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The Broadcast Engineers' Journal

- Microphone Data and Theory
- Beam Traveling-Wave Tube
- Auditory Perception and Musical Balance as a Function of Loudness
- Bibliography of Electric and Electronic Musical Instruments

★ Plus—Finger-tip Digest of Current Broadcast, Television, FM, and Trade News

MARCH
1947

VOL. 14 No. 3

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**And KICD listeners thank you.*

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THE BROADCAST ENGINEERS' JOURNAL

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THE BROADCAST ENGINEERS' JOURNAL
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NATIONAL N.A.B.E.T. OFFICE
Room 501, 66 Court Street, Brooklyn 2, N. Y.
A. T. Powley, President

NABET ACTIVITY

NEGOTIATIONS at WOR are in progress at this writing. The negotiation committee consists of Pres. Powley, NABET Attorney Tom Dunn, Chairman Walter Payne, Gene Clark, Will Da Costa, J. Mac-Reid, Jim Gavigan, and Adrian Penner.

The RCA-Victor recording contract is also in negotiation.. The negotiation committee consists of Messrs Powley, Hiller, Lynch, and Miller.

The NBC-ABC Network contracts go into negotiation on March 4th. The NABET committee will go into conference on March 2nd at the Hotel Roosevelt, New York. Committee consists of Pres. Powley, V.P. Jim Brown of Hollywood, Charlie Bennis of New York, Frank Schnepper of Chicago, John McDonnell of San Francisco, and Reid R. Davis III for Television.

N'tl Rep. Gorsuch is negotiating the WOL contract, Washington.

The Westinghouse strike fund, voted by the NABET National Council at the recent Denver Meeting, has now been collected, and 85% payments are going out to the Westinghouse engineers; the original plan was 100% payments; the 20% tax on 1946 dues overlooked the fact that 1946 revenue included initiation fees to the extent of 15% of our revenue. This honest error is being appreciated and understood all around.

We hear that IA is making overtures to the WWJ Detroit management, for the television engineering jobs at that station, which is under NABET contract. NABET has had television jurisdiction since its inception in 1934, and intends to protect its members to the full extent of the law.

V.P. Jim Brown and John McDonnell of Hollywood and San Francisco, respectively, are stopping off at Salt Lake City on NABET business, on their way East for the network negotiations.

The New York Chapter Council unanimously adopted the following By-Law: *'It is mandatory for all members of the New York Chapter to cast a ballot on all matters laid before them for such action. Members failing to cast a ballot shall be fined five dollars ($5.00) payable within thirty (30) days. Members absent due to illness or vacation during the stated period of balloting are not subject to this penalty.'* This action as a result of recent proposed constitutional amendments, all of which failed to pass due to failure to obtain a quorum vote.

Editorial from "The Hollywood Craftsman" of Jan. 22, 1947
(Not a union paper, by the way.)

THE STATE OF THE UNION

By Harry Edwin White, Editor

Very much in the eye and ear, in some cases the hair of quite a large section of our population, are the Unions and the Union leaders. In getting around I hear now and then that the Unions are unreasonable, and that the Union Leaders are irresponsible.

To this belief I do not subscribe. I will grant that there

(Continued on Page Twelve)

Concise Data and Theory on Popular Microphones

By Frank Burns

(Mr. Burns' original article dealt only with RCA microphones, and appeared in our Dec. 1941 issue. Reprints of that article have been exhausted. In response to requests for up-to-date data on all broadcast-quality microphones, it was planned that this complete revision of the original article should include microphones of the Western Electric Co., and Shure Brothers. We regret that the data relative to Shure Brothers microphones has not yet reached us, and when it is received, will be published.—EdS.)

THIS article is intended to offer our readers a reference source of information about several of the most popular R.C.A. and Western Electric broadcast microphones. We intend to add to this information in future articles with data about microphones of other manufacturers including those in the lower price ranges. The important characteristics* of the microphones shown are given in table form followed by a review of the major differences in construction and theory of operation of the pressure, ribbon velocity and uni-directional type microphones.

Pressure Microphone

To start our review of microphone construction and theory of operation we will consider the pressure microphone. This type of microphone has only one of the two surfaces of its diaphragm exposed to the atmosphere. The diaphragm is forced inward from its normal position as compressed portions of a sound wave reach it and is displaced outward as rarefied portions of the wave arrive.

A very important characteristic of the microphone is its failure to discriminate between sound arriving from random directions (at the lower frequencies). Even sound waves originating at the rear of the microphone "bend" around the microphone case and actuate the diaphragm as though they had originated at front. This is true up to the frequency where the depth of the microphone case approaches the wavelength of the sound. Thereafter, due to diffraction, the response decreases with frequency for sounds arriving from the rear of the microphone. In order to obtain the best response it is necessary to limit operations to a rather small angle in front of the microphone. Also it is obvious from above that the smaller the microphone the higher the frequency at which diffraction becomes important and hence the wider the range of uniform response.

A marked difference between pressure microphones is the way in which their mechanical moving systems translate the information in the sound wave to electrical impulses. With the condenser microphone (where diaphragm displacement determines the value of capacity and hence the output) it is necessary that the amplitude of the diaphragm displacement be constant for constant pressure, regardless of frequency. In order to achieve this reaction of the moving system to the sound wave, it is necessary for stiffness (capacitive reactance) to be the controlling element in the mechanical construction of the moving system.

One method of obtaining stiffness as the controlling factor is by use of a stretched diaphragm. This causes the mechanical impedance below the resonant frequency of the diaphragm to be almost entirely stiffness reactance and the diaphragm displacement will be constant for constant pressure over this range.

The more the diaphragm is stretched the higher will be the resonant frequency (below which the microphone response is uniform) but the less the sensitivity.

The Western Electric 640-AA is a condenser type microphone recommended for high fidelity pickup. The microphone and its associated (RA-1095) amplifier are contained in a projectile like case. The microphone itself

Model	Type	Frequency Response	Output Impedance	Output Level**	Directional Characteristics
R.C.A. 44-BX	Ribbon Velocity	30—15,000 ±6 db	50/250	—55 vu	Bi-directional
R.C.A. 77-D	Combination Ribbon Velocity & Pressure	30—15,000 ±5 db	50/250/600	—54.3 vu —57.3 vu —60.3 vu	Bi-directional Uni-directional Non-directional
R.C.A. 88-A	Pressure (moving coil)	60—10,000 ±5 db	50/250	—55 vu	Non-directional
W.E. 633-A	Pressure (moving coil)	50— 9,000 ±3 db	20	—59 vu	Non-directional
W.E. 639-A	Combination Ribbon Velocity & Pressure	40—10,000 ±4 db	35	—55 vu —61 vu —61 vu	Uni-directional Bi-directional Non-directional
W.E. 640-AA	Condenser (with assoc. amplifier)	50—15,000 ±6 db	(Amp. Out.) 30—50/200—250	(Amp. Out) —45 vu	Uni-directional Bi-directional Non-directional

* All specifications are those of the manufacturers.
** Input level of 10 bars (10 dynes/cm^2).

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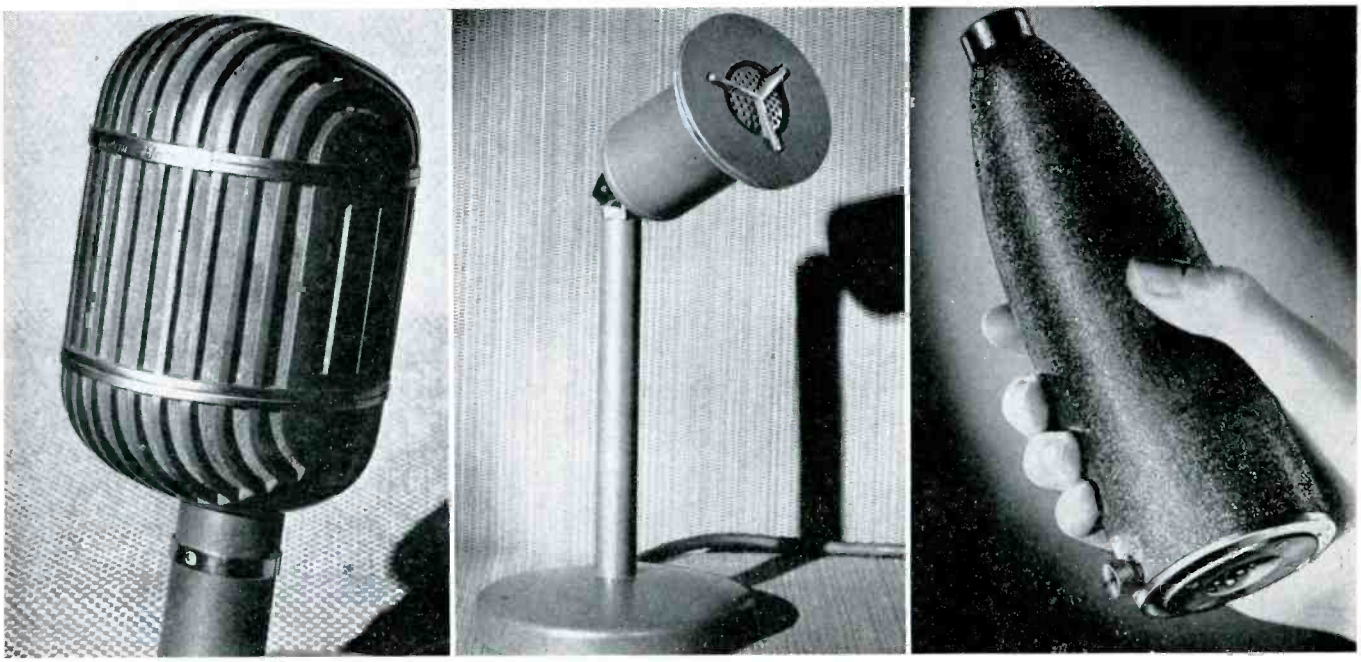


W.E. 639-A W.E. 633-A W.E. 640-AA

is an inch long and an inch in diameter and fits into the tip of the case. Its small size is a pronounced advantage from a fidelity standpoint in that physically, it approaches the ideal of a "point pick up" device, eliminating possible phase distortion, due to sound waves striking simultaneously against different portions of the microphone diaphragm. Moreover, the smaller the pick-up device, the less the disturbance caused in the sound field by the mere presence of the pick-up element.

Fig. 1 shows the frequency response of the 640-AA microphone and RA-1095 amplifier.

Now in contrast to the stiffness controlled condenser microphone (and the mass controlled ribbon velocity microphone to be discussed) there is the moving coil type of pressure microphone which has resistance as the controlling

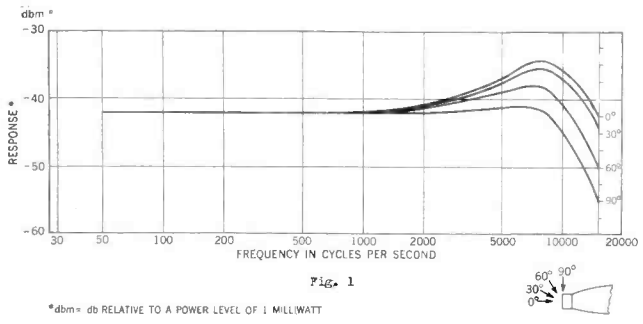


Fig. 1

*dbm= db RELATIVE TO A POWER LEVEL OF 1 MILLIWATT

Frequency response of W.E. 640-AA and RA-1095 amplifier

element in order that its output should be constant for unit pressure. This is due to the fact that the emf induced in the coil is directly proportional to the velocity of the coil. Therefore the coil velocity should be proportional to pressure and independent of frequency.

