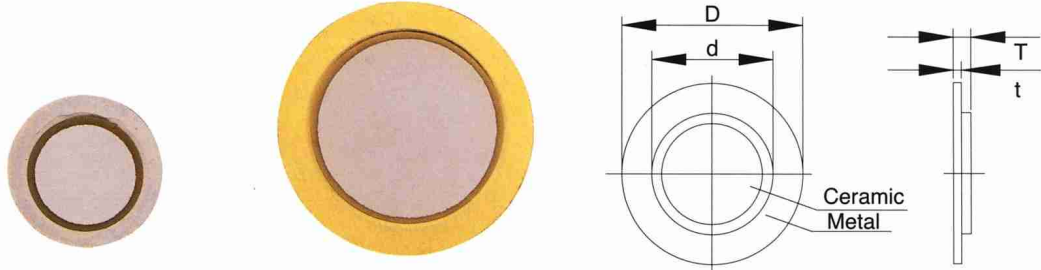




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EPZ- Piezoelectric Ceramic Element

External Drive Element



	DIMENSIONS(mm)				CHARACTERISTICS		
	D	d	t	T	Fr(kHz)	R _i (Ω)	Co(pF)
001	6.5	5	0.05	0.11	7.0	2500	7000
002	9	7	0.05	0.11	9.5	1200	10000
003	9	7	0.05	0.11	8.5	1000	10000
004	9	7	0.05	0.11	8.6	1200	10000
005	11	8	0.10	0.17	10.0	400	14000
006	12	9	0.05	0.11	5.0	600	16000
007	12	9	0.10	0.19	7.6	300	11000
008	12	9	0.10	0.22	8.7	600	10000
009	12	9	0.15	0.31	13.5	500	7500
020	13.5	9	0.10	0.22	6.6	1000	9000
021	13	9	0.05	0.11	4.3	1000	16000
022	14	9	0.20	0.41	10.0	1000	5000
023	15	9	0.10	0.19	4.3	800	13000
024	15	9	0.10	0.21	4.8	800	10000
025	15	9	0.10	0.22	5.0	1500	11000
026	15	10	0.10	0.22	5.5	600	14000
027	15	11	0.10	0.20	5.8	500	14000
028	15	11	0.10	0.21	6.0	1000	14000
029	15	11	0.10	0.22	6.0	500	11000
030	15	11	0.20	0.32	7.6	400	15000
031	15	11	0.15	0.31	8.6	500	9500
032	15	11	0.20	0.32	9.0	500	15000
033	15	11	0.20	0.36	10.0	500	9500
034	15	11	0.20	0.44	11.6	500	7000
035	17.5	15	0.10	0.19	3.7	150	42000
036	17.5	15	0.10	0.19	4.1	200	42000
037	18	11	0.10	0.22	3.6	1500	14000
038	18	15	0.10	0.22	4.8	200	27000
039	18	15	0.20	0.41	8.6	500	15000

Introduction of Piezoelectric Ceramic Element and Buzzer



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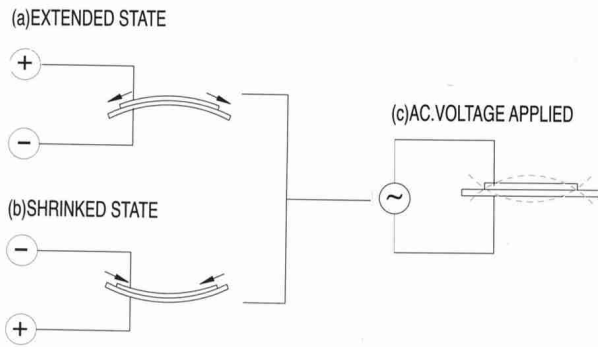


FIG.3 Oscillation system

E. There are three recommended methods for mounting the element.

- 1) Node support.
- 2) Edge support.
- 3) Central support.

In fact, if piezoelectric elements are of same shape, their values of the resonant frequency become smaller in the order of 1), 2) and 3). As shown in fig4.

