

BETWEEN:

WESTERN ELECTRIC COMPANY,  
INCORPORATED, AND NORTHERN  
ELECTRIC COMPANY, LIMITED.. }

PLAINTIFFS; 1932  
Sept. 26, 27,  
28,  
Nov. 29.

AND

BALDWIN INTERNATIONAL LIMITED. DEFENDANT.

(12774)

*Patents—Patentability—Invention—Combination—Anticipation*

The patent in suit is for a loud speaker. Previous to this patent the best loud speakers had a frequency range of somewhere from 300 cycles to about 2,500 cycles, which meant that the overtones were not reproduced and the tones of high and low pitch were distorted or not faithfully reproduced. By certain structural changes in the sound box, the present invention overcomes these defects. With it a frequency response as low as 60 cycles and good response as high as 4,000 cycles can be obtained. Between 4,000 and 6,000 cycles there is slightly reduced response, and a useful response as high as 8,000 cycles, thus permitting the overtones to be reproduced, giving a faithful reproduction of the tones of high pitch and a more uniform amplitude.

*Held*, that the invention in question being for a new and valuable loud speaker, structurally and operatively different from anything which preceded it, and giving much more satisfactory results, such invention disclosed ingenuity and was patentable.

2. That even if all elements in a combination are old, where the combination produces an old result or object in a more convenient, cheaper, or more useful way, it is proper subject matter for a patent assuming there is evidence of ingenuity or skill in the production of such combination.
3. That it is not sufficient to prove anticipation, to point to something in one published patent and something in another, and so on, and by an imaginary assemblage of all these things in combination to say

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that this mosaic constitutes anticipation. The patented article must be found as fully described in the prior art as it is described in the patent under attack in order to anticipate it.

ACTION by the plaintiffs herein to have it declared that their patent No. 287,240 for Improvements in Loud Speakers was valid and was infringed by the defendant company.

The action was tried before the Honourable Mr. Justice Maclean, President of the Court, at Ottawa.

*O. M. Biggar, K.C., and R. S. Smart, K.C., for plaintiffs.*

*E. G. Gowling and D. K. MacTavish for defendant.*

The facts and questions of law raised at the trial are stated in the reasons for judgment.

THE PRESIDENT, now (November 29, 1932), delivered the following judgment:

This action is brought against the defendant for the infringement of patent no. 287,240 which is owned by the plaintiffs. The patentee was Edward C. Wentz, a telephone engineer, the date of his application for patent being May 9, 1927, and the date of issue thereof being February 12, 1929.

The invention is said to relate to improvements in acoustic devices such as are used for receiving and transmitting sound, and ordinarily referred to as loud speakers. An object of the invention was to receive or transmit sound with high and substantially uniform efficiency over a wide frequency range. A specific object was to improve the transmission characteristics of loud speaking receivers at the upper portion of the sound frequency range.

Describing the alleged invention, the specification states:

In accordance with a preferred embodiment of the invention, a piston diaphragm is provided to radiate into a sound chamber having a plug therein which decreases the area of a portion of the sound passage there-through. The diaphragm and plug are so shaped and arranged that converging sound passages are formed thereby extending from the centre of the diaphragm and from its peripheral portion to a common sound passage. The cross sectional areas of the converging sound passages preferably increase as the common sound passage is approached and these areas are such, moreover, that the air displaced by the diaphragm flows from each of the converging sound passages into the common sound passage with substantially the same velocity. The meeting point of the converging sound passages is effectually the throat of the horn since the volume of the sound passage beyond this point is not appreciably affected by the displacement of the diaphragm. Extending from this throat portion to

the mouth of the horn, it is preferable to have the cross-sectional area of the sound passage such that the area of the wave front of the transmitted sound progressively increases exponentially with respect to the distance travelled.