The models 88-A and 633-A are good examples of the moving coil type of microphone. The directional response of the 88-A is shown in Fig. 2.

Another type of pressure microphone whose uniform output depends on resistance, is the pressure actuated ribbon microphone. This is the microphone that is combined with the ribbon velocity to form the Uni-directional microphone which we shall discuss later.

It consists of a ribbon suspended in a magnetic field and freely accessible to the atmosphere at one surface, but terminated in an accoustic impedance at the other surface. Here, again, the induced emf is proportional to the velocity of the ribbon through the magnetic field. Therefore, in order to have velocity proportional to pressure and independent of frequency, the controlling factor is resistance. This is obtained by terminating one surface of the ribbon into an accoustically treated pipe which appears

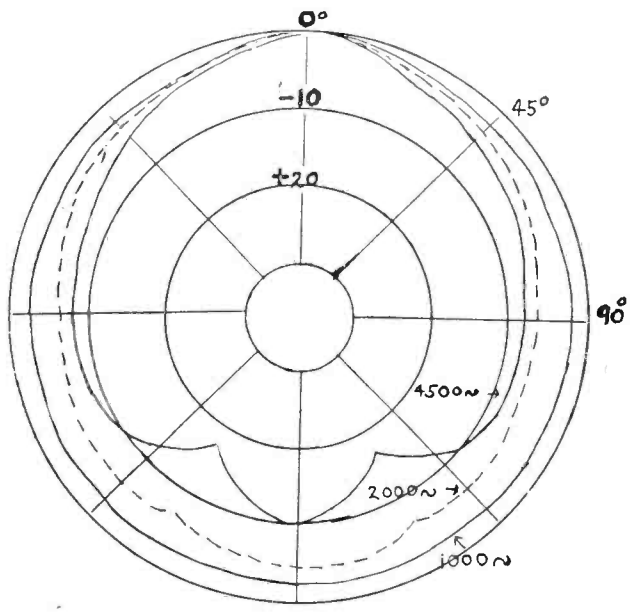


Fig. 2.—Directional response of 88-A

RCA 77-D RCA 88-A RCA 44-BX

as an accoustic resistance to the ribbon and is very large compared to the ractive components.

Velocity Microphone

The ribbon velocity microphone also consists of a light corrugated metallic ribbon suspended in a magnetic field but is freely accessible to air vibrations from both sides.

In contrast to the pressure microphone, the ribbon in the velocity microphone is not actuated by the sound wave varying the pressure on one of its surfaces. Rather, the ribbon is actuated by the pressure gradient or difference in pressure on its two surfaces. The ribbon being relatively limp, has negligible stiffness reactance and, being suspended in free space, has negligible accoustical or mechanical resistance. Therefore, though the ribbon mass is small, it is the controlling element. The ratio of the velocity of the mechanical system to the pressure or velocity in the incident plane sound wave is substantially independent of frequency.

One of the most important details of construction concerns the size of the baffle surrounding the ribbon. The term baffle is used here to designate a structure (magnetic pole pieces) that determines the air path between the front and back of the ribbon. Although the baffle is of rectangular shape, we will consider, in this discussion, only the shortest air path around it from one surface of the ribbon to the other.

We will consider the effect on the ribbon of just one cycle, of a sound of low audio frequency. In Fig. 3, let

x = Pt. of maximum compression
y = Pt. of maximum rarefaction
z = Pt. of normal pressure

Let us assume that the solid wave in the figure represents the cycle which is actuating the ribbon at a specific instant. Let lines A and B correspond to the two surfaces of the ribbon and the distance between them represent the shortest air distance around the baffle from one surface of the ribbon to the other. We will assume it is two inches for a certain microphone. It is obvious that at A, which is (at the instant under consideration) the far side of the ribbon from the direction of the sound source, the pressure is approximately one unit above normal, whereas, at B which is two inches away from A or the surface of the ribbon facing the sound source, the pressure is four units above normal. Naturally the ribbon is actuated in the direction of the least pressure. It is clear that as the wave continues past the ribbon, the pressure between A and B will continually vary and the ribbon will always be actuated by the difference in pressure on its two surfaces.

The voltage generated by the ribbon moving through the magnetic field is given by:

$$e = Blx$$

where e is the generated emf
B is the flux density of the magnetic field
l is the length of the ribbon
x is the velocity

We have already mentioned that the moving system in the microphone is mass controlled. Mass can be con-

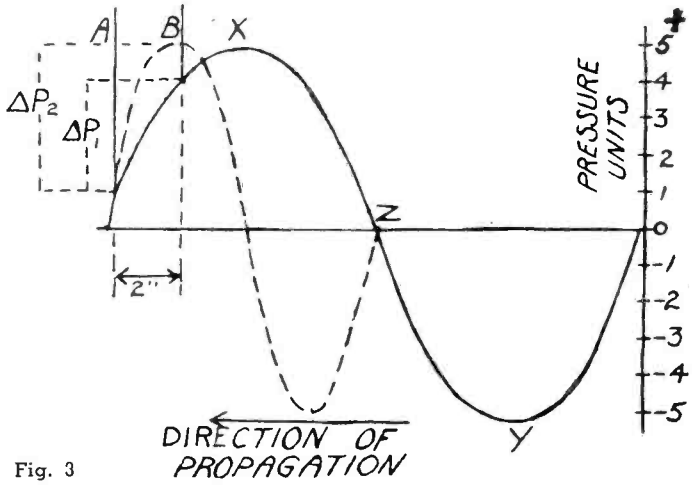


Fig. 3

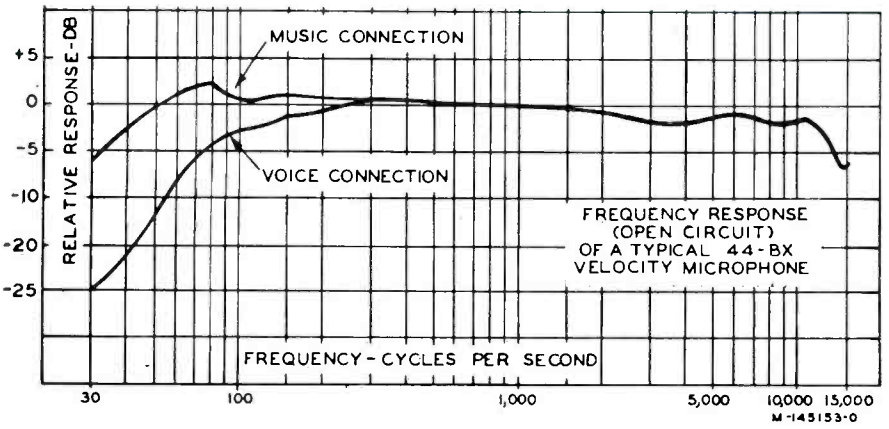


Fig. 4

sidered as an inductive reactance. Therefore, the higher the frequency actuating the ribbon the greater the reactance offered by the ribbon. This would cause the ribbon velocity to vary inversely with frequency if it were not for the fact that the pressure gradient or difference in pressure on the ribbon surfaces increases with frequency. The increase of pressure gradient with frequency can be seen in Fig. 3 where the difference in pressure units between lines A and B is greater for the higher frequency wave. This is true up to the frequency at which the thickness of the baffle is equal to one quarter wavelength of the actuating sound wave.

At the lower frequencies the larger the baffle (the greater the air distance between ribbon surfaces) the greater the pressure gradient and the higher the output. However, with the larger baffle, the output will fall off more rapidly as frequently is increased due to the size of the baffle approaching the length of the sound wave, at which time the pressure difference between the front and back of the ribbon is a minimum.

When a ribbon velocity mirophone is actuated by spherical waves (close to sound source as when making a voice pickup) the bass response is greatly accentuated. To compensate for this, the R.C.A. model 44-BX has provision for altering the low frequency response characteristic when the microphone is to be used for voice pickup. Actually, the adjustment places a reactor in parallel with the transformer winding (for 50 ohm output impedance) or part of winding (for the 250 ohm output impedance). The two curves in Fig. 4 show the frequency response of the 44-BX for music pickup and with the reactor in the circuit for voice pickup.

When the "Voice" reactor is used it drops the response from about 300 cycles down. Note that the "Voice" curve was measured in a plane wave field. Therefore, when the microphone is actuated by spherical waves, the response curve will be substantially flat.

A small circular hole is provided in the cover plate of the transformer case through which may be seen the letter M (music) or V (voice) indicating whether the microphone is set for music or voice operation.

We might also note that when a sound wave originates at the side of the velocity microphone (in same plane as the ribbon) the distance around the baffle to front and back of the ribbon is the same. Therefore, the pressure on front and back is about equal and approximate calcellation results. This accounts for the very important bi-directional pickup characteristics of the velocity microphone.

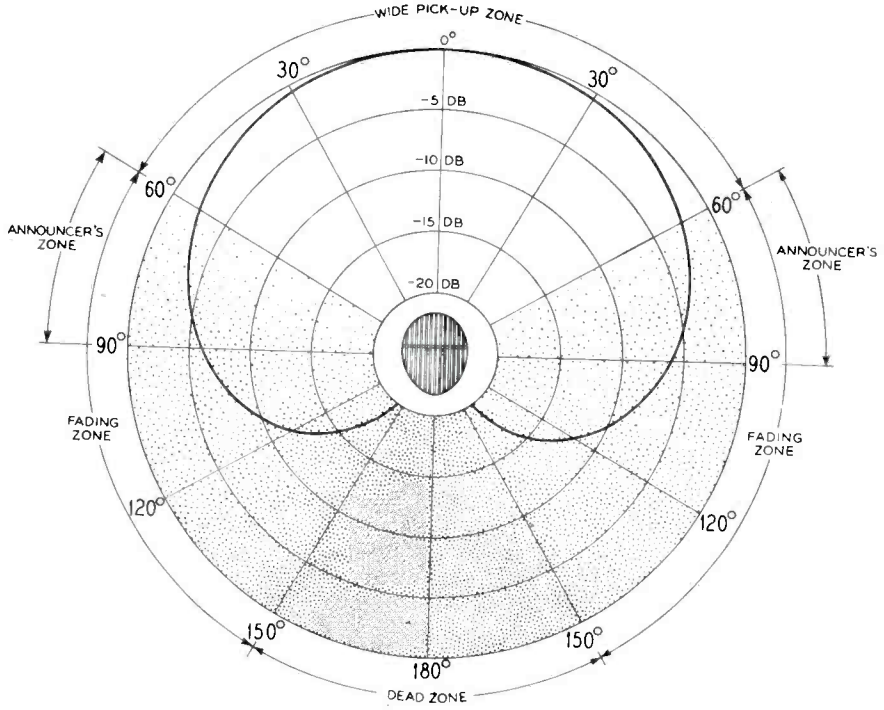


Fig. 5.—Reference Chart for interpreting the performance of the 639A Cardioid Directional Microphone

