

(12) **UK Patent Application** (19) **GB** (11) **2 384 696** (13) **A**

(43) Date of A Publication 06.08.2003

(21) Application No 0202097.2

(22) Date of Filing 30.01.2002

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(51) INT CL<sup>7</sup>

**A45C 15/00, H04B 1/38 // A45C 5/00, G06F 1/16,**  
**H04R 7/04**

(52) UK CL (Edition V )

**A4G G3Y G5J G5T13 G5T2**  
**H4J JL J30F J37X**

(56) Documents Cited

<b>GB 2293941 A</b>	<b>WO 2001/008447 A2</b>
<b>DE 020019525 U1</b>	<b>JP 2001332076 A</b>
<b>US 5409152 A</b>	<b>US 4939912 A</b>
<b>US 4571740 A</b>	<b>US 20020085730 A</b>

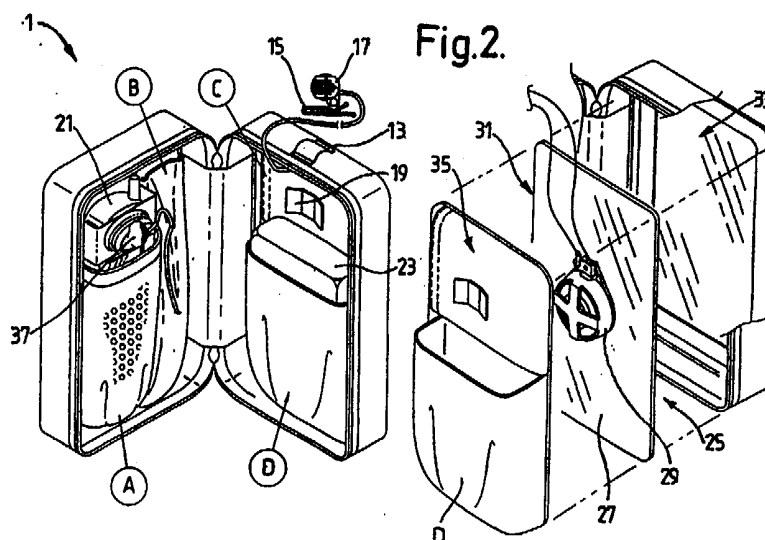
(58) Field of Search

UK CL (Edition T ) **A4G, H4J JL**  
INT CL<sup>7</sup> **A45C 3/02 3/10 15/00, A45F 5/00, G06F 1/16,**  
**G11B 31/02, H04B 1/38, H04R 7/04**  
Other: Online: **WPI, EPODOC, JAPIO**

(54) Abstract Title

**A carrying device for mobile communications equipment and/or audio equipment**

(57) A carrying device for mobile communications equipment 21 and/or audio equipment 23 comprises support A/D for the communications/audio equipment and a loudspeaker 25, the loudspeaker comprising a resonant surface 27 and an electromechanical transducer 29 attached thereto. The carrying device may be a bag, case or other portable container for the equipment. The resonant surface may be a generally flat panel 31 of the carrying device which may be flexible, may be contained within the carrying device and may comprise an inner surface of an exterior wall 33 thereof. The electromechanical transducer may be contained within a housing to form an exciter capsule. The support for the equipment may be one or more pockets, which may be arranged so as to allow both communications equipment and audio equipment to be carried at the same time and which may be arranged on two parts that are brought together to close the device. The carrying device may also be provided with support for control equipment for the loudspeaker and an optional microphone. The mobile communications equipment may be a mobile telephone 21 and the audio equipment may be any or all of a radio, a cassette player, a compact-disc player, a mini-disc player or an MP3<sup>RTM</sup> player. The carrying device may be connected to a belt or other article by a user.



