hereby apply for the grant of a Patent for an invention entitled

"TELEPHONE HANDSETS USING ELECTROACOUSTIC TRANSDUCERS"

which is described in the accompanying complete specification. This application is a Convention Application and is based on the application numbered P 31 07 344.1

for a patent or similar protection made in Germany on 26th February, 1981

Our address for service is:

Care: SPRUSON & FERGUSON
PATAENT ATTORNEYS
60 MARGARET STREET, ESSEO HOUSE, 127 KENT STREET
SYDNEY, NEW SOUTH WALES, AUSTRALIA.

The Common Seal of Siemens Aktiengesellschaft was hereto affixed in the presence of

Dated this 18TH day of DECEMBER, 1981

Signature of Applicant

To The Commissioner of Patents

COMMONWEALTH OF AUSTRALIA
PATENTS ACT 1925 Form 10

COMPLETE SPECIFICATION
COMMENWEALTH OF AUSTRALIA

DECLARATION IN SUPPORT OF A CONVENTION
APPLICATION FOR A PATENT OR PATENT OF ADDITION

In support of the Convention Application made for a

patent

patent of addition

"TELEPHONE HANDSETS USING ELECTROACOUSTIC TRANSDUCERS"

80909/82

Full name and address of Declarant.
I, Peter Drost
Procurist
of Franziskanerstraße 14, D-8000 München 80 Germany
do solemnly and sincerely declare as follows:—

1. I am the applicant for the

2. The basic application as defined by Section 141 of the Act was made in

3. I am the actual inventor of the invention referred to in the basic application.

4. The basic application referred to in paragraph 2 of this Declaration was the first

Full name and address of Inventor(s)
3. ERWIN MARTIN

of Nothkaufplatz 1, 8000 München Germany

is the actual inventor of the invention and the facts upon which the applicant

is/are entitled to make the application are as follows:

The said Applicant is the assignee of the actual inventor.

Declared at München this EIGHTEENTH day of DECEMBER 1981

Signature of Declarant Peter Drost

To: The Commissioner of Patents,

SPRUSON & FERGUSON, SYDNEY.
Claim 1.

A telephone microphone for use in a telephone handset, said microphone comprising an electro-acoustic transducer and a low pass acoustic filter arranged adjacent the transducer plate of said electro-acoustic transducer, said filter comprising a chamber divided by a separating plate having at least one sound aperture therein; an outer support having at least one slotted sound aperture therein and being spaced from the mouthpiece of said handset; and an attenuation disc arranged between said outer support and said separating plate and adapted to cover the slotted sound aperture(s) in said outer support; wherein said filter is formed as a $\Pi$-element by air mass and friction in the aperture(s) in said outer support, by air mass and friction resistance of the associated with said attenuation disc, and by the limited volume of the air between said separating plate and said...
resilience of the
transducer; late and the limited volume of air between said
outer support and said mouthpiece; whereby the frequency
response of said microphone is determined by said low pass
filter.
COMMONWEALTH OF AUSTRALIA
PATENTS ACT 1992

COMPLETE SPECIFICATION
(ORIGINAL)

FOR OFFICE USE:

Application Number: 80909/82
Lodged: 1

Complete Specification Lodged:
Accepted:
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Priority:

Related Art:

Name of Applicant: SIEMENS AKTIENGESELLSCHAFT

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Complete Specification for the invention entitled:

"TELEPHONE HANDSETS USING ELECTROACOUSTIC TRANSDUCERS"

The following statement is a full description of this invention, including the best method of performing it known to me/us.
The invention relates to telephone handsets using electroacoustic transducers and comprising a telephone mouthpiece in which an acoustic low-pass filter is arranged in an outer chamber to the front of a transducer plate, the outer chamber being divided by a separating plate which has at least one sound aperture and is covered by an outer support.

In telephone microphones, in order to improve the overall frequency response it is generally necessary to attenuate the frequency response above approximately 3.5 kHz, together with resonance peaks in the region of 2 to 3.5 kHz, and so achieve a required frequency response characteristic which lies within predetermined tolerances.

The starting point of a previous solution, described in the German Offenlegungsschrift 2,831,411 was to design a transducer support as part of the low-pass filter, the support consisting of synthetic resin and to having sound apertures that were off-set in relation to those of the mouthpiece outer cover, for a handset or the telephone if the telephone itself comprises the handset.

Synthetic resins do not form any protection against foreign electromagnetic fields, which can be extremely disturbing, in particular with high field strengths (10 V/m). If transducers are still to operate efficiently when such high field strengths prevail, the casing of the transducer and the support which seals the casing must consist of metal. However, this means that
the longitudinally extending bores for sound apertures in the support, which can be formed by the wall thickness of the synthetic resin, are not readily available because metal parts to be manufactured by deep-drawing techniques cannot be designed so as to have any significant thickness.

One object of the present invention is to provide an arrangement for improving the frequency response, wherein the support consists of metal, but co-operates with the remaining transducer components to form a frequency characteristic which meets the usual requirements.

According to one aspect of the present invention there is disclosed a telephone microphone for use in a telephone handset, said microphone comprising an electro-acoustic transducer and a low pass acoustic filter arranged adjacent the transducer plate of said electro-acoustic transducer, said filter comprising a chamber divided by a separating plate having at least one sound aperture therein; an outer support having at least one slotted sound aperture therein and being spaced from the mouthpiece of said handset; and an attenuation disc arranged between said outer support and said separating plate and adapted to cover the slotted sound aperture(s) in said outer support; wherein said filter is formed as a \( \Pi \)-element by air mass and friction in the aperture(s) in said outer support, by air mass and friction associated with said attenuation disc, and by the limited volume of the air between said separating plate and said transducer plate and the limited volume of air between said outer support and said mouthpiece; whereby the frequency response of said microphone is determined by said low pass filter.
Therefore, a support is used which approximately corresponds to the support described in the German Patent.
Specification No. 1,229,592. This support, together with the remaining described features, forms an effective low-pass acoustic filter which effectively prevents the transducer from being contaminated when a user is speaking into the transducer.