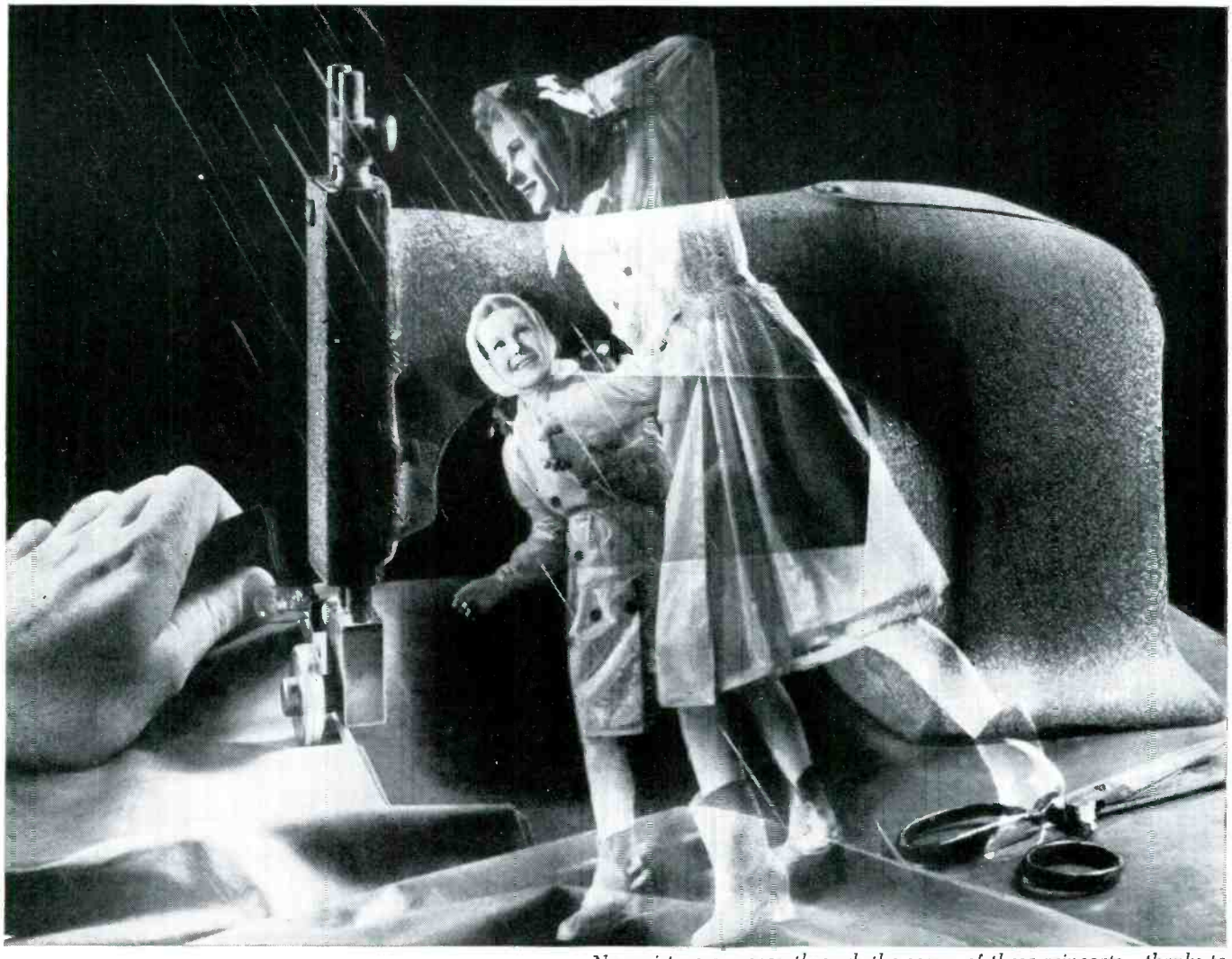
Uni-directional Microphone

Speaking of important directional characteristics leads inevitably to a discussion of the Uni-directional microphones which have become so popular in recent years. The measured directional response curves of these microphones approach cardioid patterns.

"Cardioid" is the term used by mathematicians to express the plot of $1 + \cos\theta$, because of its heart-like shape. Technically, a curve (see Fig. 5) in polar coordinates that respresents the sensitivity of the microphone versus the angle of sound approach is similar to the plot of $1 + \cos\theta$, that is a "cardioid."

An approximate cardioid directional response can be obtained by combining the outputs of a non-directional pressure unit with a bi-directional ribbon velocity unit. As has been shown, the output of the pressure unit is independent of direction and may be represented by a pure number, say unity. The ribbon velocity has an output which reverses in phase when the sound direction is reversed, and is actually proportional to the cosine of the angle. Adding the two together, the result is $1 + \cos\theta$, the "cardioid."

(Continued on Page Twenty-two)



No moisture can seep through the seams of these raincoats—thanks to the electronic sewing machine developed at RCA Laboratories.

A sewing machine...without a needle or thread!

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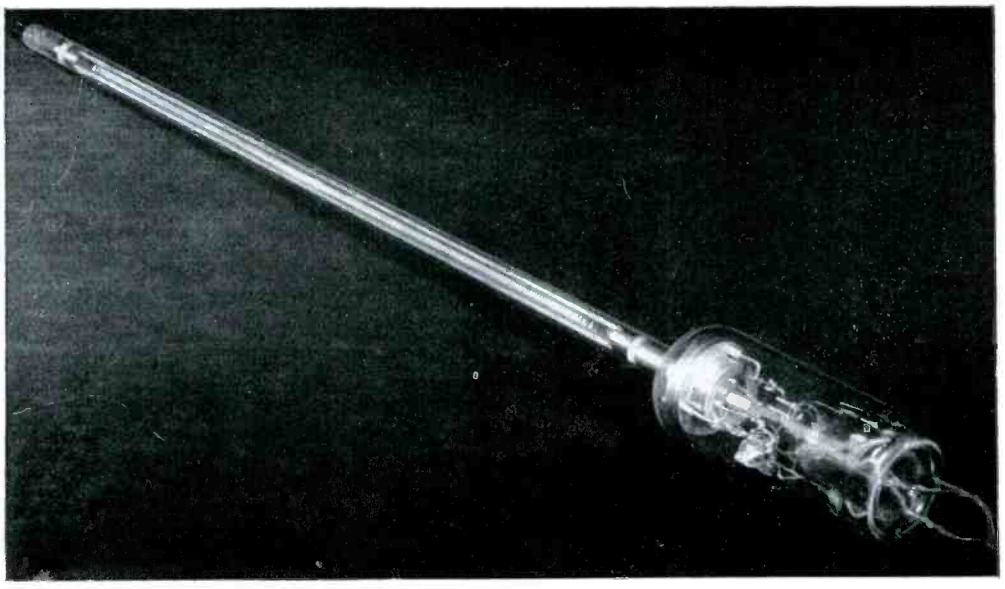
The electronic sewing machine "welds" seams in thermoplastic materials. Anyone interested in manufacturing this instrument can obtain information by simply writing to RCA, RCA Building, Radio City, New York 20, N. Y.

RADIO CORPORATION of AMERICA

The Beam Traveling-Wave Tube

By J. R. Pierce

Physical Research
Bell Telephone Labs.



(Reprinted from the Dec., '46 Bell Lab. Record)

(Above) One form of the beam traveling-wave tube

In developing broad-band communication such as television and pulse modulation it has been difficult to obtain adequate amplifications over the wide frequency ranges required. With the amplifier tubes most suitable for microwave frequencies, such as disk-seal triodes and klystrons, high gain can be secured only by narrowing the band. If an amplifier with a band width of 10 megacycles were required, a gain of perhaps 10 db per stage could be obtained. Were such an amplifier readjusted to give a 20-megacycle band, the gain would fall from 10 db to 4db, and for a 32-megacycle band the gain would be 0db, and, as a result, the amplifier would be competely useless.

The recent development by Bell Telephone Laboratories of the beam traveling-wave tube promises to overcome this limitation. An experimental tube such as that shown in the photograph below has given a high gain with a band width about eighty times as great as has been practicable with other microwave tubes. Further, the nature of this new tube is such that the band can be broadened even more without sacrificing gain.

The beam traveling-wave amplifier has in common with other vacuum tubes an evacuated envelope and a stream of electrons, but it differs widely from more familiar types in appearance, construction, and operation. Electrons are accelerated from a hot cathode by a high-voltage electrode and shoot down the axis of the tube in a narrow beam, focused and guided by magnetic fields. No grids are employed, and the electrons striking the anode do not carry the amplified output, since the amplifying action has been completed before the electrons reach the anode.

Surrounding the electron beam for nearly a foot of its length down the tube there is a closely wound helix of wire which carries the signal current. The signal current produces electric and magnetic fields, and indeed the signal progresses down the helix as an electromagnetic wave. This wave tends to go along the wire at about the speed of light, and as the wire itself is roughly thirteen times as long as the wound spiral, the wave travels down the helix about one-thirteenth as fast as light. The electron stream travels through the helix a little faster than the wave.

It is the interaction of the electrons with the electric field of the helix which produces the amplification; the greater the electron current or the longer the helix, the greater is the gain. No tuned circuit is used in any part of the path; the helix acts throughout as a smooth line capable of transmitting a broad band of frequencies, and thus band width limitations are almost absent. Were better means provided for getting the signal onto and off of the helix, bands of greater than 800 megacycles could probably be attained. As it is, the present 800-megacycle band far exceeds existing needs, and little effort has been directed toward broadening the band further.

In the present amplifier two wave guides, one carrying the weak input signal and the other the amplified output signal, are fitted around the tube near the ends of the helix. At each end the helix is fastened to a metal collar

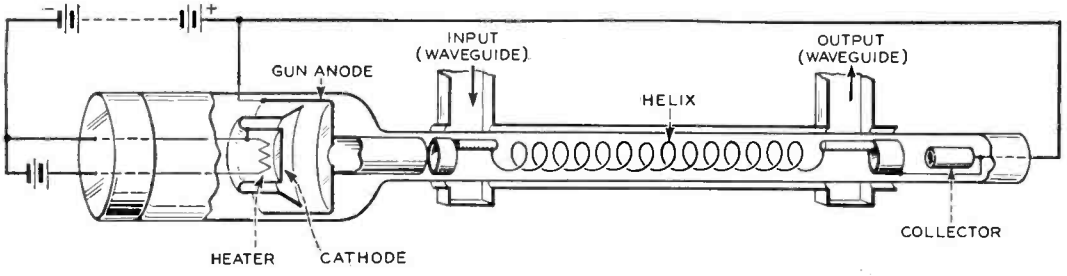


Fig. 1. — Cross-section of beam traveling-wave tube showing the arrangements of the elements from the cathode at the left to the collector at the right.