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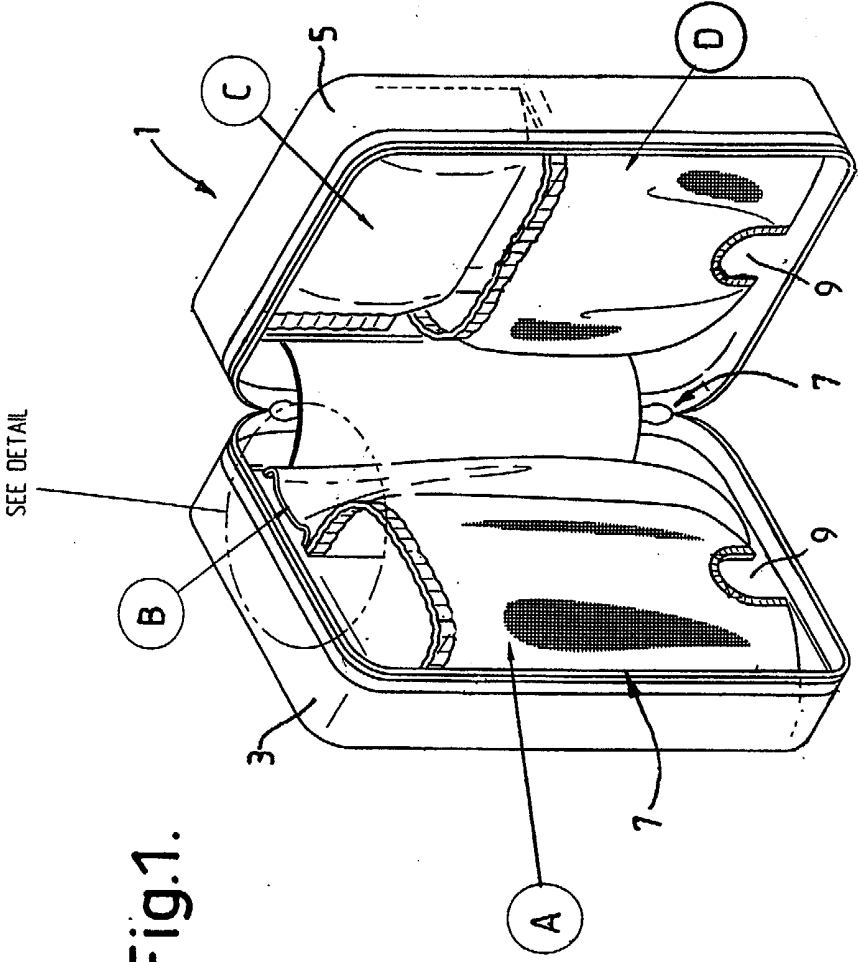
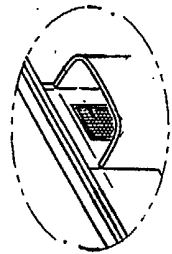
