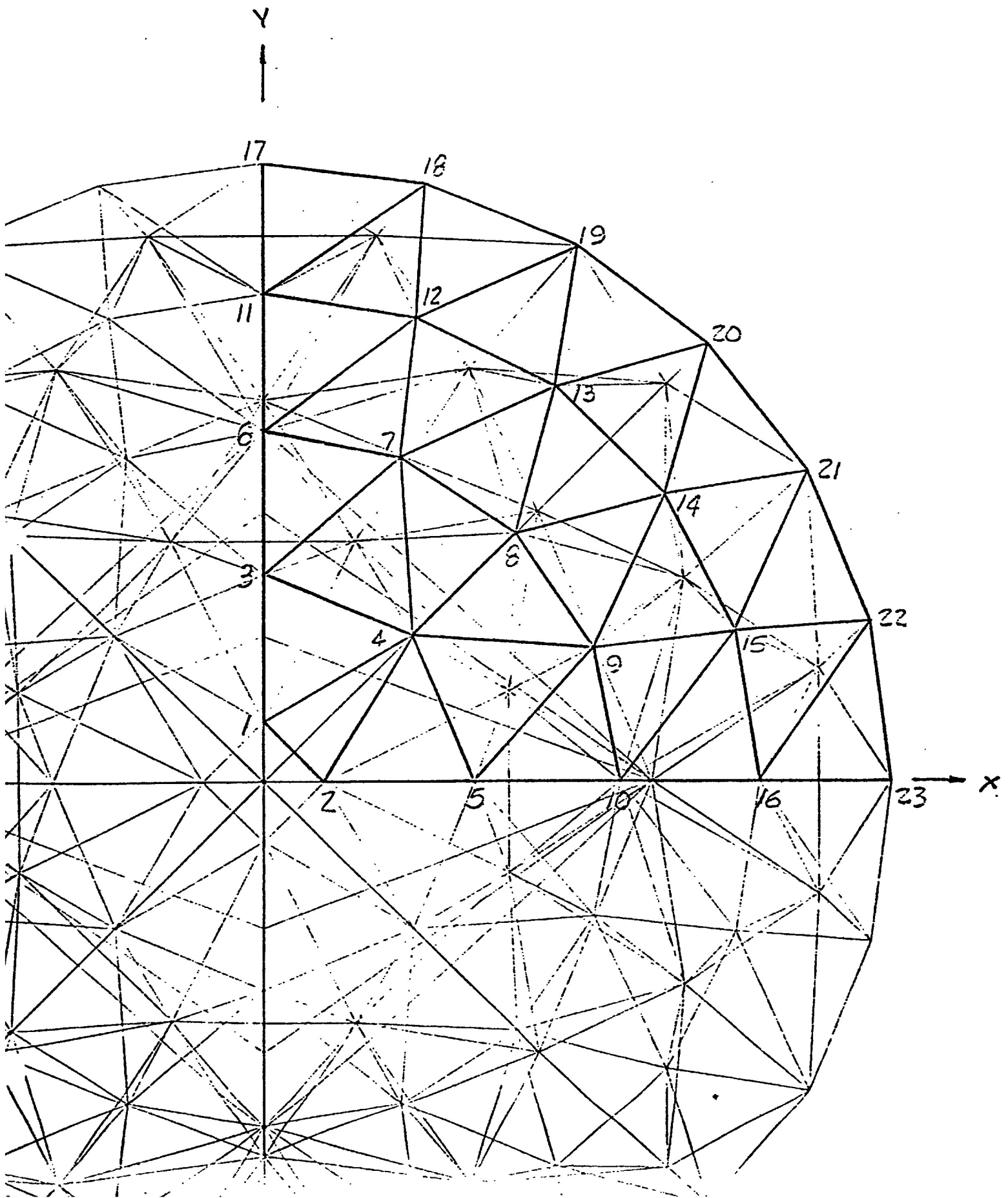
101	27-28	4	0.28	160.76	2.68	0.0	1.13	0.67	0.10	2.61	0.67	0.23	2.61	119	0.29	1
102	28-29	4	0.28	160.76	2.68	0.0	1.52	0.16	0.11	3.20	0.22	0.71	3.20	119	0.35	1
103	29-30	4	0.29	134.77	2.68	0.0	-0.42	-1.75	-0.05	-1.23	-1.92	0.17	2.34	100	0.21	1
104	30-34	2	0.28	90.44	2.68	0.0	0.44	0.0	0.03	0.83	0.0	0.55	0.99	134	0.17	1
105	24-35	4	0.28	138.61	2.68	0.0	0.05	-0.04	-0.00	-0.02	-0.12	-0.82	0.88	103	0.10	1