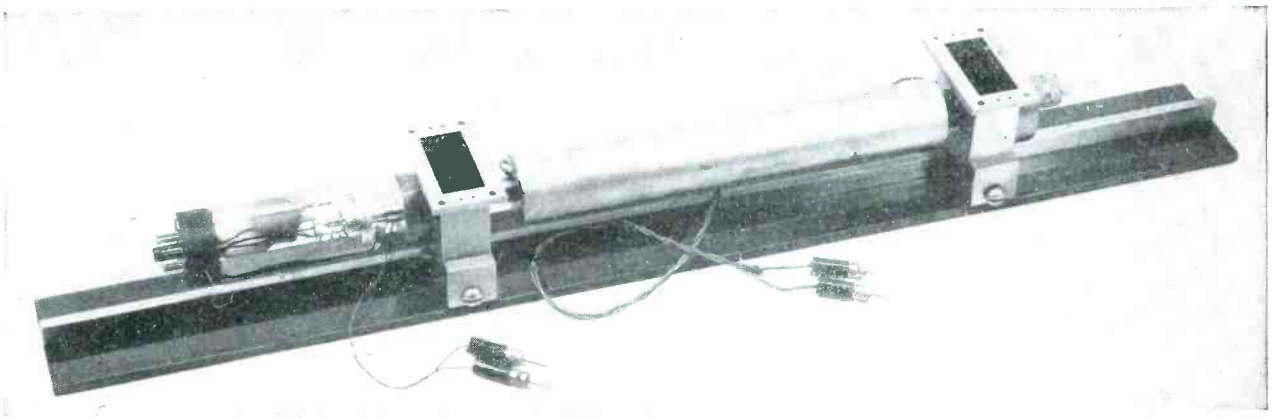


Fig. 2. — An experimental model of a beam traveling-wave tube showing the coil for guiding the electron beam placed over the tube between the two wave guide connections.

inside the tube, and short straight sections between the collars and the helix act as antennas to couple the helix to the guides. At the input end, the receiving antenna picks up the electromagnetic radiation coming down the input guide and sends it along the helix; at the output end the transmitting antenna directs the power from the helix out into the output wave guide. This arrangement is indicated diagrammatically in Figure 1, while Figure 2 illustrates a complete beam traveling-wave amplifier.

Besides the tube and the two wave-guide connections, two coils which can be seen in Figure 2 are required in forming the electron flow into a narrow beam and in guiding it down the tube. The electrodes surrounding the cathode are so shaped as to send the electrons into the tube in nearly parallel paths. The narrow coil just to the left of the input wave guide in Figure 2 provides a final adjustment before the beam enters the helix, and the long coil covering the tube between the two wave guides keeps the beam from spreading in its passage through the helix.

The construction of the experimental tube can be seen more clearly in Figure 3, which shows enlarged views of the two ends. Four slender ceramic rods which run the length of the tube between the helix and the inner surface of the glass hold the helix accurately centered in the envelope. The ends of these rods are held in four slots placed ninety degrees apart in the metal collars to which the helix is connected. The connection of the helix to each collar is made at the end of a narrow projecting finger which acts as an antenna in coupling the helix to the wave guide. Thus, the ends of the helix are fastened to the high voltage ends of two antennas.

A mathematical analysis of the operation of the tube has been carried out. This agrees with measurements of the field along the helix in showing that near the input end, where the electron stream is shot in as a smooth unvarying flow, the signal level remains nearly constant for a short distance. In this region the signal acts on the electron stream, gradually producing fluctuations in velocity and density. Then, when these fluctuations become large enough, the electron stream begins to give up energy to the electric field, and finally there is a long region in which the signal increases the same number of db for each inch of travel.

The detailed behavior of the field and of the electrons in the region near the input end of the tube is quite complicated. It is found, however, that this complication can be resolved into a simple picture of three different waves, excited nearly equally by the input signal and traveling down the helix quite independently and without mutual interaction. In the absence of the electron stream there is only one sort of wave, of a unique speed and attenuation, which can travel on the helix; it can, of course, travel in either direction. When the electron stream is present, however, it is found that there are three different sorts of waves that can travel in the direction of electron motion. Two of these are attenuated with distance, and are present only near the input end of the tube, accounting for the complicated behavior in that region. The third wave has

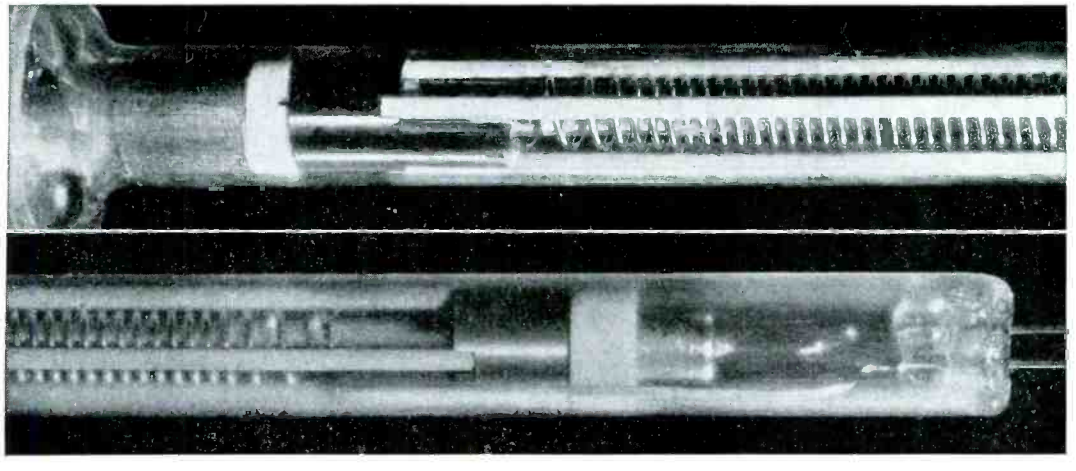


Fig. 3.—At each end the helix is attached to a projection from a metal ring that acts as an antenna. Cathode end of the tube, above, and collector end, below.

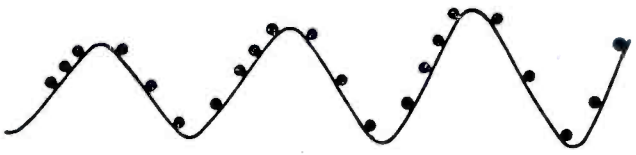


Fig. 4.—The distribution of the electrons may be likened to the action of frictionless balls rolling up and down hills of increasing height.

the unusual property of negative attentuation; that is, it grows stronger as it travels instead of weaker. It is this wave which, increasing with travel while the other two waves are attenuated and become neglible, accounts for the linear increase in the signal level with distance in the latter part of the tube.

The mechanism leading to the increase of this negative attenuation wave can be likened roughly to the building up of water waves as a wind blows past them. In the beam traveling-wave tube, the electrons move faster than the increasing wave and form a sort of "electron wind" which gives energy to the wave as it moves along. A mechanical analogy of this action is illustrated in Figure 4, which shows a representation of the electric field as it would be seen by an observer moving along the helix with the speed of the wave. The electric field is represented as a series of hills and valleys, increasing slightly in height from left to right, the direction in which the wave is traveling, and the electrons are represented as frictionless balls rolling up and down over the hills. It can be shown that when the electrons move to the right past the wave, and when the hills grow higher with time (as they do for an observer moving with the growing wave), the electrons will go slower on the up slopes than on the down slopes. Hence, the electrons will crowd together in regions of retarding field, where they are going slowest, and where they are giving up energy to the wave.

In the past a number of studies have been made at these Laboratories and elsewhere of the interaction of electrons with traveling waves. During the war, R. Kompfner and others at the Clarendon Laboratory, Oxford, England, showed that amplification was possible with a device consisting of an electron stream and a helix. Work in these Laboratories by L. M. Field and F. H. Best in association with the author has been successful in producing amplifiers with the astonishingly high gain and broad band already mentioned, and further development should lead to tubes for various broad-band mocrowave communication systems.

NABET Activity

(Continued from Page Three)

are unreasonable leaders, and unreasonable members in some Unions, but to group them all under the head of being unreasonable is doing all parties an injustice.

Personally I like coffee with but very little cream in it, and I find now and then a waiter or coffee server that will not serve me my coffee the way I want it. That, however, would not justify me in saying that all waiters or coffee servers were unreasonble.

As to irresponsible leadership, I am not ready to agree to that statement either. There may be irresponsible leaders, but they are in the minority, and they are the ones that get the headlines. The quiet, efficient leaders are usually the ones that head those Unions which get the most for their members. In many cases they are unappreciated, not only by their own members, but by the public.

A Union Leader to keep his members satisfied has to get results for them. If he doesn't, he will, like a railroad president, or a hod carrier foreman, be replaced by one who does.

Getting results for their members is a matter of bargaining for the Union Leaders. It is unfortunate that our present way of getting things is set up that way, but it is, and we have to remember just that.

Look at it this way. If a Union wants a dollar an hour increase, asks for and gets it without argument, the members say to the leaders that they might have gotten a dollar and a quarter increase. The Corporation Board of Directors, on the other hand, say to their superintendent that he should have offered 75c, and maybe he could have gotten away with it.

But if the Union asks for a $1.25 increase and after an argument and after turning down an offer of 75c, gets a dollar increase, both sides are happy, and the financial results are the same. If the Union leader doesn't make a fuss in getting the raise, he is suspected of not getting all he could. If the Corporation doesn't make a fuss because it has to give the raise, their Superintendent is criticized for being easy.

This writer will defend his claim in a debate with any one, in a barroom, Pershing Square, or the Hollywood Bowl, that without Unions, wages, working conditions, general prosperity and the state of the Union (not Unions) would be a lot worse.

---

* NBC had requested a 16-month delay for its Cleveland television outlet; FCC granted 6-month delay.

---

* As we go to press, AFM asking for 37½-50% increase; countered with 12½% offer. Nets feel the 18½% Chicago-AFM settlement should set the pattern.

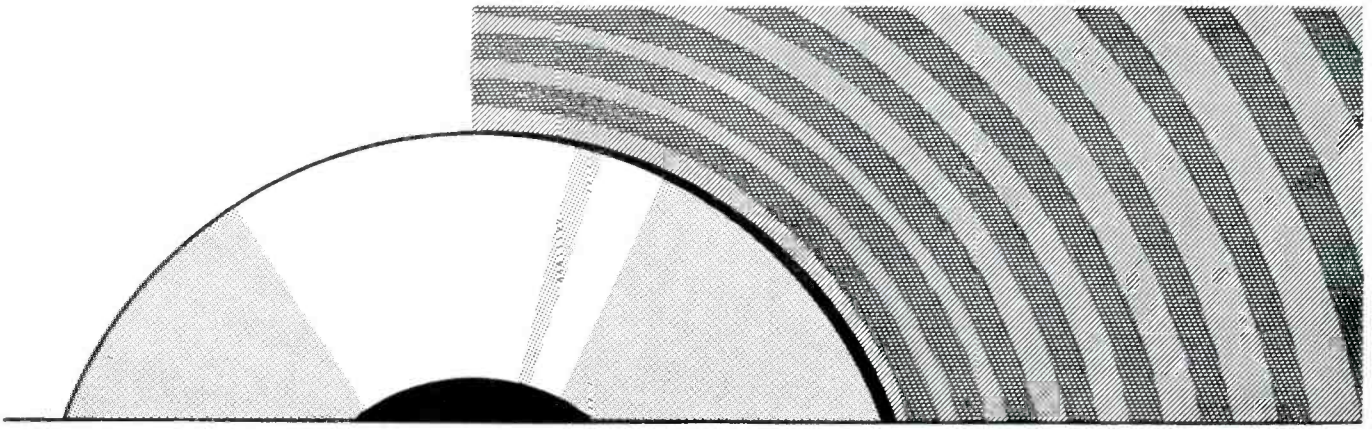
---

* RDG has just opened its 11-months-to-go contract on a cost-of-living clause; asked for 20% COL increase; received 10%.