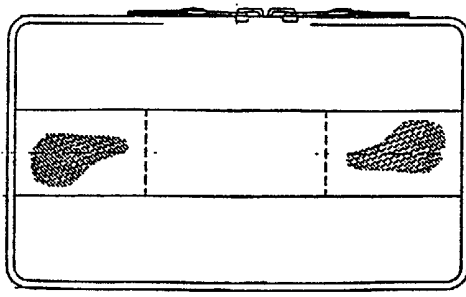
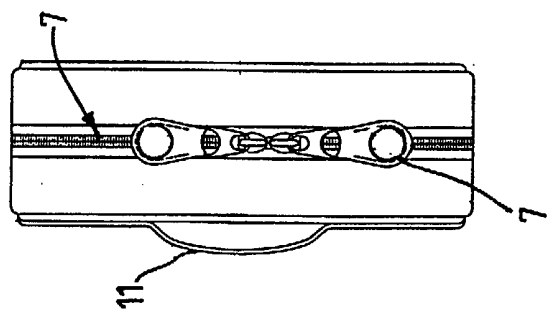
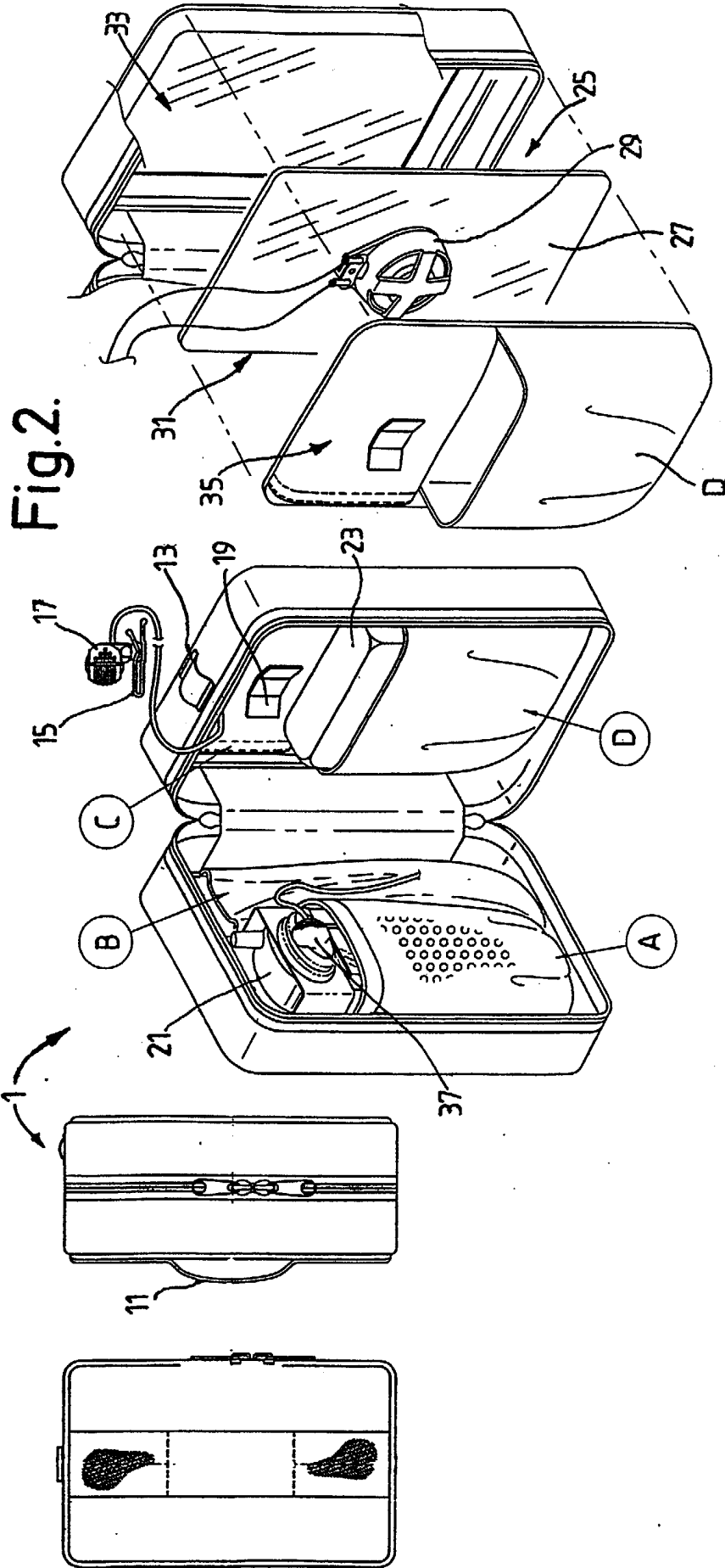