The specification further states:

When employed in conjunction with a horn having no inherent losses, a loud speaker constructed in accordance with the above description has an efficiency of approximately 30 per cent, measured from the electrical energy input to the acoustic energy output, over a wide range of frequencies. Measurements made on a loud speaker of this type, from which the plug 23 has been removed from the sound chamber, and which employs a diaphragm about 2.75" in diameter, show that the frequency response falls off at frequencies above about 3,000 cycles per second at such a rate that practically no radiation takes place at a frequency of about 6,300 cycles. By inserting the plug into the sound chamber the frequency response characteristic of the loud speaker is improved to such an extent that the point of low radiation is moved up to a frequency of about 14,000 cycles per second and the efficiency of the loud speaker is practically uniform up to a frequency above 5,000 cycles.

The claims relied upon are nos. 4 and 9 which are as follows:

4. An acoustic device comprising a piston diaphragm having a flexible peripheral portion and a substantially dish-shaped central portion, means for driving said diaphragm at the periphery of its central portion, a horn, a sound chamber between said diaphragm and said horn, a plug in said sound chamber for decreasing the cross-sectional area of a portion of the sound passage therethrough.

9. An acoustic device comprising a diaphragm having a dish-shaped portion and a flexible portion, a coil attached to said dish-shaped portion for driving said diaphragm, and means juxtaposed to one face of said diaphragm for directing sound waves from the centre of the diaphragm outwardly and from the outer edge of said diaphragm inwardly to an annular passage, the face of said means conforming substantially to the face of the diaphragm juxtaposed thereto.

Sound, as heard by the human ear, consists of a vibration of the air with two characteristics, that of pitch, and that of loudness or intensity; the pitch is determined by the number of vibrations per second, or the frequency; the intensity is dependent upon what is called the amplitude of these vibrations. For any given frequency the greater the amplitude the louder is the sound. In translating or reproducing sound waves that had been recorded, on a talking picture film, into the replica of the original tones of the instrument, or voice, as the case might be, there arose problems unknown in the reproduction of sound in the telephone or the phonograph. In talking pictures it was desirable and necessary to reproduce sound not only with fidelity but with sufficient loudness or intensity so as to be heard

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by a theatre audience who were without telephone receivers at their ears, and who were not closely seated to the reproducing apparatus. There accordingly came to be developed a device called a loud speaker, generally comprising a horn, and a sound box containing a vibratory diaphragm, the diaphragm usually being a thin vibratile piece of material so arranged that it would move backwards and forwards in response to electric impulses corresponding to the sounds desired to be reproduced. Many forms of diaphragms were suggested by patentees and others, the quality desired was that of physical strength combined with sufficient flexibility to permit it to be actuated by the electrical impulses set up in the electric circuit of the loud speaker. The diaphragm had generally taken two forms, the flat or flexible type, or, what is known as the piston type. The diaphragm was generally actuated either by what is known as a magnetic drive, or a dynamic drive. In the case of the magnetic drive the diaphragm is directly actuated by a magnet, the magnetism of which is varied in sympathy with the electrical impulses. In the case of the dynamic drive the diaphragm is actuated by a coil fixed on the diaphragm and placed between the poles of a magnet.

Prior to Wente's invention, in 1926, loud speakers then known and in use, while marking a step forward, were not satisfactory or efficient in talking picture reproduction, although for some purposes they may have been satisfactory, for example, where naturalness of sound, or clarity of enunciation, was not required to be of the highest order. Loud speakers in use prior to 1926 were marked by certain imperfections. One shortcoming was their limited range in frequency response, and the other was the variation in the intensity with which they reproduced certain frequencies. or, to state it in another way, there was a large number of frequencies the loud speaker could not reproduce at all, and the other was the irregularity in the intensity of the sound at different frequencies, causing a distortion in the resulting reproduction. A consequence of this was that the characteristic sound, say of an individual voice, was not faithfully reproduced; one could understand a substantial portion of what was spoken or sung, but the sound as reproduced did not convey the voice characteristics of the speaker, or singer, as the case might be. In order to sur-