---

* International Typographical Union (printers) asked for 65% money increase plus about 38% increase of other benefits; settled for 23½% increase in money. Printing rates to customers (that's us!) increased 25%. Radio broadcasters ready to substantially hike their time rates to take care of approximate 30% salary increases and bonuses to non-contract employees, and similar increases to AFM,

(Continued on Page Sixteen)



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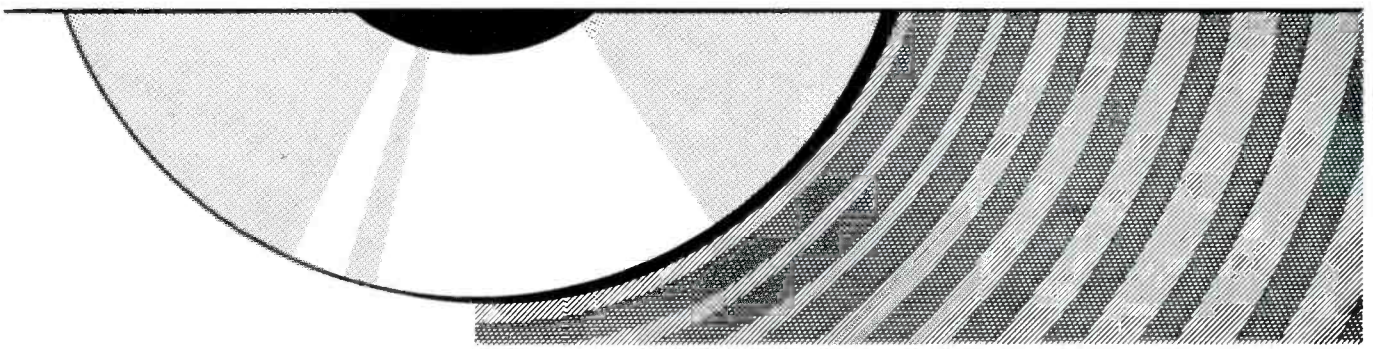

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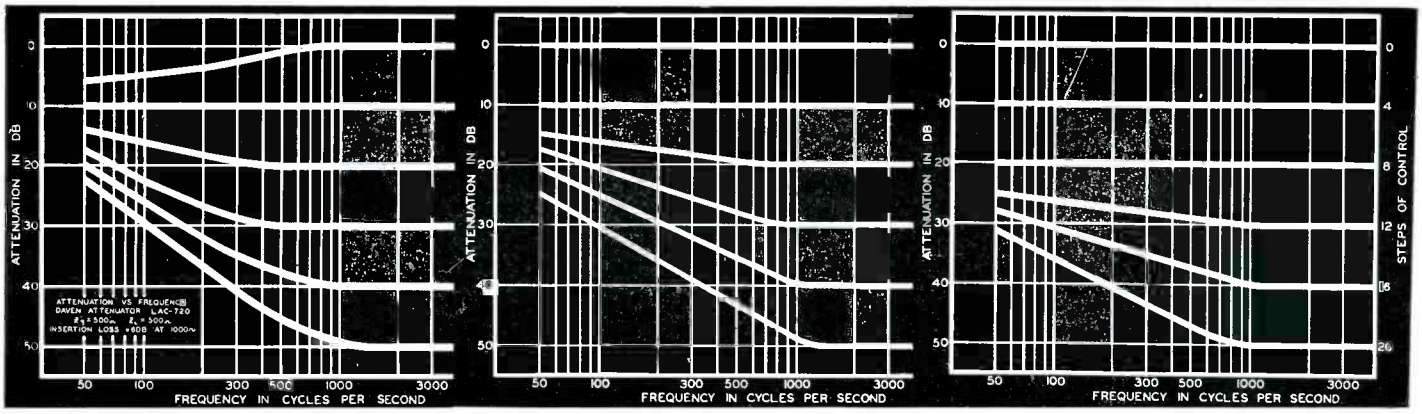

Fig. 1.—No connections to terminals 1, 2, 3, 4, 5.

Fig. 2.—Connect 5 to Out; no connections to 1, 2, 3, 4.

Fig. 3.—Connect 5 to Out; 4 to C; no connections to 1, 2, 3.

Fig. 1 illustrates the maximum low-frequency compensation.

AUDITORY PERCEPTION AND MUSICAL BALANCE AS A FUNCTION OF LOUDNESS

By Ed. Stolzenberger

THE HUMAN ear is a very complex device. It collects and translates minute variations in sound pressure over the extremely wide frequency range of about nine octaves[1], from about 30 to 16,000 cycles.

With advancing age, the high-frequency response of the ear gradually decreases; this is a natural trend. It is neither important to the broadcast engineer who must balance and monitor a musical pickup, nor to the musical appreciation of the trained listener. This statement is based on comprehensive tests related in the January 1944 *Bell System Technical Journal*, titled "Discernibility of Changes in Program Band-Width."[2]

However, the low-frequency response of the ear varies considerably with the loudness setting of our loud speaker. This is because the ear requires a certain minimum-loudness for low-frequency sounds before their presence is recognized. As the loudness is increased, the low-frequency cutoff is continually extended downward toward the 16 cycle region, where the whole body senses, or "feels" these sub-audible frequencies.

This characteristic of the ear has long been recognized by manufacturers of high-quality broadcast receivers. They have compensated for this low-frequency "minimum loudness" requirement of the ear by building low-frequency compensation networks[3] into their volume control circuits. This receiver refinement attempts to maintain some semblance of loudness-balance between the bass and middle and upper registers, by attenuating the bass less rapidly than the high frequencies as the volume control is turned down.

Because what we hear is a function of loudness, the relative bass-to-middle-register balance will vary with setting of the uncompensated volume control of a broadcast receiver. The same is, of course, true and applies equally to the loudness setting of the broadcast station monitoring loud speaker.

Example. Uncompensated volume controls at the broadcast station monitoring loudspeaker (A), and an adjacent receiver (B); bandwidth will be assumed to be similar. We will assign arbitrary loudness numbers, with 1 representing very low volume, and 10 representing uncomfortably loud. Both volume controls are set at 5; the same balance is observed at "A" and "B". "A" is now reduced to 3, and "B" is increased to 6. "A" will now have lost some of its former bass, and "B" will contain more bass than with its former setting, and the difference between "A" and "B" will be marked. Repeat, increasing "A" to 6 and decreasing "B" to 3, and we have arrived at the point of this discussion:—

Apparent bass response drops off with monitoring loudness.

The implication is that if a musical program (X) is balanced using an abnormally high loud speaker volume setting (above the home-listener average volume setting), and is directly followed by another musical program (Y) which was balanced using an abnormally low loud speaker volume setting (below the home-listener average volume setting), then to the home listener program "X" will have *thin* or inadequate bass, and program "Y" will have *heavy* or over-prominent bass. This condition is not at all unusual. As you turn your dial, wide difference in low-frequency response will be noted between similar types of programs.

It is hardly possible for millions of home receivers and broadcast monitoring loud speakers all to be operated at nearly the same loudness. Low frequency compensation as a function of

1. The eye has a response range of only about one octave, from 4000 to 8000 Angstroms.

2. This important article was reprinted in the Sept. 1944 issue of this Journal. This article developes the Liminal Unit. As the db is the minimum change in loudness that the ear can perceive, so the Lim is the minimum change in bandwidth that the ear can perceive; starting at the high-frequency end, the whole range above 8,500 cycles had to be eliminated before any change in bandwidth was perceived. The same treatment is applied to the low-frequency end, and important balances are developed between high-frequency and low-frequency response.

3. Not to be confused with "tone controls" which progressively chop off more and more of the high frequency response with advancing of its setting, without relation to the loudness setting of the volume control.

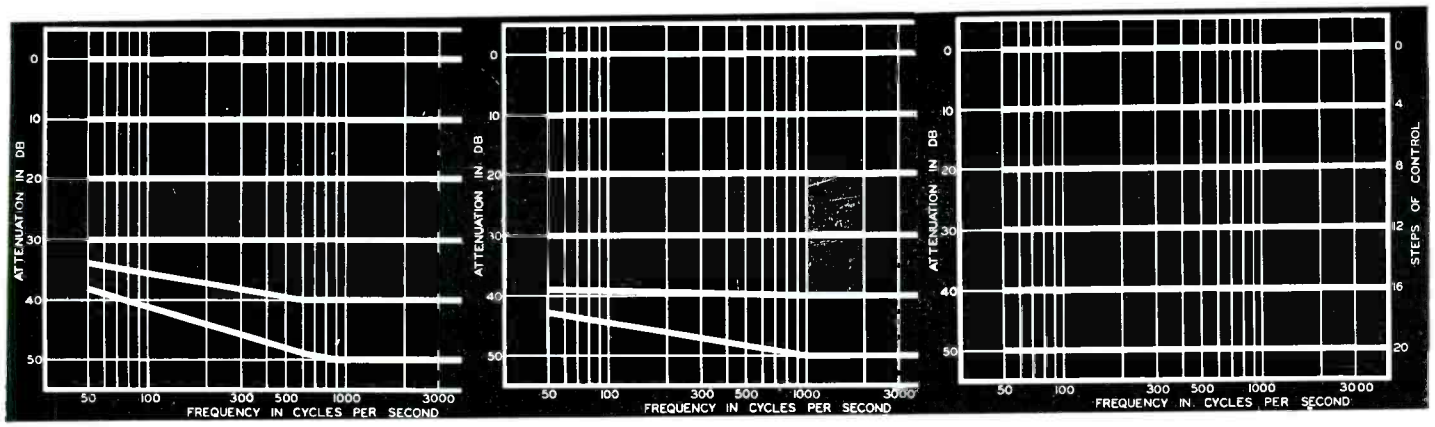

Fig. 4.—Connect 5 to Out; 4 and 3 to C; no connections to 1 and 2.

Fig. 5.—Connect 5 to Out; 4, 3, 2, to C; no connections to 1.

Fig. 6.—Connect 5 to Out; 4, 3, 2, 1 to C.

Fig. 6 illustrates the flat attenuator, with all compensation removed.

loudness setting is necessary in both the receiver and broadcast monitoring loud speakers, if we are to compensate for the lack of perception sensitivity of hearing of the human ear to bass notes at low volume levels.

However, the whole problem is considerably more complex than stated in the example. For example, it should be noted that an uncompensated system is necessary when the reproduced loudness equals the original. In any one program some parts may be ridden at levels equal to or above the original, and these parts may be sandwiched in between parts treated oppositely. Heavy orchestral sections with speech between would be in point. No one compensation could equalize for the music (boosting bass because the reproduction is below normal loudness,) and equalize for the speech, especially if the original speech effort was low and required bass attenuation. This entire problem requires further study, which would be facilitated by the equipment mentioned in the next paragraph.

The Daven Co., of Newark, N. J., has developed a special attenuator known as LAC-720, which was designed primarily for monitoring purposes and high quality reproducing systems. This is a low frequency compensating attenuator. By selection of connections on the terminal board, six steps of bass compensation from flat to the maximum compensation built into the unit are available. These curves have been supplied by the Daven Co. as shown. A compensation switch, SW-720, is also available, making the six characteristics instantly available without changing terminal board connections. This switching arrangement is particularly suitable for applications in psychological testing, experiments in hearing perception, and research and development in the study of music appreciation.