Fig. 1.



DETAIL OF POCKET 'B'



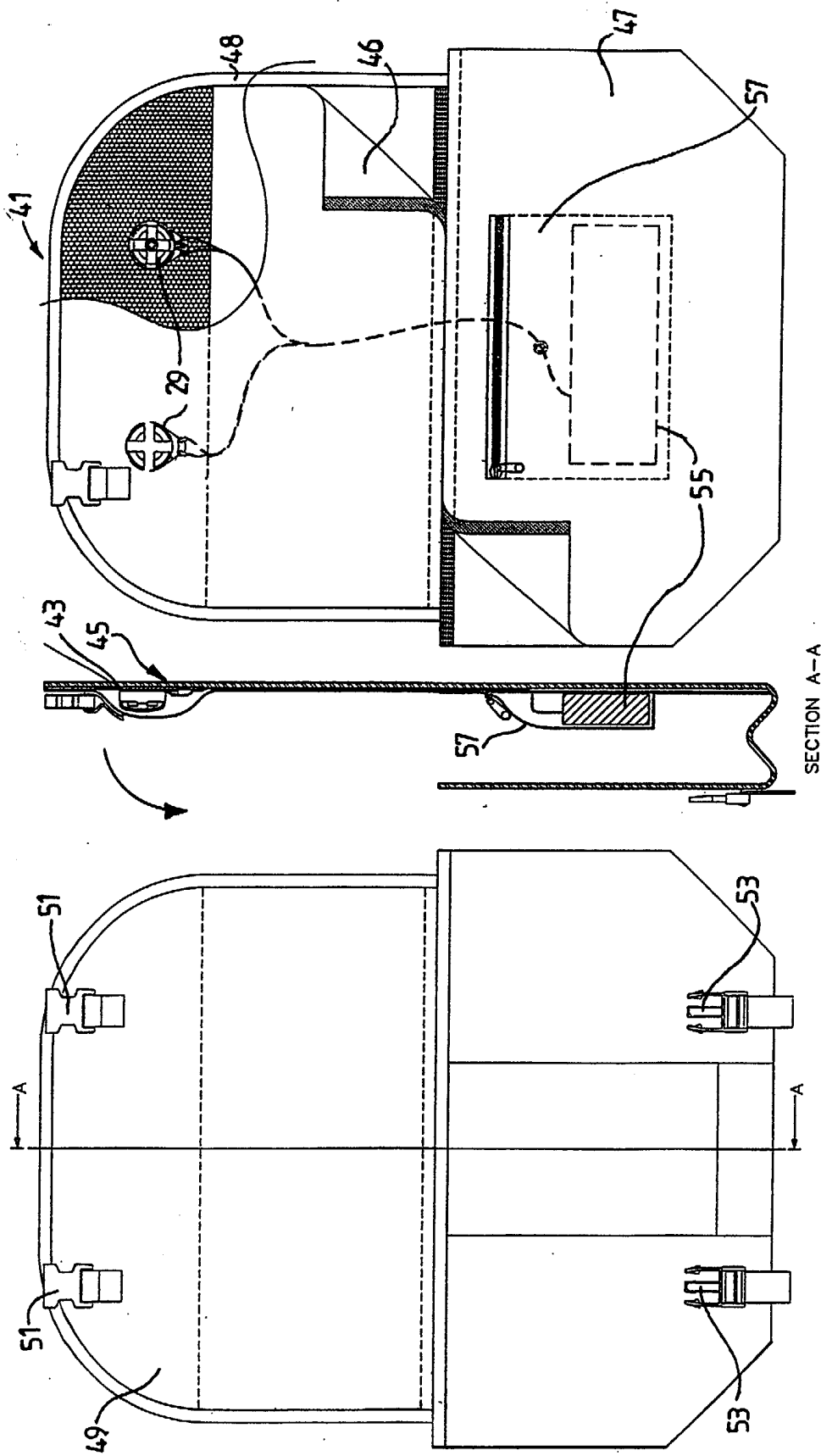


Fig.3.