106	26-35	4	0.28	201.17	2.68	0.0	0.05	-0.23	-0.01	-0.08	-0.23	0.80	0.88	150	0.19	1
107	27-35	4	0.28	185.86	2.68	0.0	0.08	0.33	0.01	0.28	0.36	0.08	0.45	138	0.11	1
108	24-36	4	0.28	150.94	2.68	0.0	-1.29	-0.36	-0.11	-3.00	-0.73	-4.73	6.08	112	0.59	1
109	24-36	4	0.28	150.94	2.68	0.0	-0.12	-4.41	-0.07	-1.22	-4.77	-0.52	4.92	112	0.48	1
110	27-36	4	0.28	156.36	2.68	0.0	-3.13	0.19	-0.25	-6.94	-0.38	-3.99	7.14	116	0.74	1
111	28-36	4	0.28	192.54	2.68	0.0	-2.58	-0.50	-0.21	-5.76	-0.75	-0.80	5.76	143	1.04	1
112	29-36	4	0.28	156.36	2.68	0.0	-2.64	-3.67	-0.23	-6.20	-3.87	-0.31	6.52	116	0.67	1
113	25-37	4	0.28	138.61	2.68	0.0	-0.10	-0.85	-0.01	-0.25	-0.77	-0.14	0.89	103	0.10	1
114	29-37	4	0.28	185.86	2.68	0.0	0.52	0.03	0.03	0.94	0.07	0.41	0.94	138	0.17	1
115	30-37	4	0.28	201.17	2.68	0.0	-0.23	0.76	-0.02	-0.50	0.76	-0.26	1.04	150	0.22	1