The LAC-720 is currently available in 500 and 600 ohm impedances. As the unit was designed primarily for monitoring purposes and high quality reproducing systems, it does not belong in a low impedance mixer system. A similar unit is now in development for use in the grid circuit of a vacuum tube. It will have an impedance in the neighborhood of 100,000 to 250,000 ohms, and will be available in a few months.

Use of such loud speaker low frequency compensating attenuators at broadcast stations would help considerably to standardize broadcast transmission balance.

NBC-Hollywood 10-Year Club Anniversary Dinner at the Beverly Hills Hotel

(Left to right) Sidney N. Strotz, V-P NBC Western Division; Lew S. Frost, Ass't to Mr. Strotz; Ralph Stevens, Guest Relations; Floyd Wetteland, Master Control Senior Supervisor; Bob Brooke, Studio Engineer; Joe Kay, Studio Engineer; Howie Cooley, Recording Engineer; Bob Dwan, Production; Hal Gibney, Announcer; Elaine Forbes, Network Sales; Virgil Reimer, Sound Effects; Bob McAndrews, Promotion; Frank Barton, Chief Announcer; Bruce Kammen, Producer of "Truth or Consequences"; and Don Thompson, Night Supervisor. At table, Frank V. Dellett, Auditing Dept.

NABET Activity

(Continued from Page Twelve)

AFRA, and the NABET-IBEW cycle of contracts now being negotiated.

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* IATSE Seattle meeting attended by Pres. Walsh, Sec'y Raoul, and nine VP's decided to continue the Hollywood jurisdictional fight until the bitter end!

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* NABET and IBEW cooperating 100% in present network negotiations, with advance iron-bound agreements that scabs and strikebreakers listed by either NABET or IBEW will be forever barred from membership in NABET **and** IBEW.

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* IBEW picket lines at KFEL Denver, were regularly crossed by AFM and AFRA.

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* Although associated Bell companies of AT&T have requested rate increases, broadcast circuit costs will not be affected.

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* Sec'y of State Marshall encouraging increased international broadcasting activities, to provide the world with the truth. (—more O.I.C. engineers.)

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* Chicago Class B AFRA stations being asked for 30% increase plus list of couple dozen items of working conditions. Class A Chicago stations already agreed to AFM 18½% increase.

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* The AFRA-Network contracts have been signed, and provide minimum increases of 20%, with some increases to 30%.

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* *Broadcasting* of 2/3/47 in an item titled "Simple as 2 Plus 2" trys to tell us that if the broadcast industry workers all get a raise, the industry might have to increase its time rates, and this might scare some of the advertising over to printed media (the magazines and newspapers). We know that *Standard Rate & Data* is available to *Broadcasting;* we know that if they will open its pages, they will find that the printed media have substantially *raised* their rates, to cover increased labor and material costs, and with recent hikes in printing costs, the rates are going to be raised again. The soap accounts, large and profitable users of radio time, have raised *their* retail prices (in one typical case) from 17c per package of soap to 33c—almost 100% increase. Surely if the Broadcast station time rates were increased, the amount of the increase would be passed on to the customer, as usual. This is really as "Simple as 2 Plus 2." And we are thoroughly confident in the future of broadcasting.

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* Our good wishes to Vincent Barker, now "Mr. Barker" —whose 1 kw AM application for Freeport, Ill., has received final approval. Vince has toured the world in the British Coast & Geodetic service, constructed a half-dozen high-power Mexican broadcast stations, has been acting ass't station engineer at WNBT—the world's pioneer television station, and for the past two years, Ass't Station Engineer at WNBC, NBC key station.

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* SMPE requesting that the FCC set aside special channels for theatre television, so that commercial television standards will not interfere with special problems relating to theatre television.

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* We hear that the dubbing mixer on the recorded Bing Crosby program receives $286 per week. That's just about $15,000 per year, and sounds like a normal professional income.

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* Hollywood IBEW recording engineers are reported receiving a $57.50 fee per recorded program—in *addition* to his regular salary; the fee is paid either by the agency or CBS.

---

* We still have on our desk, Norman Dewes (Hollywood Assoc. Editor) telegram stamped "1946 Nov 3 AM 1 15" wherein we are advised that we will receive *for the Yearbook* (!) a one-page biography of V.P. Jim Brown, one page of Ham-News, and a three-page Hollywood column. We are still waiting, Dewes; what happened?—It's a good thing we didn't set aside the space in the YB, and then wait.

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* Ed Stover, NABET-Baltimore, says in a letter, "I think the Yearbook has an indispensible place in promoting goodwill for NABET; I hope it keeps growing bigger and better . . . " 100% right! We have yet to see the Broadcast Engineer who wasn't anxious to get his copy of the Yearbook, and then beam all over with rightful pride as he hefted the slick-papered book that was a monument to HIM—the Broadcast Engineer.

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* NABET Engineer Z. T. Bogar of Laurel, Md., says he would rather see photos of engineers' wives and children, instead of what he calls hypermammiferous show-gals. (What say, Chapter Editors?—EdS). On the other hand, we haven't published a publicity-type photo for some months and we are getting plenty of "Where are gals this month?" Our next reader-poll coupon (see P. 23, Jan. issue) will include the question on show-gal photos! We aim to please.

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* The results of the poll (see p. 23, Jan. issue) will be published as soon as they start coming in in sufficient quantities to indicate an accurate trend; the few coupons returned to date are for the status quo in all departments, except for increased coverage of general news of over-all union activity, problems, and plans. We have greatly expanded that coverage in this issue, and will watch the sign-posts for guidance.

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* Deadline still the same: April 2nd in Richmond Hill for the May issue, etc. Mail on time to be delivered by the 2nd.

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* ZONE NUMBERS. Neither NABET nor the Journal assumes any responsibility for non-delivery or delayed delivery unless the reader has given the Journal his Post Office Zone Number—which by law is part of the address.

Bibliography of Electrical and Electronic Musical Instruments

By Ed. Stolzenberger

THE installation, operation, and maintenance of electronic musical instruments is rapidly becoming an integral part of the broadcast engineer's routine duties. For those of our readers who are interested in acquiring a background in this most interesting field, the bibliography which follows should prove beneficial.

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No. 2,126,464; Aug. 9, 1938, to L. Hammond (Piano).
No. 2,126,682; Aug. 9, 1938, to L. Hammond (Novachord).

Television News and Activity

* CBS reported to continue its black and white programming regardless of outcome of FCC color ruling.

* Southern California Telco reports its San Francisco-Los Angeles coaxial cable will be installed early in 1948, and will be in operation for video programming early in 1949.

* KSD-TV, the St. Louis Post Dispatch television station in St. Louis, beat its own schedule and was on the air 30 days ahead of time!

* The latest developments in the filming and use of 8 mm and 16 mm motion pictures for television will be presented at the 61st Semi-Annual Convention of the Society of Motion Picture Engineers, to be held at the Drake Hotel, Chicago, April 21 to 25 inclusive.

* Forecasting production and sale of more than 2 million black-and-white television receivers within the next three years, the RMA Engineering Dep't informed the FCC that a study made by three special industry committees indicated that adoption of the proposed CBS color television standards would delay public service comparable to that now available in black-and-white from four to five years.

* U. S. Television advises that they have started delivering their 10″ direct-view television receivers. The set includes AM, FM, short wave, and a record changer in addition to television, and retails at $895., plus installation and tax. Also in production is a 16″ x 21″ projection television receiver.

* Percentage-wise, television receiver production for 1946 showed a marked rise over 1945. The number of receivers produced, however, is still far below the demand.

* J. R. Poppele, TBA prexy, advises that considerable interest has been aroused during the past weeks in the matter of antenna installations for reception of television programs in multiple dwellings and apartment houses, because of circulars distributed to tenants, advising them that television installations will not be permitted for a number of reasons. TBA has immediate plans for an educational campaign to thwart fears of lightning hazard, etc., which were prominent in the early days of radio. Plans are also under way to develop suitable multiple-dwelling television antenna systems, similar to present radio antenna systems.

* TBA is inviting new memberships. Three types of memberships are available: active, affiliate, and educational. TBA represents the great majority of the industry as a common meeting ground for all interested parties to this new industry. It has established itself before the FCC as spokesman for the industry. It has developed an organized publicity campaign. Write: TBA, Inc., 500 5th Ave., New York 18, N. Y.

* Lack of sufficient television receiver production is the present brake on television expansion as an ad medium, according to Washington Ad Club talk, which summed up, "Production willing, television will be an economically sound investment for the advertiser . . . in the areas where the television market has been developed . . . "

FM News and Activities

* The FCC under date of Jan. 28th, advised Mr. Hofheinz, President of FM Ass'n, that because of many administrative problems involved, it is unable at this time to comply with the FMA request for deletion from existing rules of all references to "standard broadcast" station and substitute the words "amplitude modulation" or "AM".

* FCC Chairman Denny addressed the recent FMA meeting in Washington. Highlights: There are now 136 FM stations on the air, operating in 100 cities and 33 states. Denny anitcipates 700 FM stations on the air by the end of 1947. Suggests maximum cooperation between FM receiver manufacturers and broadcasters, to bring closer the day of cutover to FM.

* The FCC issued the following statement showing the status of applications pending for FM stations as of the close of business Dec. 31, 1946:

FM stations on the air	136
Construction permits granted since Oct. 8, 1946	426
Conditional grants	211
Applications which have been set for hearing	118
Pending applications	174

Of 901 FM applications analyzed by the FCC, 69.7% were from persons in the AM field, and an additional 11.1% were from non-AM newspaper interests. The remaining 19.2% were without either AM or newspaper interests.

Discussing plans for the use of this 100th FM transmitter built at the GE Syracuse electronics plant, are left to right, R. D. Compton, director of engineering for WPEN, operated by the Philadelphia Evening Bulletin, and T. B. Jacocks and James D. McLean of the G.E. Co.

* From FCC Public Notice No. 1600, the following grants were made for commercial television stations in the Los Angeles area:

National Broadcasting Co.,	Channel 4
American Broadcasting Co.,	Channel 7
The Times-Mirror Co.,	Channel 11
Television Productions Inc.	Channel 5
Dorothy S. Thackery,	Channel 13
Earle C. Anthony, Inc.	Channel 9

A Letter From SAN FRANCISCO

Dear 'ED':

Well, here we are, with the holiday season well behind us, and almost 20 percent of 1947 gone. With the Yearbook Journal well thumbed through, and on the shelf, it might be well to look ahead to the approaching dead-line, and see if I can scrape up a few shavings about doings hereabouts in past weeks. By the way, what happened to page 46 of the Yearbook? (We have on file written request to print the ABC-NY Announcers page up-side-down; they wanted the page folio up-side-down too, but we insisted; their explanation, "we want to be sure our page will be looked at; if it's up-side-down, we know they will turn the book around to see what it is." No comment—EdS).

SF NABET has an office. An office, complete with desk, chairs, apple boxes, a telephone, (ORdway 8484, in case you are interested) but, except on occasions, no blond secretary. The office is located just across the street from Radio City, (375 O'Farrel—Rm. 301) and whatever it might lack in appointments, is more than made up for in hospitality as extended by the congenial personage behind the desk, one Chairman MacDonnell.

