RESEARCH DEPARTMENT

TANNOY RIBBON VELOCITY MICROPHONE

Report No. M.007

Serial No. 1947/9

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Fig. No. M007

SERIAL NO. 1947/9

TANNOY RIBBON VELOCITY MICROPHONE

General Construction

The size of the microphone head is approximately 5 5/8" wide by 2 1/4" deep, and, together with the supporting stirrup and connecting plug, weighs 3 lbs 2 oz. compared with 9 lbs for the BBC Type AX. The case is a light alloy casting about 5/32" thick, having five slots, each 5/32" X 2 1/2", at both front and rear. Apart from smaller apertures at the sides, the remainder of the case is completely closed. The ribbon/line transformer is mounted in the base of the magnet system in the usual manner, and a certain amount of resilience in mounting is obtained by the use of rubber grommets between the stirrup and the microphone head.

Output Impedance and Sensitivity

The output impedance is nominally 600 ohms. As originally measured this was found to be very high, the ribbon resistance being about eight times its proper value, which was due to bad contact at the ribbon clamps, caused by warping of the insulating material of which they are made. The makers, on being approached, admitted that this is a common fault, and, acting on their recommendation, the clamps were tightened down as much as possible (the limit being set when one of the copper strip connections began to tear) and the output impedance was thus reduced to 750 ohms.

The plane wave sensitivity of the microphone, measured on a 950c/s±650c/s warble tone is - 74db on 1 volt/dyne/cm^2 open circuit. This is 2db lower than that of our Type AXB (hence 8db less than our Type AXBT) when allowance is made for the difference in impedance.

Magnet Poles

The pole pieces of this microphone are chamfered in the same manner as those of the BBC Marconi ribbon microphone, but the cavities formed on either side of the ribbon are much shallower than those of the BBC design and any effect which they might have on the response would be at higher frequencies. The pole pieces are very wide but are "ventilated" in the well known manner by a series of holes, to reduce the effective front-to-back path difference. The minimum path length measured through the above mentioned holes is 1/4" less than that in the BBC design, so that the theoretical cut-off frequency

should be higher and the need for reinforcement by pole cavities less.

Frequency Response

The axial frequency response of the Tannoy microphone, measured as accurately as present facilities permit, is shown in the figure together with the response of the BBC Marconi Type AX microphone for comparison. The high frequency response is relatively poor, being down on that of the Type AX microphone by 3db at 5.000c/s and 6db. at 8,000c/s. This result, taken in conjunction with the form of the pole pieces, suggests that the " ventilation" is not fully effective and that the front and back cavities have little influence, at least up to 8,000c/s.

In addition, the response is considerably reduced at low frequencies by the low open-circuit inductance of the ribbon/line transformer. While a certain amount of electrical attenuation at low frequencies may sometimes be desirable, this is not a good way to achieve it, since the loss is not under control, affects other microphones on the same line and varies with circuit impedance.

The frequency response also shows a series of very sharp resonances of the type usually encountered with thick ribbons. These are all of the general form shown at 400c/s but most of them are too sharp to be accurately displayed on the curve and only their frequencies and amplitudes have been indicated. The ribbon in the Tannoy microphone is somewhat thicker than that of the original BBC Type A model, the resonances are even worse, and the transient response is, as expected, very bad at these frequencies. For example, the rate of decay of the transient excited by driving the ribbon with interrupted tone (see Research Report M002) is 3 millisec/db. at 400c/s, a figure which, from experience with loudspeakers, is thought to be excessive. In addition, there are large resonances, the cause of which has not been investigated, around 3,000c/s and 5,500c/s. These, too, ring badly on interrupted tone.

Patent Position

The question arises whether the construction of the pole pieces in the Tannoy microphone constitutes an infringement of the BBC patent No. 429307, covering resonant pole cavities. The essential feature of the above patent is the provision of (a) "a cavity which is broadly resonant over a large part of the range from 4,000 to 9,000c/s", or (b) a system in which the natural high frequency loss "is substantially counteracted by the influence of a cavity resonance". From the foregoing it will be seen that neither of these conditions obtains and since

chamfering of pole pieces is in itself a normal feature of magnet design included for other reasons, no infringement can be claimed.

Listening test

The Tannoy microphone was set up beside a Type AX microphone in the lagged chamber used for sound measurement and a comparative listening test carried out on male speech, paper rustling and key jingling sounds. A normal speech chain, terminating in a Lansing loudspeaker was used for reproduction.

The relative deficiency in the high frequency response of the Tannoy microphone was very noticeable and the general quality lacked "presence", having at low speech frequencies the effect of enhanced reverberation.

Conclusion

In view of the poor performance so far measured, it was decided not to continue the investigation of the Tannoy microphone at present. Inspection of the casing and magnet system suggests that the polar response is not likely to be any better than that of our Type AXB. The instrument has therefore nothing but its small size and weight to recommend it.

H. Kirke

(H. L. Kirke)

DATA SHEET No. 165 LOGARITHMIC x M.M. (3 CYCLE)

WIGHTMAN MOUNTAIN LTD.,
ARTILLERY HOUSE, ARTILLERY ROW, WESTMINSTER, S.W.1.

27 - 5 - 47.

—— DENOTES SMOOTHED RESPONSE.
--x-- DENOTES TYPICAL RESONANCE.
x DENOTES EXTREMES OF RESONANCES.
——— DENOTES B.B.C. MARCONI TYPE AX.

+4
+2
db 0
-2
-4
-6
-8
-10
-12
-14

10 20 30 40 50 60 70 80 90 100 200 300 400 500 600 700 800 900 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000

Frequency in Cycles per Second.

TANNOY RIBBON MICROPHONE RESPONSE.

B.B.C. RESEARCH DEPT.	
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