mount these difficulties, it was necessary that there should be a considerable extension of the range in frequency response, and a greater uniformity in the intensity throughout the range of the reproducing device. One of the best loud speakers then available was one commercially known as Magnavox, the frequency range of which was somewhere from 300 cycles to about 2,500 cycles or possibly less. For a given energy input it gave no response to frequencies below 200 cycles. For the same energy input, as the frequency was increased, a limited response was obtained up to 400 cycles, and then from 400 to 2,000 cycles, there was a good response. After reaching a high point, at 2,000 cycles, the response began to fall off, and at 3,000 cycles it was again quite limited, while at a frequency of 4,000 cycles there was none at all. The importance of this will be recognized when it is pointed out that the soprano voice actually goes up to 4,000 cycles with its fundamentals, and there are important overtones all the way up to 8,000 cycles. It was a general defect in loud speakers in use at that time, in talking pictures, that they were unable to reproduce satisfactorily either the upper or lower registers, if at all, overtones were lacking, and the S's and F's were reproduced in such a manner as to give the singer, or speaker the effect of lisping. So it was therefore in the highest degree desirable to extend, if possible, the range of frequency response in the reproduction apparatus and to improve the fidelity of the voice or music emitted therefrom. Until Wentz came on the market there was no loud speaker that could adequately reproduce sound with sufficient strength or volume to fill a theatre of any size. Several things were in the way of producing sound of sufficient intensity. Most of the loud speakers of that time were magnetic drive devices. The effective area of the diaphragm of the magnetic driven type was usually so small that it was impossible to get sufficient amplitude to disturb the air to the extent necessary to produce a loud sound. Then there was the difficulty of what is known in the art as "blasting," a distortion, then inherent in all loud speakers. That was explained by one witness as occurring when the amplitude of the oscillations of the diaphragm got suddenly larger when certain frequencies were struck, the sound output in such frequencies becoming unduly en-

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hanced as compared with that produced at other frequencies with the same energy input. Two ill effects might result from such a combination, one, the undue loudness of the sound in the neighbourhood of this resilient frequency, and the other, that the great increase in the amplitude at such frequency might cause the diaphragm to strike some mechanical stop and make undesirable mechanical noises. There are some frequencies at which the mechanical impedance of the diaphragm is low and the force required to drive it is correspondingly small, so that the amplitude becomes disproportionately larger when you strike such frequencies. It is therefore to be seen that prior to Wentz, the frequency response of existing devices in the upper range did not extend beyond 3,000 cycles and in the lower range did not go below 200 cycles, or thereabouts, the amplitude or sufficiency of sound was not adequate, and the fidelity of the reproduction was imperfect. The Magnavox, as I have already stated, was one of the best reproducing devices on the market when Wentz came on, and it is sufficiently established, I think, that its effective frequency range was from 300 cycles to somewhere around 2,500 cycles.

Now, referring more specifically to the patented device in suit. We may entirely eliminate the horn because it is not here in question. Wentz's device, broadly speaking, comprises a sound box which has a domed shape plug in it, and a piston diaphragm which is coil driven; the piston diaphragm is driven from the periphery of the rigid or stiff portion of the diaphragm by a coil. The diaphragm is constructed with a dish shaped centre and might be compared to a hat with a round brim. The outer edge of the diaphragm, the brim of the hat, is flexible and corrugated, but the centre portion, the crown of the hat, is stiff, and the whole acts as a piston when actuated by electrical impulses; when a current is passed through the coil sound waves originate in the slight space between the diaphragm and the plug, the sound chamber having been decreased by the space occupied by the plug; the sound displaced by the diaphragm escapes through the passages formed between the surface of the plug and the sound box and thence into the horn. This form of diaphragm, it is claimed, makes it possible to move a comparatively large amount of air, because the flexible portion permits the whole diaphragm to

swing to wide amplitudes. The coil type of driving system has the advantage, it is claimed, of drawing the maximum amount of electrical power from the source at all frequencies, while devices in use prior to Wenté were capable only of drawing its maximum power at some one frequency and discriminated against all but those of a very limited frequency range, and good sound power was not sufficiently obtained at these other frequencies.