Big ABC news of the moment is that construction has actually begun on the new KGO transmitter plant. The site is some 25 miles southeast of San Francisco, on the east shore of the Bay, on land (?) normally used as evaporation ponds for a local salt manufacturing concern, and the resulting highly concentrated salt water should provide excellent ground-wave characteristics for the proposed directive antenna system, but the effects on automobile finishes and other metal parts is something else again. Hope to have a complete story on the new rig in the near future.

Dick Parks, of the ABC studio staff, bet on the wrong Rose Bowl team, and as a result, has been cultivating the finest set of chin spinach this side of Vandercook, no fooling. Bet was for only 30 days, however, so Dick's chin will be up for air in a few days. (Photo of spinach, please,—EdS).

Ham news here is the return to the air of W6MY, Jefferson of the MCD gang. Look for Jeff on any band at any time, and if he gives you a 'very QSA' report, just remember that 'ham' lingo has changed a lot in 19 years! Also, I hear that more of the gang are getting wise to the BC-375-E inegma, but so far, no one has come forward with the dismantling problem.

Sid Blank is going to the dogs, literally. Devoting a lot of his spare time to training his and other pups for obedience tests, and writing good and timely articles for contemporary dog magazines. Sid is also interested in the local 'seeing-eye' dog movement,—both he and Agnes devoting time and energy to bettering the organization among those interested in this area.

Red 'High-ball' (?) Sanders got a thrill

(Continued on Page Twenty-four)

Theodore 'Teddy Bear' Kasna of WOR

By Pat Miller

OUR boy Ted is a stout cherub of some forty-two years but his avoirdupois doesn't slow him up when that emergency call comes through.

Ted is the man behind the man behind the dials. He is the truly unsung hero who is right on the spot when he is needed most.

Talapoosa Georgia, a hamlet near Macon, is his natal place. His father, a gentleman farmer, split his time between the farm and his fur business in New York City.

As a lad Ted planned to become an agricultural expert but his Dad's decision to sell the farm and concentrate on the fur business took Ted to the big town.

Though his arrival in the big town started him on new interests, Ted's love of the soil remained undamped for a while. He earned his first pay dirt milking cows in the Bronx. Yes, the Bronx! In those days New York had many farms in the outlying districts. He culled 75 cents a week caring for ole bossy on a farm located where 173rd Street and Morris Avenue now stand!

TED KASNA

1922 saw the end of his formal schooling and a job with the Allen D. Cardwell Co. He was assigned the task of testing pole pieces for a device called the "wonder brush". This was his formal introduction to the world of electricity. To put it mildly this introduction sparked his interest and he invested in a Capitol Institute Radio Course. This turned out to be a wise move, as he not only gained a lot of radio know-how this way, but also garnered himself a job with Western Electric. He worked with them for three years doing installation work and then hopped to Warner Brothers where he did his bit on the research that led up to the dawn of the era of talking pictures.

Leaving Warners in 1929, he did a two year stint with the Edison Co. and then finally came to roost in WOR's aviary.

A bit of everything for the first few years and then he settled for what is called T.F.D., the Technical Facilities Division, or just ole maintenance, as we call it. Our Teddy Bear has been thriving on this type of radio fare ever since.

Where Mainbocher is famous for her fine design and workmanship in the field of women's clothes, a "Kasna" job rates equal merit in the broadcast field. We all know that when Ted fixes something it stays fixed.

Back in 1929 he was one of the leaders of the North Bronx timberwolves, but along came his starry eyed Josephine who soon pulled his fangs and went to work making him her pet. However, it took her four years to domesticate him. The fatal day when she took Kasna for her very own thundered on the scene in 1933. Both are still very happy about the whole thing after 14 years and have two strapping sons to show for their efforts.

Ted, incidentally, is quite a craftsman with wood. He built two rooms up in the attic where his lads study, play and fight. When Xmas rolls around all the neighborhood kids hang around the Kasna home in starry eyed expectancy. They have a good reason to do so, too. Ted turns out some beautiful wooden toys and he sees to it that every child receives one for Xmas. Some of the samples I've seen are not only excellent workmanship but also show great imagination and originality in their design. It only goes to prove that Ted has the soul of an artist.

He has a jail record too to add spice

to his varied career. Many years ago he was trying to sell a bill of goods to a chap who is now a famous Broadway producer. Putting on the dog our penniless Ted offers to drive the guy to a date downtown and in the process goes through a red light. A lemon faced cop gave him a ticket and a judge with a heart of stone tossed him in the clink when Ted couldn't fork over the moola for the fine. So over Xmas day he sat forlornly in a cell.

Every once in a while, WOR rips him away from his racks and panels and sends him on an odd job. One spring, 1939 I believe, he went along with Stan Lomax our sportscaster on a spring training junket. His job was to record interviews and get them on the plane to New York. This he carried out with nary a hitch or a glitch.

Another time they gave him another dose of fresh air but made it salty. He was sent out with a crew to put on a broadcast from the Queen Mary on her maiden voyage here. He had the dizzying job of sitting on the forward funnel. He almost did a tailspin when the whistle took off under his seat. He said he was glad to get back to the shop after that one.

Ted is a rarity in the sense that he is happy in his job. He always has a laugh or smile that he tenders to all comers. His job too is a tough one and he carries it out with skill and precision. We who ride gain on the boards always turn to Ted and the rest of the T.F.D. gang when our producers ask the impossible. The impossible turns out to be a working reality when the T.F.D. gang gets done. Ted keeps busy in his spare time keeping up with developments in the field and is looking forward to the massive assignment of building WOR's television transmitter.

When I asked him what he thought of that pile of work he said; "Let me at it. Television, where is thy sting!" He may be a Teddy Bear but he sure ain't lazy.

Cliff Gorsuch, NABET National Representative, announces birth of second son, as of Jan. 9th. Everybody doing fine.

* * *

The Feb. issue of *Woman's Day* has a fine publicity article complete with photo of ABC Field Engineer Tony Hutson and appropo story on the pick-up of "America's Town Meeting. Chapter Assoc. Editors please note.—EdS.).

MICROPHONES

(Continued from Page Eight)

The Western Electric 639-A is an example of a high quality uni-directional microphone. The 639-A uses the well known "Eight Ball" dynamic microphone for the pressure unit and mounted above the dynamic unit is a ribbon velocity section with a specially designed ribbon. Sounds originating at the rear of the microphone actuate the two sections so that the outputs are out of phase and approximate cancellation takes place. Over the range of 40 to 10,000 cycles the average discrimination between sounds originating at the front and rear of the microphone is 20 db. Fig. 5 shows that the pickup angle from 60 to 90 degrees is known as the announcer's zone because at this angle the ribbon element contributes very little to the total output and the announcer may talk close to the microphone without employing a "voice strap". A switch on the back of the microphone allows for using either the non-directional pressure or the bi-directional velocity alone when desired.

Polydirectional Microphone

The new R.C.A. 77-D Polydirectional microphone incorporates an ingenious design whereby a single ribbon unit combines the action of the heretofore necessary separate pressure and ribbon velocity units.

The rear side of the ribbon is terminated in an acoustic impedance which looks like an infinitely long tube but which is actually a connector tube running from the rear of the ribbon to an acoustic labyrinth located in the lower microphone shell. An opening in the back of the connector tube is made variable in size by a rotating plate control.

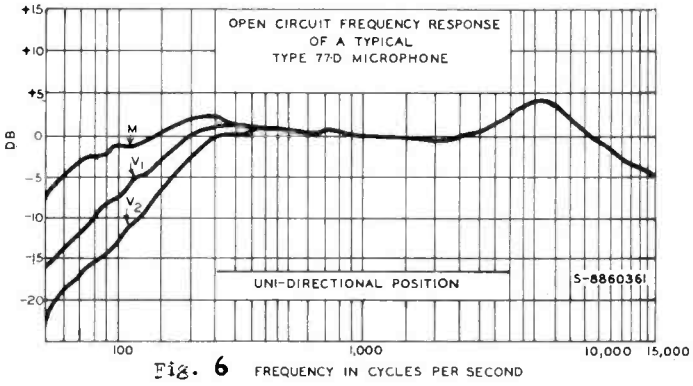

Fig. 6 FREQUENCY IN CYCLES PER SECOND

The directional characteristics of the microphone are controlled by varying the size of this opening.

When the aperture is wide open the ribbon is not terminated in the acoustic labyrinth but rather has both surfaces exposed to the medium. Under these conditions the microphone operates as a straight ribbon-velocity unit and the pickup is bi-directional. When the opening is about half closed, one-half of the ribbon has both surfaces exposed to the medium and therefore operates as a ribbon velocity unit but the other half of the ribbon is terminated in the acoustic labyrinth and operates as a pressure unit. Hence the output of the two sections tend to reinforce each other for sounds arriving from the front but tend to cancel each other for sounds arriving from the rear giving the typical uni-directional cardioid pattern. When the aperture is completely closed the entire ribbon is terminated in the acoustic labyrinth and the microphone operates as a straight pressure unit with a non-directional pickup. Because the aperture is continuously variable a great number of different directional pickup patterns may be obtained.

When the control is in the uni-directional position sounds arriving from the rear of the microphone are attenuated an average of 14 to 20 db relative to sounds from the front. This gives approximately a 10 to 1 ratio of desired to undesired pickup.

In addition to housing the acoustical labyrinth the lower half of the case contains the output transformer and a selector switch for voice or music. The switch will attenuate the low frequencies (as in the model 44-BX) below 300 cycles for voice pickup and has three positions designated as "M", "V_1", and "V_2". The switch, operated by a screwdriver, is accessible from the bottom of the lower cylindrical shell. The frequency response characteristics for the 77-D are shown in Fig. 6 for the uni-directional setting of the directional pattern control and with the "Music-Voice" switch in each of its three positions.

TRADE NEWS

* Variety reports January WJZ business 32% better than December, based on WJZ's own figures. WNBC also states its business up considerably over December. That should be good news to all quarters.

* Teamsters Union, Local 100 Cincinnati, going after "recognition of social status" after hearing some cinema

heroine quip: "I'd rather marry a truck driver than marry you." After all, how deep can your quick be cut?

* Western Electric reports its new Railroad Radiotelephone equipment; mobile, phase-modulated, operating in the 152-162 mc band; it provides two-way communication for end-to-end of train, train-to-train, and fixed point-to-train.

* "Power and Gas Tubes for Radio and for Industry (Form PG-101)" is available from the Commercial Engineering Section, Tube Dep't, RCA Harrison, N. J., or thru local RCA tube distributors, at 10c per copy. This 16-page technical booklet covers 138 air and water-cooled power tubes, voltage regulators, thyratrons, ignatrons, and gas rectifiers.

* NAB-RMA conferences to effect closer cooperation, now in exploratory stages. Planned to cooperate in such matters as industry statistics, legislative and FCC matters, development of FM and television, etc.

* A simple, inexpensive cure for fluorescent-lamp radio interference is presented by the Aerovox IN-23 interference filter. It connects across the line at the lamp by means of two spade lugs, and grounds to frame of the lamp by means of a slotted mounting.

* On May 3, 1947, in Cambridge, Mass., there will be an all-day New England Radio Engineering Meeting under the sponsorship of the North Atlantic Region of the I.R.E. Invitation is extended to all interested. There will be six technical sessions, none concurrently, with exhibits by leading manufacturers, and a luncheon and banquet with entertainment. Place: Continental Hotel, Cambridge.