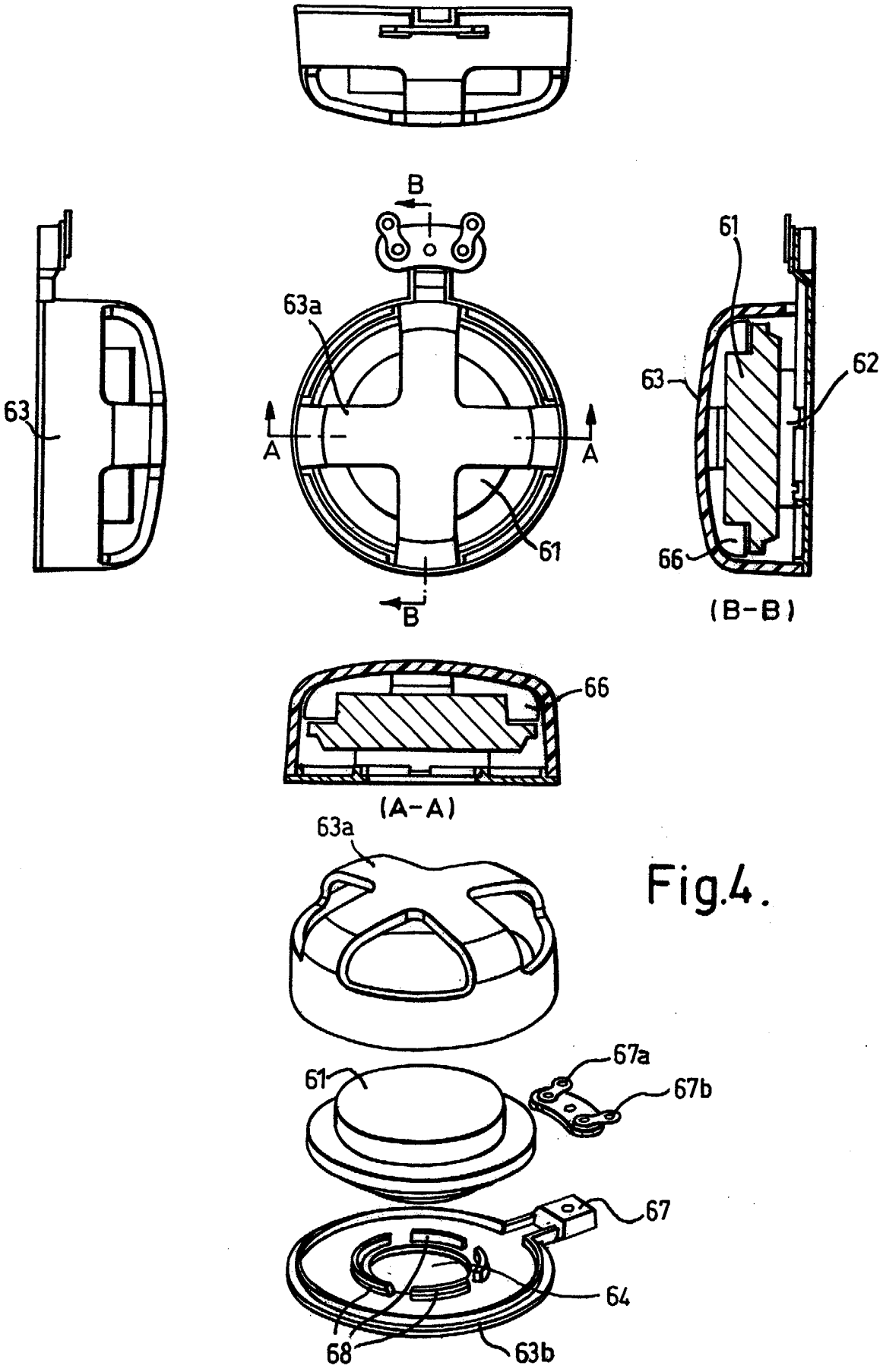


Fig.4.

CARRYING DEVICE FOR MOBILE COMMUNICATIONS EQUIPMENT  
AND/OR AUDIO EQUIPMENT

The present invention relates to a carrying device for mobile communications equipment, e.g. a mobile telephone, and/or audio equipment. In particular, the invention relates to such a carrying device incorporating a loudspeaker.

With the increased use of mobile telephones for business and leisure, there is an increased need for "hands free" use of such telephones, for example while driving a car, for conference-call operation, and while carrying out leisure pursuits such as running, climbing and cycling. There are also more specialist needs such as those of motorcycle or bicycle couriers, and maintenance engineers working in the field, for example.

Additionally, the use of portable audio equipment, for example radios, cassette players, compact disc players, mini disc players, MP3 players, palm-top computers, and the like is very widespread. There is a continual demand for portable loudspeaker systems for such audio equipment. Furthermore, there is a trend for convergence of mobile telecommunications and audio technologies, for example in the form of equipment having combined telecommunications and audio functionalities.

Accordingly, the present invention provides a carrying device for mobile communications equipment and/or audio equipment, comprising support means for supporting the equipment, and a loudspeaker for radiating sound from the equipment, the loudspeaker comprising a resonant surface of the carrying device and an electromechanical transducer attached thereto.