The utility of Wenté is conceded by the defendant, and the principal question for determination is whether there is sufficient novelty in the combination to constitute invention. The ready and wide adoption of anything that is useful is frequently, but not always, evidence of novelty and invention. Wenté seems to have been successful since it first went into use in talking picture reproduction in theatres, in August, 1926. That improvement in loud speakers was deemed desirable is evidenced by the fact that in this connection the Western Electric Co., one of the plaintiffs, had expended in experimental and research work, over a period of ten years, well over a million dollars up to the time Wenté appeared; I do not emphasize the amount of money or time expended, but the fact that a large expenditure of time and money was made is evidence that loud speakers prior to the time of Wenté were not regarded as perfect and that the field was open for improvement. The plaintiffs have sold some 70,000 loud speakers made according to the Wenté patent. They have equipped about 8,000 theatres with Wenté, besides those sold for public address systems. It is an established fact, I think, that with the advent of Wenté's loud speaker in 1926, came a very marked improvement in the quality of talking picture reproduction. That it increased the reproduction of frequencies above and below the range of anything before accomplished by any other known devices is, I think, clearly established. It has been shown that by the use of Wenté a frequency response can be obtained as low as 60 cycles, and that the response does not begin to fall off until over 4,000 cycles is reached, a slightly reduced response is obtained up to 6,000 cycles, and a useful response up to 8,000 cycles; so there was a considerable extension in frequency response at both ends of the scale, and there was in addition an improvement in the intensity or volume of

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the sound. Apparently the use of the plug had never before been used in such a combination. It matters not if all the elements in the combination are old, because if old elements in combination produce an old result or object in a more convenient, cheaper, or more useful way, it is proper subject matter for a patent if there is any evidence of ingenuity or skill in the production of such combination. Wenté, I think, did produce a new and valuable loud speaker, structurally and operatively different from anything preceding it; it produced much more satisfactory results than any loud speaker previously known, and, I think, there is enough invention disclosed to hold that the patent in suit contains subject matter.

As to the defence of anticipation I do not think much need be said. I have carefully examined all the cited prior art and in no one of them can I find the combination of Wenté. It is not permissible, it almost needless to say, to point to something in one published patent and something in another, and so on, and by an imaginary assemblage of all these things in combination say that this mosaic constitutes anticipation. You must find the patented article as fully described in the prior art as it is described in the patent under attack, and I am of the opinion that Wenté cannot be found described in the prior art cited on behalf of the defendant. Mr. Cornwell, one of the defendant's witnesses, referred to a loud speaker, made by de Forest, which he heard in use in 1926, and which he said seemed satisfactory, but no description of the details of that loud speaker was given. It would be impossible to base anticipation on that kind of evidence.

Now, as to the question of infringement. It is quite clear that all the elements found in Wenté's loud speaker are to be found in that of the defendant's. We find an air chamber interposed between the diaphragm and the horn, and there is a plug in the air chamber. The diaphragm in each is substantially the same, except in that of the defendant's the central and stiff portion of the diaphragm is dished in the opposite direction to which it is in Wenté. In the latter, the central portion is dished back on itself so that the central portion is dished away from the horn side of the sound chamber. Each diaphragm is of the piston type, each is driven from the periphery of the stiff portion of the



dish-shaped diaphragm by a coil interposed between the two poles of the magnet. Barring the hole, the plug in the sound chamber in each is the same except for the change in form required by the fact that the defendant's diaphragm is dished one way, while Wenté is dished the other way; this difference in the plugs, does not in my opinion, call for serious consideration. The plug in the defendant's device has a hole in it, and in that respect it differs from the plug in Wenté. Response curves of the defendant's device, taken according to standard practice, indicate that the sound intensity for the different frequencies are practically the same with the hole free, or with the hole plugged. The hole does not seem to have any practical effect in so far as results are concerned. On examining the loud speaker of the plaintiffs, and that of the defendant I really fail to see any difference of substance between them; such as there are seem to me to be minor distinctions. All the chief characteristics of Wenté are found in the defendant's apparatus. The defendant's loud speaker, I think, comes within the claims of the plaintiffs' patent which are here relied upon. Even if there was an improvement in having a hole in the plug, I should doubt very much if that would save the defendant from infringement if there is invention in Wenté, because at most it could only be a patentable improvement which the defendant could not use or put into practice without infringing Wenté's combination.

The plaintiffs therefore succeed, and are entitled to the relief claimed together with their costs of the action.

*Judgment accordingly.*

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