Advantageously, the support consists of metal of relatively great mass and stiffness, because this considerably enhances the frequency behaviour, in addition to the added protection against unwanted electromagnetic fields.

Preferably, to reduce the danger of contaminating the transducer, the slots are formed by sections which are alternately arranged above and below the disc plane of the support, so that the sound apertures are arranged in planes which run perpendicularly to the disc planes.

A further correction of the frequency behaviour and extensive protection of the transducer against contamination can be achieved by arranging a further disc which has a low attenuation in relation to the first-mentioned disc in the space between the mouthpiece and the support.

This further disc can be easily exchanged without having to encroach upon the transducer itself, and preferably it consists of a porous foam. When the equipment is to be used in a noisy environment, the low-attenuating disc can be replaced in a simple manner by a disc which has a high attenuation and additional mass.
In order that the volume classification of the transducer should be visible to the outside without opening the mouthpiece, it is expedient that the disc is visible through the sound apertures of the mouthpiece and is marked in a colour depending upon the volume classification.

The invention will now be described with reference to the drawings, in which:

- Figure 1 schematically illustrates a cross-section of one exemplary embodiment of a transducer constructed in accordance with the invention;
- Figure 2 schematically illustrates a theoretical view of the transducer shown in Figure 1; and
- Figure 3 is an explanatory equivalent circuit diagram relating to Figure 2.

The embodiment shown in Figure 1 comprises a housing 1 of metal, accommodating the following parts.

A carrier 2 supports on its lower face a circuit board 3 with electronic components. On this circuit board, there are arranged two contact blades, 4 and 5, which project through recesses in the housing and form external electrical terminals, as well as serving to secure the carrier 2 and circuit board 3 to the housing 1.

On its upper face the carrier 2 is provided with a bearing body 6 on which rests a transducer plate 7 provided with a piezo-ceramic layer 8. A further bearing body 9 forms a counter-bearing for the plate 7. The housing 1 is sealed by a separating plate 10 which is
inseparably connected to the housing and possesses a plurality of sound apertures, arranged in a circle, and of these, only two apertures, 11 and 12 are shown. The separating plate is provided with ribs 13, which run radially outwards on the side facing towards the transducer plate.

The transducer is sealed by an outer support 14 which possesses a similar number of sound apertures 15, also arranged in a circle. These sound apertures are formed by slots which are produced by sections arranged alternately above and below the plane of the disc. Between the separating plate 10 and the support 14 there is an attenuation disc 16 which covers the slots 15 and the sound apertures 11 and 12 of the separating plate. The complete capsule assembly can be fitted into a standard handset mouthpiece casing, to leave a chamber $V_{HA}$ above the apertures 15.

In Figure 2, the transducer in accordance with Figure 1 is schematically illustrated in theoretical form, corresponding parts being provided with like reference symbols. A low-pass acoustic filter is formed by the components $c_3$, $m_3 r_3$, $m_4 r_4$ and $c_{HA}$, as indicated together with Figure 3, where:-

the symbol $c$ is used to denote the resilience of the subscripted air volume;

the symbol $m$ is used to denote the air mass of the subscripted air volume or the mass of the subscripted item;

the symbol $r$ is used to denote the friction of subscripted air volume;

the symbol $HA$ is used as a subscript referring to the handset;
and of the symbol $V$ is used to denote the volume of the subscripted air volume.

The mouthpiece and its sound apertures are referenced 17.
THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A telephone microphone for use in a telephone handset, said microphone comprising an electro-acoustic transducer and a low pass acoustic filter arranged adjacent the transducer plate of said electro-acoustic transducer, said filter comprising a chamber divided by a separating plate having at least one sound aperture therein; an outer support having at least one slotted sound aperture therein and being spaced from the mouthpiece of said handset; and an attenuation disc arranged between said outer support and said separating plate and adapted to cover the slotted sound aperture(s) in said outer support; wherein said filter is formed as a $\pi$-element by air mass and friction in the aperture(s) in said outer support, by air mass and friction associated with said attenuation disc, and by the limited volume of the air between said separating plate and said transducer plate and the limited volume of air between said outer support and said mouthpiece; whereby the frequency response of said microphone is determined by said low pass filter.

2. A telephone microphone as claimed in claim 1, wherein said outer support is metallic, of relatively heavy weight and relatively rigid.

3. A telephone microphone as claimed in claim 1, wherein the slotted aperture(s) in said outer support are formed by sections which are arranged alternately above and below the central plane of said outer support.
4. A telephone microphone as claimed in claim 1, wherein the space between said mouthpiece and said outer support contains a further disc which has a low attenuation effect in relation to said attenuation disc.

5. A telephone microphone as claimed in claim 4, wherein said further disc consists of porous foam.

6. A telephone microphone as claimed in claim 1, wherein the space between said mouthpiece and said support contains a further disc having a high attenuation effect.

7. A telephone microphone substantially as described with reference to Figures 1 to 3 of the drawings.

DATED this FIFTEENTH day of DECEMBER 1983.

SIEMENS AKTIENGESELLSCHAFT

Patent Attorneys for the Applicant
SPRUSON & FERGUSON
END