* The FCC advises all concerned that the announcement "by authority of the FCC" which was a former requirement of its predecessor the FRC, is not prescribed by rules and/or regulations, and is not required.

* The FCC has granted a CP for a portable developmental "Wired Radio" station at Laurel, Md. The licesee plans "to demonstrate the practicability of wired radio as a means of providing local program service; the signals will be confined to the vicinity of the power lines; power: 10 watts." The system is to be similar to that used by over 50 educational systems comprising the Intercollegiate Broadcasting System. College wired radio is not regulated by the FCC.

* G.E. has made available power rheostats in 25 and 50 watt sizes; in 35 to 10,000 ohm units.

* The RMA reports it prefers a cut in the 10% radio excise tax, rather than a reduction in their own income taxes, and are so advising Congress. Claim is that the radio receiver market is a low-price market, etc.

* Quicker than a shell can fly its course from rifle to target, a new, automatic electronic computer can accurately calculate its trajectory. Developed at M.I.T. under sponsorship of Army Ordnance.

* RMA has appropriated $50,000 to conduct a "Radio-In-Every Room" campaign.

* From Variety, we learn that actors are entitled to these income tax deductions, among others:

Actors are entitled to many income tax deductions that

(Continued on Page Twenty-four)

Trade News

(Continued from Page Twenty-three)

do not come up in the case of the average run of taxpayer. The following is a list of some of the items actors can take under given circumstances:

Preparation expenses—cost of materials, dialog, music; costumes, wigs, shoes; repair, pressing and cleaning of professional clothes; wardrobe, valet; studio rentals, tips to studio employees.

Booking expenses—scouting for engagements, agent's commissions, legal expenses on contracts.

Traveling expenses—transportation, board and lodging away from home, automobile expenses.

Public relations—handling of fan mail, fan photographs; entertaining newspapermen, playwrights, critics, backers, agents, directors, etc.; club membership dues.

Professional expenses—Variety and other trade papers; accountants' fees; household expenses if household is used actively for conferences with authors, writers, agents, etc.; expenses on pleasure trips if taken to get ideas for professional work; income taxes paid abroad on foreign bookings; beautifying, physical culture, bodyguard; Equity and other union dues; telephone exchange.

The Daven Co. announces a direct-reading frequency meter, with seven overlapping ranges from 20 to 100,000 cycles. Accuracy on all ranges is ±2% of the top frequency on the range in use. Input impedance is high, requiring small signal for stable indication.

Indication is substantially constant for input voltages between .5 and 150 RMS volts. Output jack is provided for connection to an external recording milliameter, for use when a graphic frequency record is required. Additional information will be supplied by The Daven Co., 191 Central Ave., Newark 4, N. J.

Another Letter to the Editor

Dear Ed:—

Looks like R. T. Parks in his letter to Editor, July 1946, has started a feud here in Baltimore in which we'd like to add a word of our own. Our local gossip column editor has expressed his personal views on the subject, so why can't we?

First of all, let us agree with Parks on his idea of the Journal getting down to more serious stuff. Some gossip is O.K. to let the local boys in on some of the publicity.

We're glad to see that the Board of Trustees is preparing a space allocation plan and we certainly hope that they will include more technical articles such as your recent articles: "Phase Inversion Circuits", "Audio Amplifiers", "And Now We Take You To", and IRE meeting reports, which we think were excellent and fitting for the Journal. Some swell cartoons have appeared lately and your "Now It Can Be Told" column is very informative.

All of this and finally we get to our beef! Just thinking of this makes us burn under the collar. The NABET Journal, according to the caption on every issue's cover, is "Of, By, and For the Broadcast Engineer". This, in our opinion does not include every Tom, Dick, and Harry that happens to be employed by a broadcast station in a capacity anywhere from porter to executive. We think that the Journal should stick to reporting dope on the engineers and not waste precious space explaining why some announcer has big feet, or one of the office girls has a sprained hangnail!

It also seems that some lengthy local writeups are written on a basis to further an associate editors personal gains. This stuff shouldn't ever get through your hands Ed., but of course you don't know that Smoe is an announcer and Kilroy a porter, and not engineers.

So for now, what say? How about cutting out this waste of space and using it for more technical dope and news that will be of interest to all members of NABET.

Sincerely yours,
(signed) Otto R. Claus, Jr.
(signed) Albert W. Rhine, Jr.
Baltimore Chapter NABET

Crystal Ball Dep't

The Journals addressed to the following are undeliverable by the United States Post Office, for the reasons stated by the Post Office on P. O. Form No. 3547, as follows:

E. A. McCornack (Chicago)—not at address.

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A. Anspach (Washington)—moved.

H. Austin (Denver)—moved.

H. C. Florence (New York)—moved.

San Francisco

(Continued from Page Nineteen)

the other day. While working a local missing-persons clues program, he heard his own name and description come through! Red musta had a guilty conscience, because he really took it serious, until it developed that the whole thing was a gag, perpetrated by some of his announcer pals.

Chairman Mac is getting all set for the big meeting, scheduled for early March. We don't any of us envy him his job, but we know he will uphold the 'be firm' wishes of us all.

Russ Butler back on the job, after an extended assignment to the hinterlands, to survey the extent of, and determine a possible solution to a serious interference problem caused by the operation of a new local station on 1590 kcs. (KPO on 680 kcs, plus twice the standard IF of 455 kcs, equals 1590 kcs, get it?) Fortunately, the 1590 rig closes down at sunset, but the effects during the daylight hours, and close to the 1590 station, are really interesting.

The SF field gang are elated over the new Mobile Unit,—a 1947 Mercury Station Wagon—, after nursing the 1936 Chevvie along all these years. The new unit is equipped with most of the comforts of home, including ship-to-shore radiophone, and will accommodate a lot of various and sundry extra passengers, should the occasion arise, which frequently does.

Haven't heard from the gang up at Dixon for weeks, so suppose they are the same big, happy family as in the past. Ditto for the gang at KPO, and, except for the news of the new KGO plant, those fellows are a quiet bunch, too.

So, ED, 73 to you and the gang there, and see you again on March 1.

E. L. Parkhurst

The clock on the studio wall and the important warning signal below it are two ever-present reminders on which radio broadcasting depends.

Today, approximately half the time this warning signal appears in the broadcasting stations throughout the country, the studio clock is measuring the time of transcribed programs. This large proportion of broadcast time devoted to recorded programs is a significant tribute to the advancement in the quality of sound recording and reproduction.

In this spectacular trend of broadcasting, AUDIODISCS have played a basic role. These recording discs are the ones most extensively used for instantaneous recording, for the original sound recording in making pressings and for the Master discs used in the electroplating process

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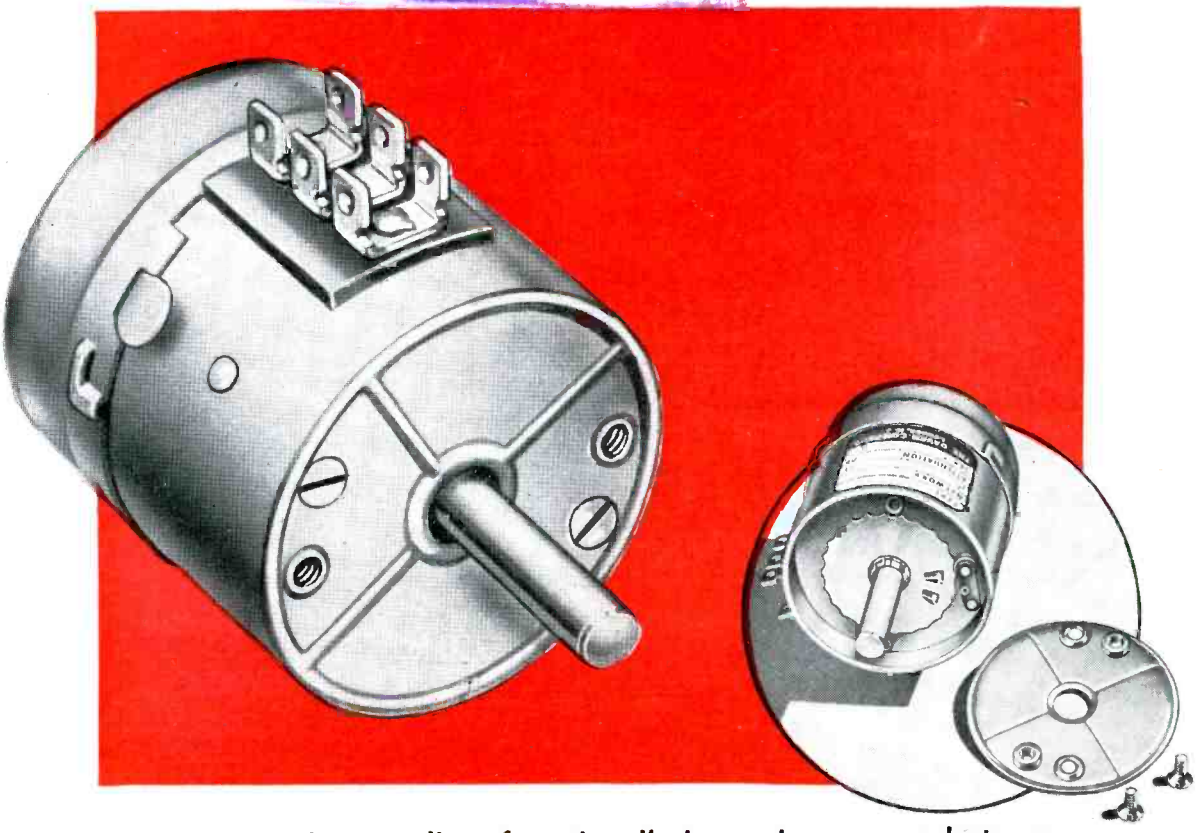

In keeping with our policy of continually improving our products, we have developed a new and better design for the mechanical construction* of our attenuators. In addition to improved standard features, the latest Daven units offer a choice of mountings and an optional ground lug. Dimensions of the new type attenuators make them interchangeable with preceding models.

*Patent Pending.

IMPROVED FEATURES

- A non-ferrous can with an attractive finish.
- A dust-proof housing which provides total shielding.
- A two piece can with a positive lock, which is constructed so that the dust cover can readily be removed with one hand. No more screws or knurled nuts to strip, misplace or drop.
- 50% less space is required than heretofore to remove the new shallow dust cover, thus permitting the unit to be mounted in a smaller space than formerly.
- Good electrical contact is assured between the front of the unit and the back cover.
- All fibre and other moisture absorbing parts have been eliminated.
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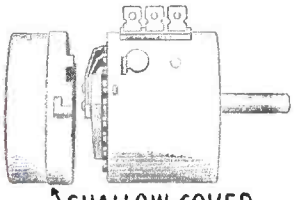
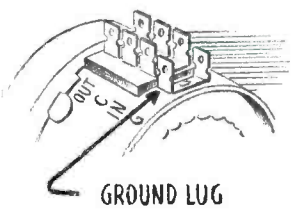
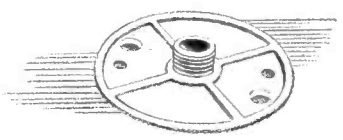
- Two hole mounting is standard on the new type units, however single hole mounting may be secured.
- A roller type detent, as shown above, replaces the former ball and spring mechanism. Advantages of the roller detent are longer life and more positive action.



SHALLOW COVER



GROUND LUG



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