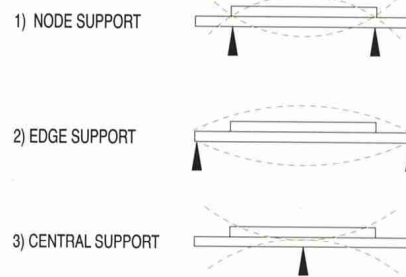
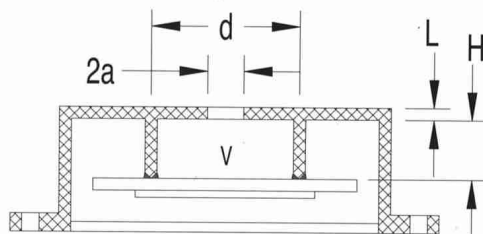


FIG.4 Supporting method

F. In general, the piezoelectric element is installed in a cavity to produce high sound pressure. The resonant frequency of the cavity is obtained from Helmholtz Formula. As shown in fig5. Since the piezoelectric element and cavity have proper resonant frequencies. f_r and f_{cav} respectively, sound pressure in specific frequencies can be increased and a specific band width can be provided by controlling the both positions. Else, the sound pressure put out is a composite parameter, piezoelectric element is only one thing, there are still other facts to be considered, such as, housing design, given drive signal, buzzer fitting and manufacture process, and even the glue used to paste piezoelectric element.



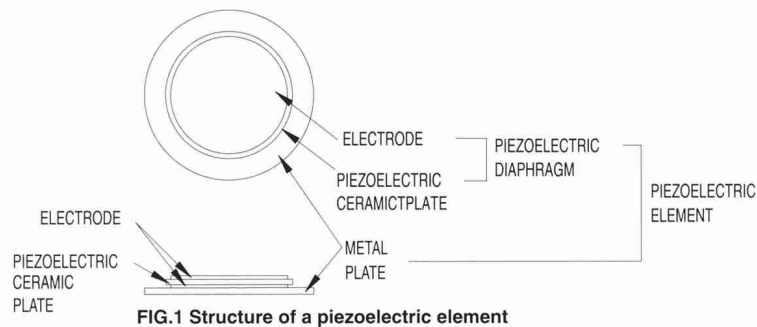
$$f_{cav} = \frac{C}{2\pi} \sqrt{\frac{\pi a^2}{V(L+1.3a)}} = \frac{C}{2\pi} \sqrt{\frac{4 a^2}{d^2 H (L+1.3a)}}$$

- f_{cav} : resonant freq. of a cavity(Hz)
- C : the speed of sound(cm/sec)
- a : radius of sound emitting hole(cm)
- d : diameter of a supporting rim(cm)
- H : depth of a cavity(cm)
- L : wall thickness of a cavity(cm)

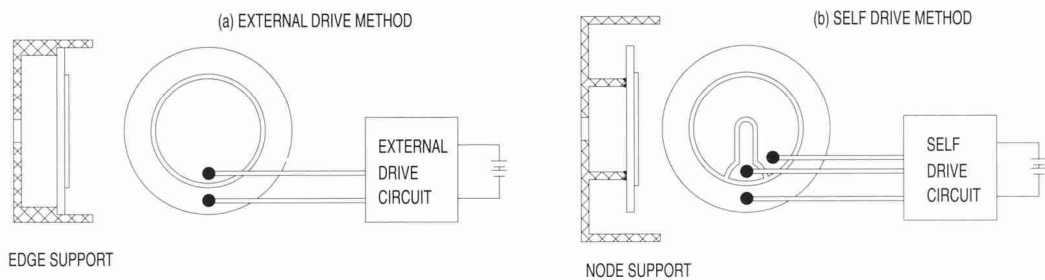
FIG.5 Sectional view of a cavity

Introduction of Piezoelectric Ceramic Element and Buzzer

- A. Structure of a piezoelectric element consists of a piezoelectric ceramic plate which has electrodes on both sides and a metal plate. And a piezoelectric ceramic plate is attached to a metal plate with adhesives, as shown in fig1.



- B. Basically, Sound source of a piezoelectric sound component is a piezoelectric element.
- C. Drive procedures for piezoelectric sound components include (a). external drive method and (b).self drive method as shown in fig2.



- D. Voltage between electrodes of a piezoelectric element causes mechanical distortion due to the piezoelectric effect. For the piezoelectric diaphragm expands in radial direction, the piezoelectric element bends towards that direction. But the metal plate bonded to the piezoelectric diaphragm does not expand; Conversely, when the piezoelectric diaphragm shrinks, the piezoelectric element bends in another direction. Thus, when AC Voltage is applied across electrodes, the above descriptive is repeated, producing sound waves in the air as shown in fig3.