116	36-41	4	0.28	235.03	14.58	0.0	-0.32	0.74	-0.00	-0.39	0.35	0.00	0.68	53	0.06	2
117	36-42	4	0.28	235.03	14.58	0.0	-0.53	2.00	-0.01	-0.70	1.34	-1.03	2.22	53	0.15	2
118	38-41	3	0.28	307.09	7.29	0.0	0.27	-0.44	0.00	0.32	-0.27	0.0	0.54	70	0.07	2
119	38-36	4	0.28	307.09	14.58	0.0	1.35	0.78	0.06	2.34	0.63	1.62	3.10	70	0.23	2
120	38-42	3	0.28	307.09	7.29	0.0	-4.68	0.0	-0.16	-7.20	0.0	-2.30	7.20	70	0.49	2
121	38-39	1	0.28	307.09	3.64	0.0	2.62	0.0	0.13	4.64	0.0	0.0	4.64	70	0.33	2
122	36-39	4	0.28	434.29	14.58	0.0	-1.99	-1.42	-0.12	-3.84	-1.13	-1.13	3.84	99	0.39	2
123	39-42	3	0.29	434.29	7.29	0.0	3.72	0.0	0.15	5.98	0.0	4.37	8.09	99	0.77	2
124	38-43	3	0.28	307.09	7.29	0.0	0.53	-0.59	0.02	0.78	-0.38	0.0	0.91	70	0.09	2
125	38-44	3	0.28	307.09	7.29	0.0	-0.67	-0.48	-0.03	-1.10	-0.29	0.0	1.10	70	0.11	2
126	38-45	3	0.28	307.09	7.29	0.0	-1.47	-0.31	-0.06	-2.35	-0.16	0.0	2.35	70	0.18	2