Introduction of Piezoelectric Ceramic Element and Buzzer

Recommended circuit

1. Telephone Ringer type

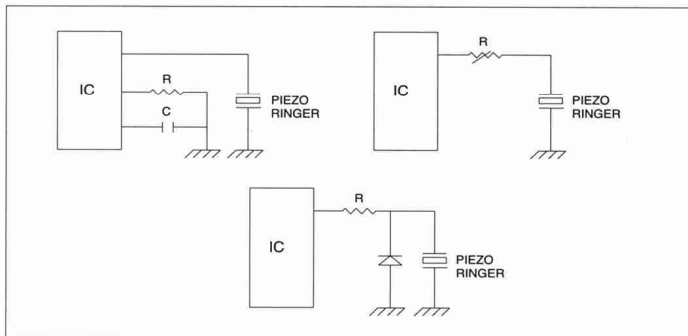


FIG.6 Circuits for piezo ringer

2. Self-Oscillation Circuits

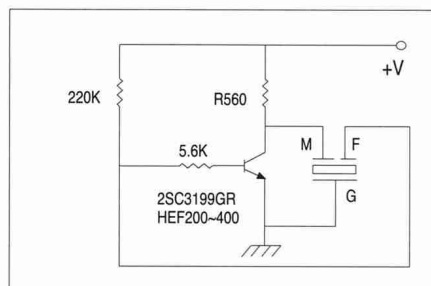
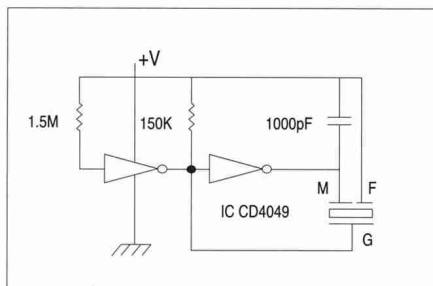


FIG.7 Examples of the external drive circuit

3. External-Drive Circuits

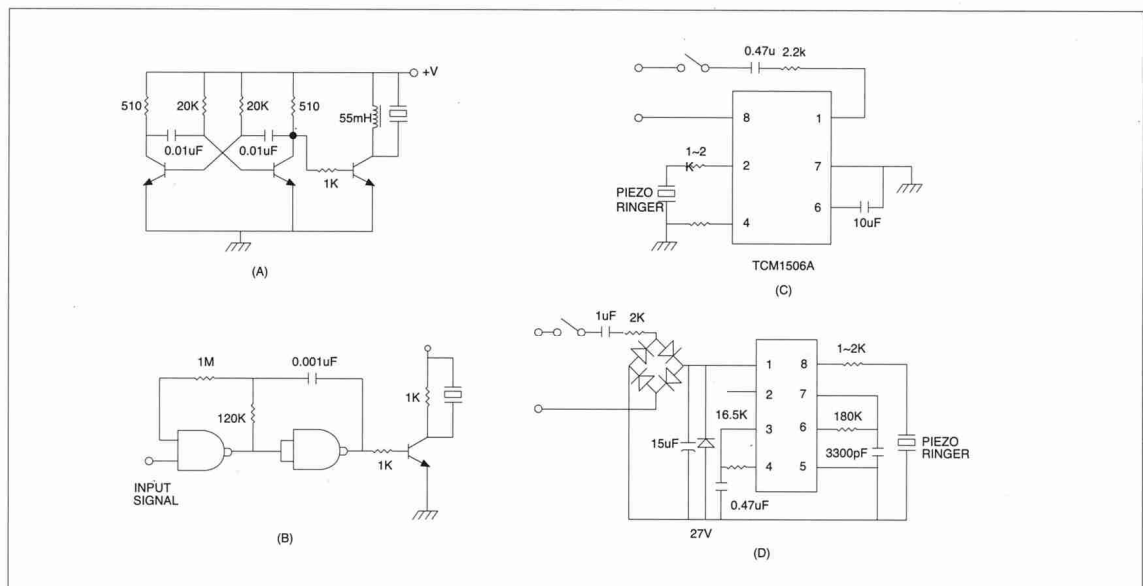


FIG.8 Examples of the external drive circuit



Piezoelectric Ceramic Element

External Drive Element

	DIMENSIONS(mm)				CHARACTERISTICS		
	D	d	t	T	Fr(kHz)	R(Ω)	Co(μ F)
072	26	18.0	0.20	0.44	4.1	250	20000
073	26.5	25.0	0.15	0.43	3.6	150	145000
074	26.8	20.0	0.20	0.41	4.2	200	25000
075	26.8	20.0	0.20	0.41	3.7	200	25000
076	27	20	0.10	0.20	2.0	300	65000
077	27	20	0.10	0.22	2.3	200	50000
078	27	20	0.10	0.22	2.5	200	50000
079	27	20	0.20	0.31	3.0	200	50000
080	27	20	0.20	0.36	3.0	200	36000
081	27	20	0.10	0.26	3.3	200	35000
082	27	20	0.20	0.37	3.3	200	35000
083	27	20	0.20	0.44	3.9	200	25000
084	27	20	0.20	0.41	4.0	200	27000
085	27	20	0.20	0.44	4.4	200	24000
086	27	20	0.25	0.51	4.4	200	21000
087	27	20	0.25	0.51	4.4	200	18000
088	30	20	0.20	0.41	3.0	300	25000
089	31	20	0.10	0.22	1.3	800	48000
090	31	18	0.10	0.22	1.3	800	45000
091	31	20	0.10	0.22	1.3	800	40000
092	31	20	0.10	0.22	1.8	700	40000
093	31	20	0.10	0.22	2.0	400	50000
094	31	20	0.20	0.41	2.8	400	27000
095	31	20	0.20	0.46	2.8	500	24000
096	31	20	0.20	0.44	3.0	300	25000
097	31	20	0.20	0.46	3.3	300	23000
098	31	25	0.20	0.64	4.3	200	90000
099	32	20	0.10	0.22	1.2	500	50000
100	32	20	0.10	0.22	1.6	800	60000
101	32	32	0.10	0.44	2.2	150	220000
102	32	30	0.10	0.52	3.3	200	130000
103	33	25	0.15	0.39	2.2	200	170000
104	35	25	0.10	0.22	1.3	200	80000
105	35	25	0.10	0.22	1.6	200	80000
106	35	25	0.15	0.31	2.0	250	55000
107	35	25	0.20	0.36	2.3	200	55000

Piezoelectric Ceramic Element

External Drive Element



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	DIMENSIONS(mm)				CHARACTERISTICS		
	D	d	t	T	Fr(kHz)	R _i (Ω)	C ₀ (pF)
108	35	25	0.20	0.44	2.4	200	42000
109	35	25	0.25	0.49	2.6	250	42000
110	35	25	0.25	0.48	2.9	200	30000
111	35	25	0.30	0.56	2.9	200	26000
112	35	25	0.40	0.56	3.0	200	37000
113	38	25	0.10	0.22	1.0	800	80000
114	38	25	0.15	0.29	1.5	400	52000
115	38	25	0.15	0.36	1.7	400	48000
116	38	25	0.20	0.44	2.0	200	42000
117	40	25	0.20	0.32	1.6	300	75000
118	40	25	0.20	0.32	1.6	400	80000
119	40	30	0.20	0.41	2.0	200	65000
120	40	25	0.20	0.41	2.0	300	42000
121	41	25	0.10	0.22	0.7	1500	80000
122	41	25	0.10	0.22	0.8	1000	85000
123	41	25	0.10	0.22	1.0	1000	80000
124	41	25	0.15	0.27	1.1	500	80000
125	41	25	0.10	0.21	1.3	400	85000
126	41	25	0.10	0.22	1.5	300	80000
127	41	25	0.20	0.41	1.5	500	45000
128	41	25	0.40	0.64	2.2	300	42000
129	41	25	0.15	0.27	3.0	200	80000
130	41	25	0.20	0.44	4.5	250	40000
131	42	25	0.10	0.22	1.2	200	80000
132	42	25	0.20	0.44	1.5	500	42000
133	43	20	0.10	0.22	2.3	200	48000
134	47	25	0.10	0.22	0.6	1500	80000
135	41	25	0.10	0.22	2.6	200	80000
136	47	25	0.20	0.41	3.2	200	45000
137	47	25	0.25	0.49	3.8	200	42000
138	49	25	0.20	0.44	3.2	300	42000
139	50	25	0.20	0.41	0.8	1000	45000
140	50	30	0.20	0.41	1.1	800	60000
141	50	30	0.20	0.46	1.3	500	55000
142	50	25	0.15	0.27	2.2	300	80000
143	50	25	0.20	0.41	2.8	200	35000
144	50	25	0.20	0.44	3.1	300	42000