127	42-43	4	0.28	434.29	14.58	0.0	-0.26	0.54	-0.01	-0.43	0.27	0.00	0.53	99	0.12	2
128	42-44	4	0.28	434.29	14.58	0.0	0.68	0.40	0.02	0.98	0.21	0.0	0.98	99	0.16	2
129	42-45	4	0.28	434.29	14.58	0.0	1.31	0.19	0.04	1.93	0.11	0.00	1.93	99	0.23	2
130	41-43	3	0.28	119.82	7.29	0.0	-0.13	-0.00	0.00	-0.13	0.00	0.0	0.13	27	0.01	2
131	43-44	3	0.28	119.82	7.29	0.0	-0.32	0.08	0.00	-0.32	0.00	0.0	0.32	27	0.02	2
132	44-45	3	0.28	119.82	7.29	0.0	-0.46	0.22	-0.00	-0.46	0.00	0.0	0.46	27	0.03	2
133	39-45	3	0.28	119.82	7.29	0.0	-0.54	0.41	0.00	-0.54	-0.00	0.0	0.54	27	0.03	2
134	36-40	4	0.28	665.62	14.58	0.0	-0.14	-0.39	0.00	-0.14	0.00	-0.00	0.14	151	0.21	2

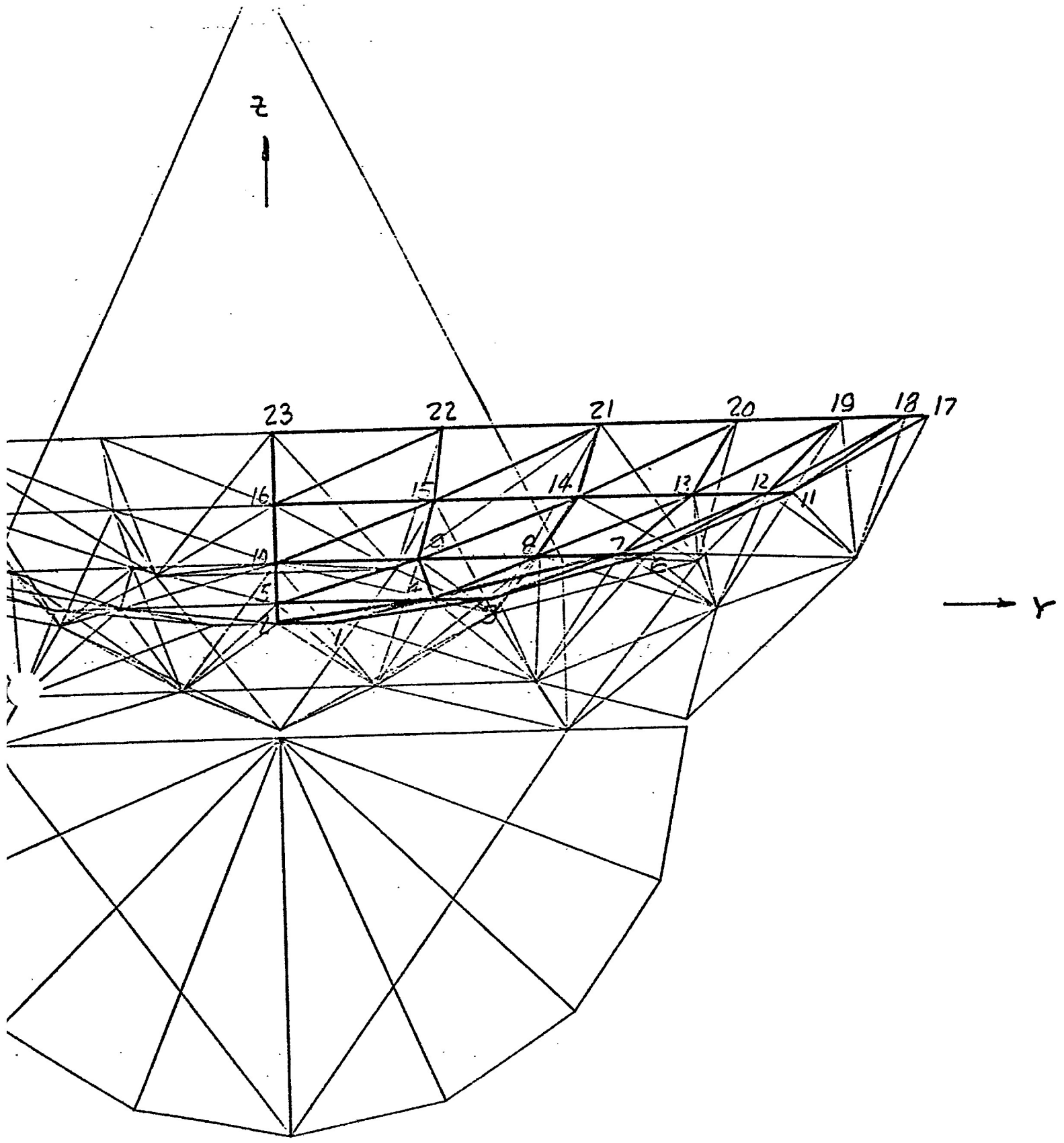
fig 3a
+
fig 3b

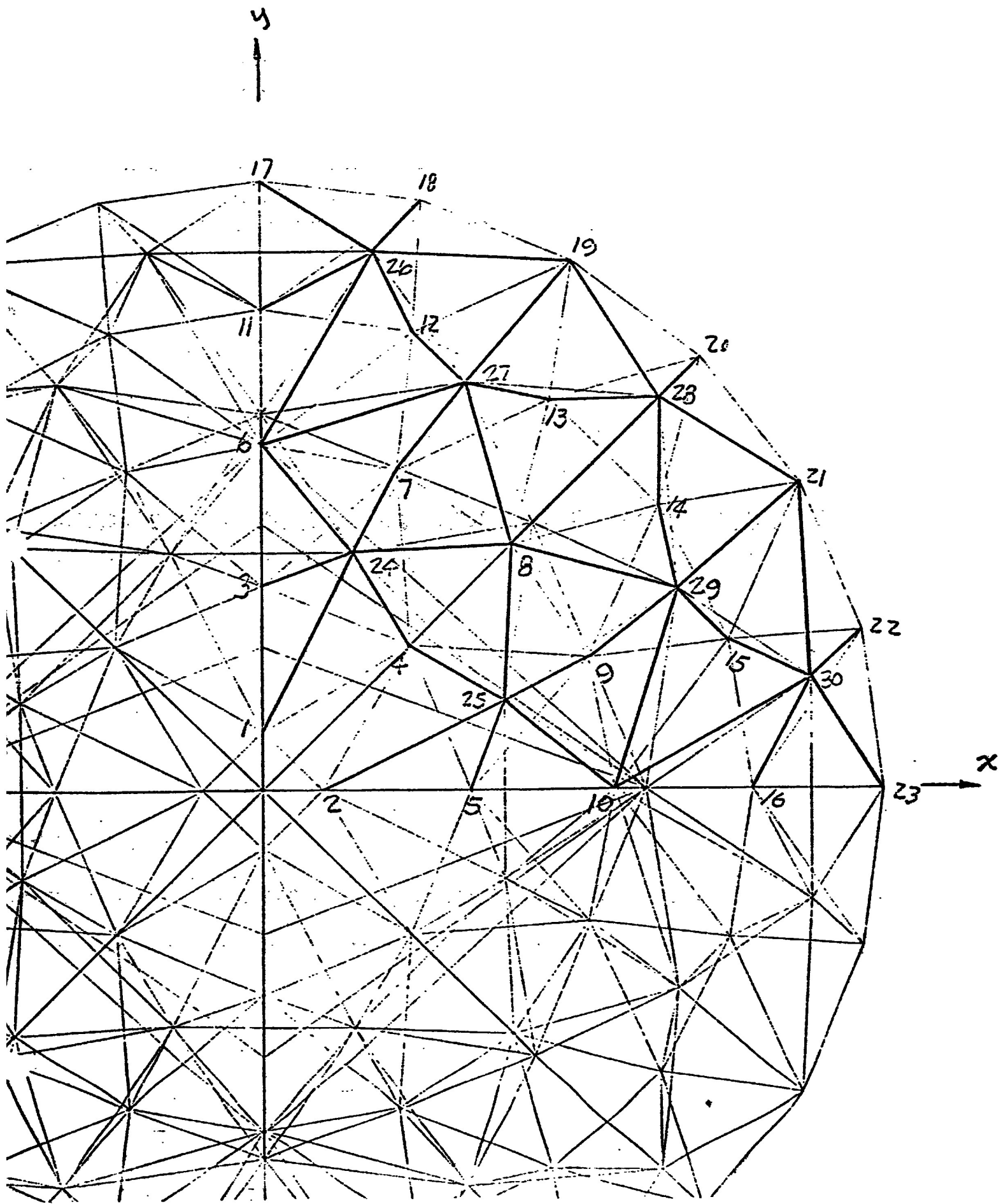


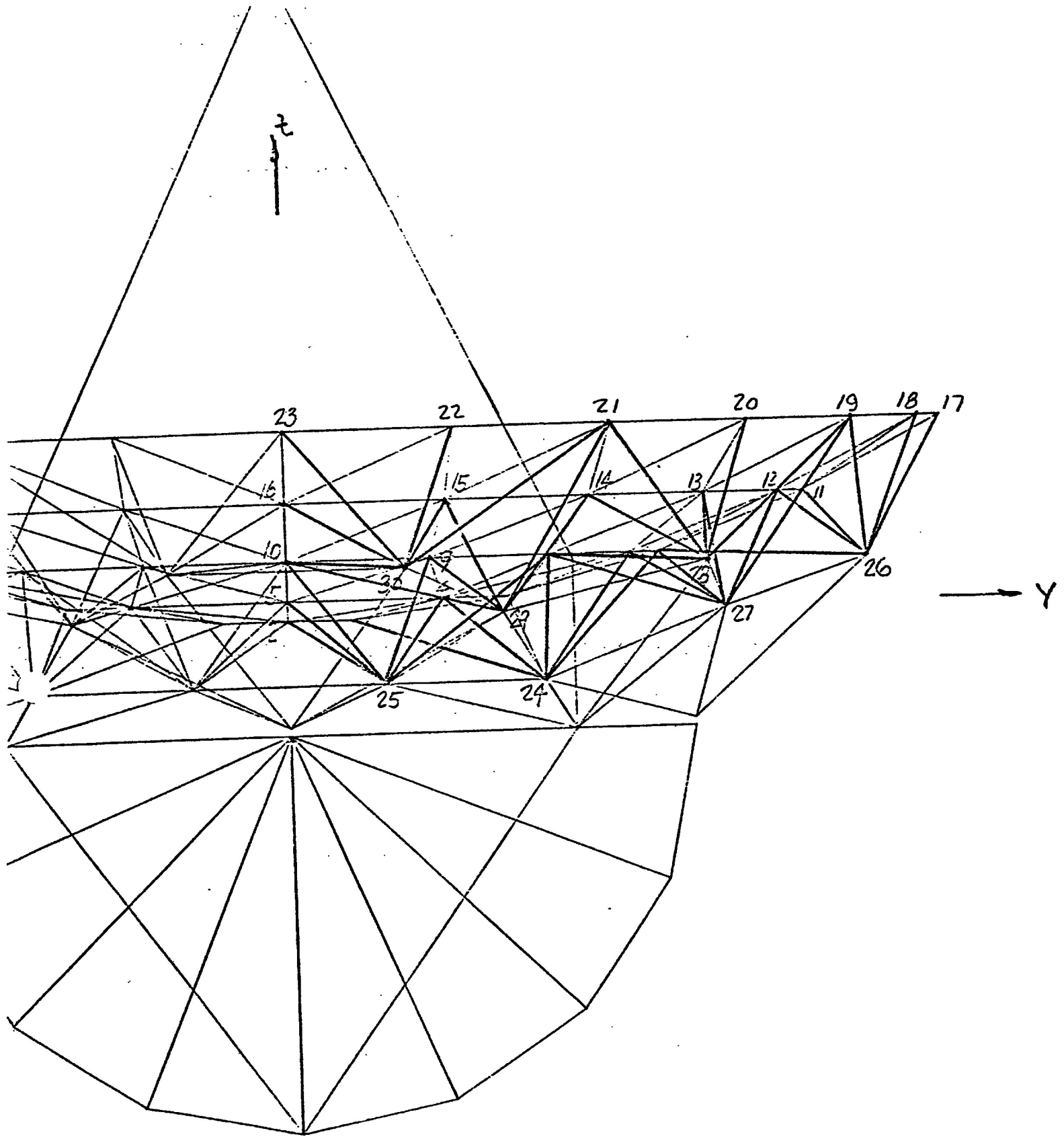
fig 4a
4b
5a
5b
5c

$3\frac{1}{2}$ " sch 40 $A = 2.68 \text{ in}^2$ $OD = 4.00"$, $\alpha = .226$, (use in member # 1 ~ 115)
 12 " sch 40 $A = 14.58 \text{ in}^2$ $OD = 12.75"$, $\alpha = .375$, (" " " " 116 ~ 134)

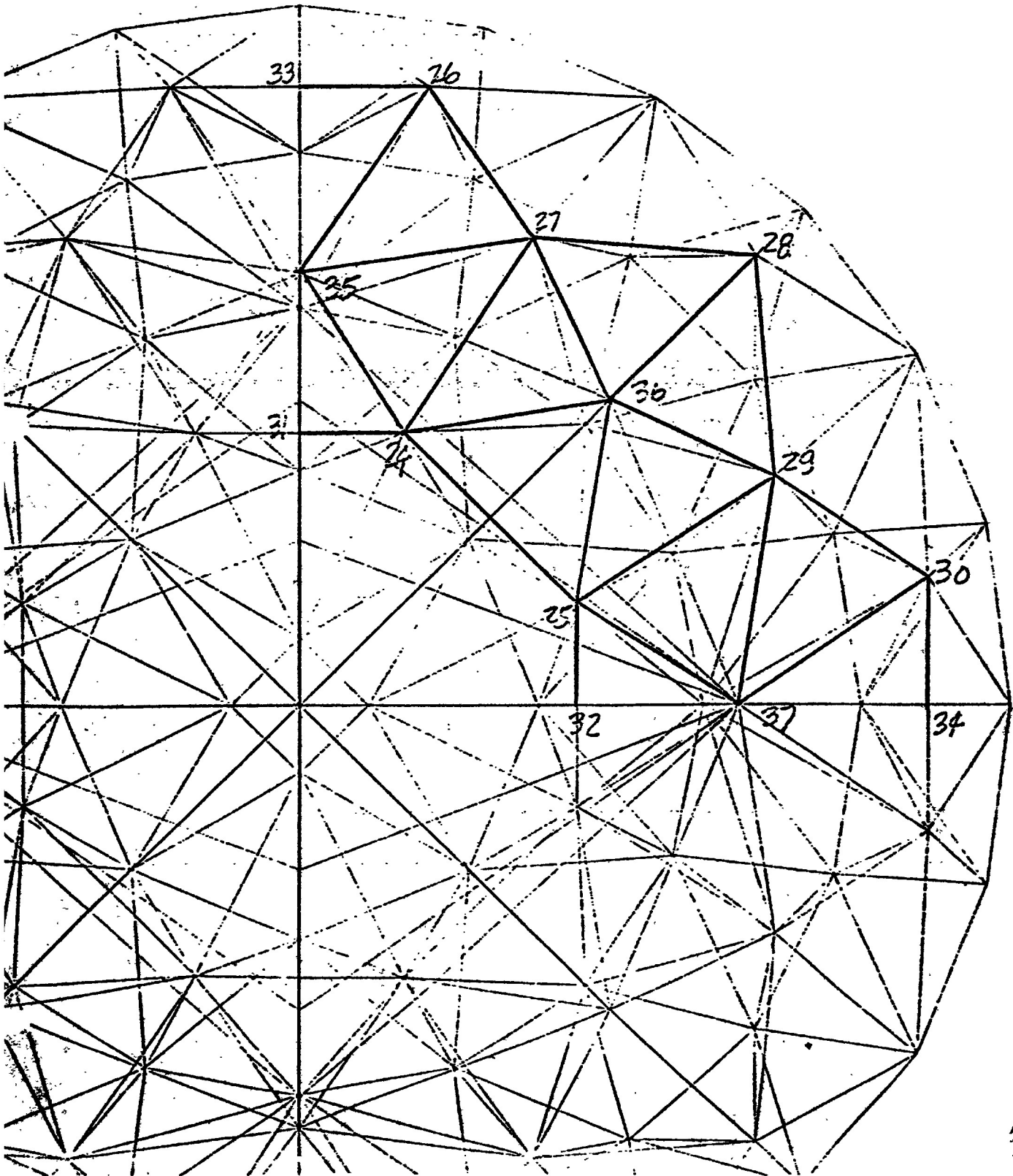






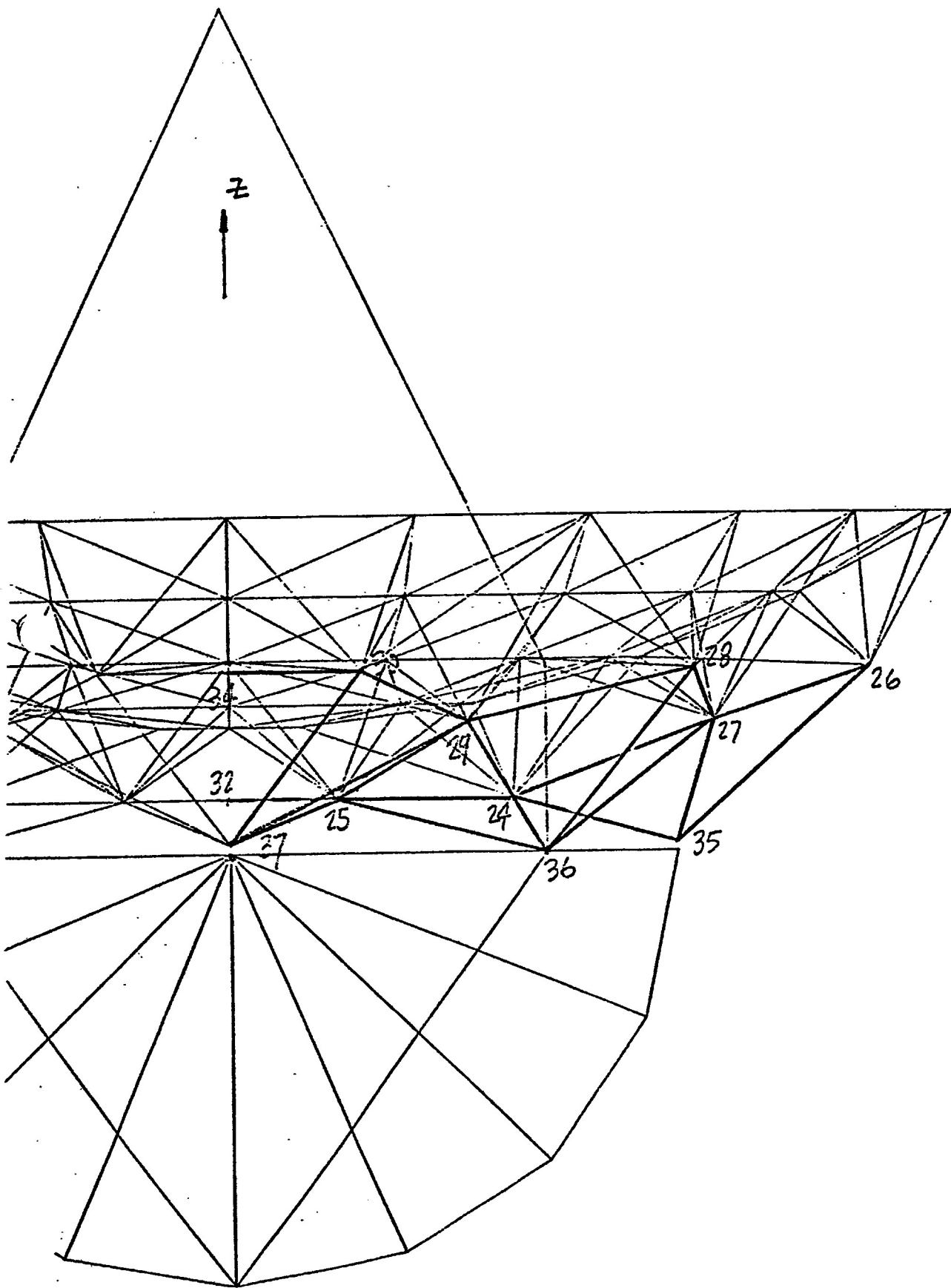


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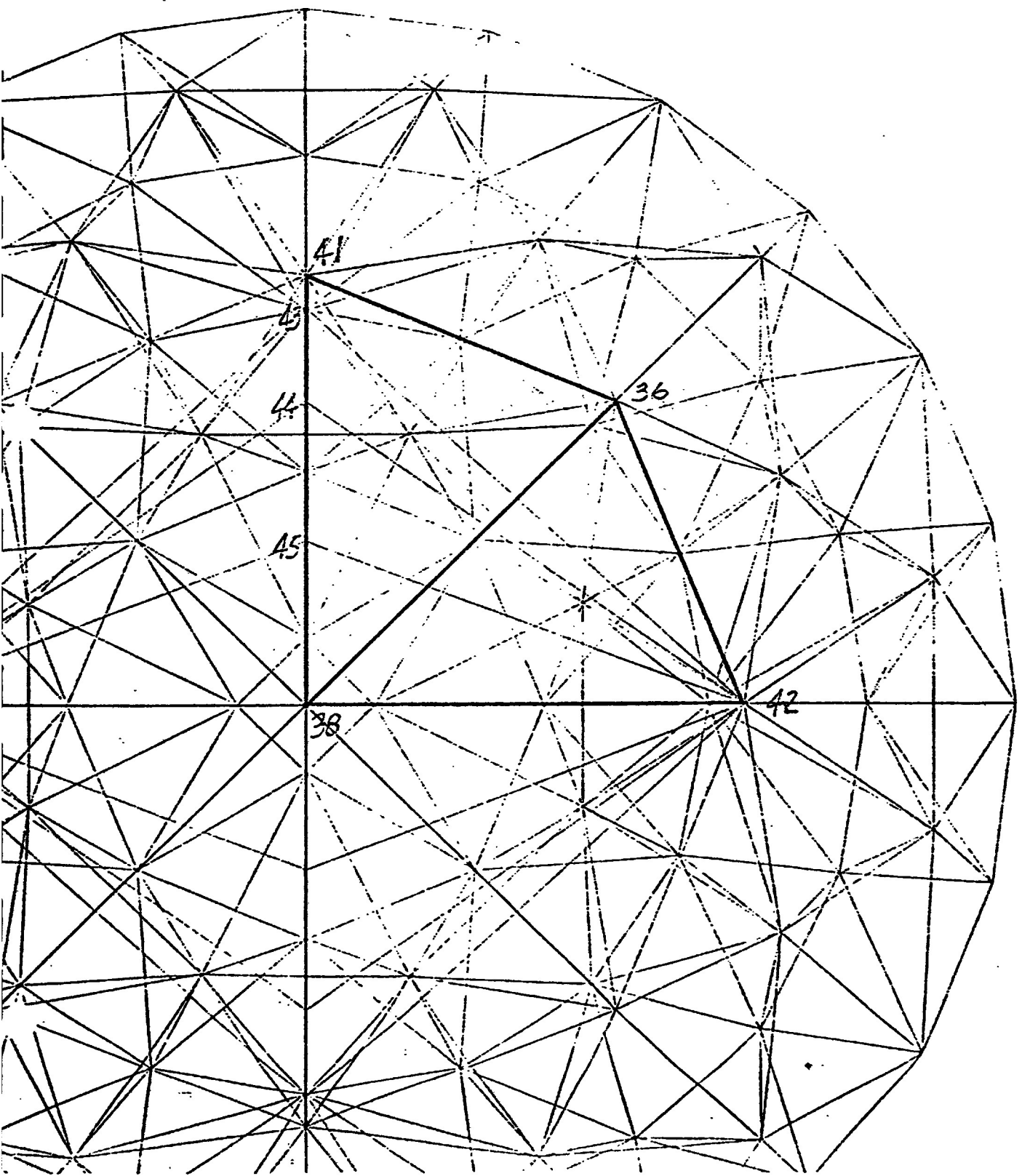


X

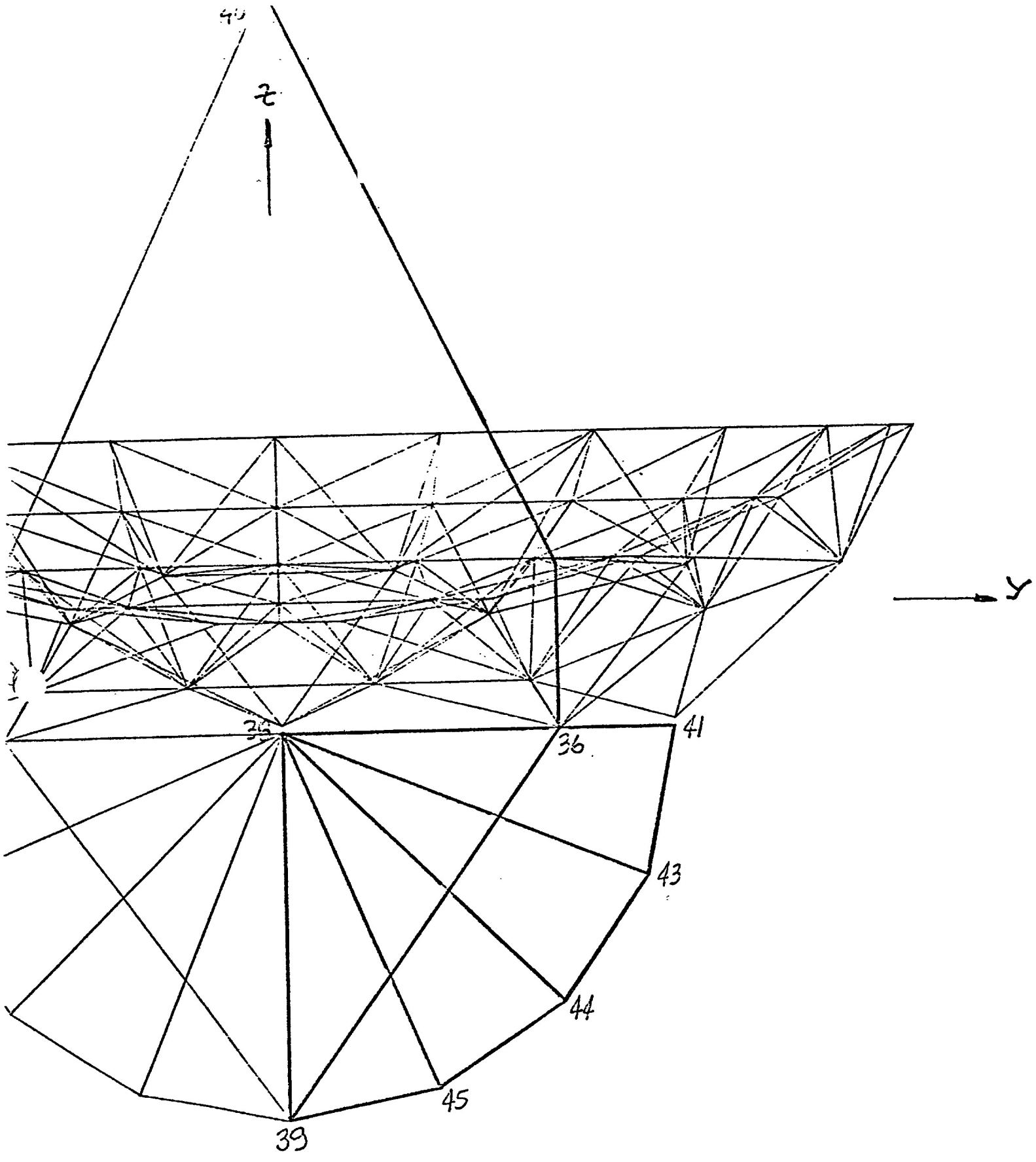
Fig 3c



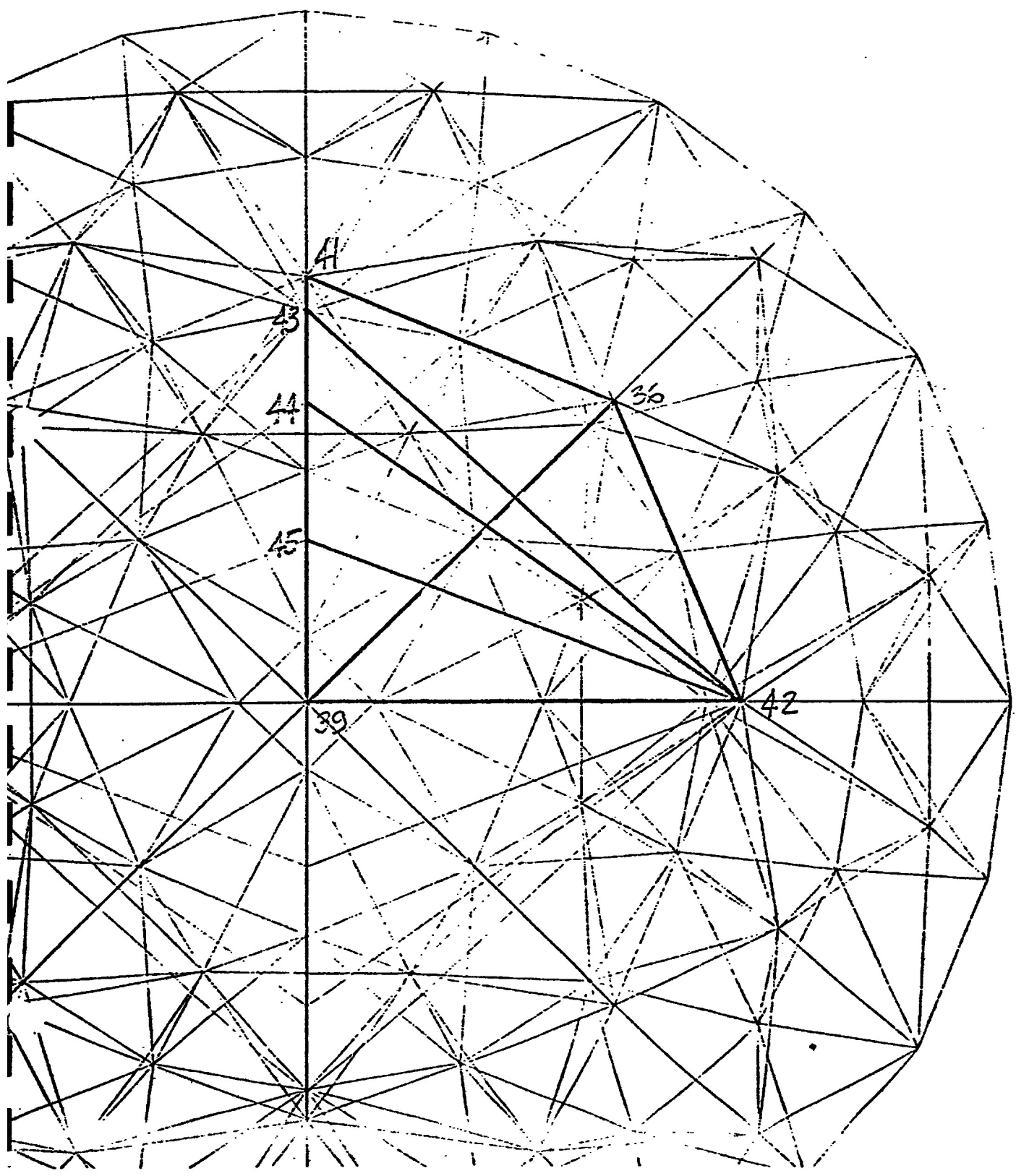
4



x



Y



X