The invention has the advantage that by incorporating a loudspeaker in the form of a resonant surface and an electromechanical transducer into a carrying device for mobile communications and/or audio equipment, the carrying device is provided with a potentially lightweight and/or compact loudspeaker. In contrast, the weight and bulk of conventional moving cone loudspeakers (for example) has hindered their portability. A resonant surface/electromechanical transducer loudspeaker incorporated into such a carrying device need not add significantly to the weight and/or bulk of the device, thereby enabling truly practicable "hands-free" use of a mobile telephone and/or audio equipment, with a loudspeaker.

Preferred and optional features of the invention are described below and in the dependent claims.

Preferred embodiments of the invention will now be described, by way of example, with reference to the accompanying drawings, of which:

Figure 1 shows several views of an embodiment of a carrying device according to the invention;

Figure 2 shows several further views of the Figure 1 embodiment of a carrying device according to the invention containing a mobile telephone and audio equipment;

Figure 3 shows a second embodiment of a carrying device according to the invention; and

Figure 4 shows, in detail, an embodiment of an electromechanical transducer contained with a housing, as used in the embodiments of the invention shown in figures 2 and 3.

Figure 1 shows a carrying device according to the invention in the form of a flexible case 1. The case 1 comprises two parts 3 and 5 of substantially equal size and shape, which are hingedly joined together along a longitudinal

edge of the case. The case 1 may be closed by bringing the parts 3 and 5 together and joining them by means of a zip-fastener 7 which extends along the periphery of the open side of each part. The case 1 includes support means in the form of internal pockets A, B, C and D for containing mobile communications equipment and/or audio equipment. As drawn, pockets A and D are formed from a fine denier Nylon mesh edged with elasticated strips.

Pockets A and D are arranged to contain, respectively, a mobile telephone and audio equipment (e.g. an audio player, such as a mini disc player). Consequently, pockets A and D include apertures 9 (edged with elasticated strips) to allow access for cables/plugs etc. Pocket B is elongate in shape and is specifically arranged to contain control equipment (not shown) for controlling a loudspeaker (also not shown) incorporated in the case. A detail of pocket B shows a strip of a "loop-and-hook" fastener (e.g. VELCRO (trade mark)) for retaining the control equipment in the pocket. A major external surface 10 of the case 1 includes a loop 11 for attaching the case to a belt worn by a user (for example).

Figure 2 shows another embodiment of carrying device according to the invention, in the form of a soft case 1 which is very similar to that shown in Figure 1. The only significant differences between the case of Figure 2 and that shown in Figure 1 are that in Figure 2 pocket C has been removed, and the exterior of the case includes a loop 13 for receiving a clip 15 of a microphone 17, for attaching the microphone to the exterior of the case. Pocket C is removable, and is attachable to the interior of the case by means of "loop-and-hook" fastener 19 (e.g. VELCRO – trade mark).

In Figure 2, a mobile telephone 21 and a piece of audio equipment 23 (e.g. a mini disc player) are contained in pockets A and D respectively. Figure 2 also includes an exploded view showing a loudspeaker 25 incorporated in the case 1. The loudspeaker 25 comprises a resonant surface 27 and an electromechanical transducer capsule 29 attached thereto. The resonant surface 27 is a surface of a generally flat panel 31 incorporated in the case 1. The flat panel 31 preferably is formed from a stiff, lightweight



material and is located between an external wall 33 of the case (which preferably is made from a very lightweight, acoustically substantially transparent material, e.g. LYCRA (trade mark)) and an internal component 35 which carries pocket D. In use, the panel 31 and transducer capsule 29 are inaccessible.

The case 1 of figures 1 and 2 preferably is intended primarily for use with a mobile telephone, and its use with audio equipment preferably is optional. (However, the case can be used only with audio equipment, and its use with a mobile telephone can be optional). The loudspeaker 25 is connected to the output of the mobile telephone 21 via the control equipment (not shown) normally contained in pocket B. The connection between the loudspeaker 25 and the mobile telephone 21 may be via an acoustic coupler 37 attached to the built-in speaker of the telephone (as shown), or it may be via an output socket of the telephone, for example. The microphone 17 is also connected to the telephone 21 via the control equipment. Additionally, the audio equipment 23 is connected to the loudspeaker 25 via the control equipment.

The case functions as follows. Sound from the audio equipment 23 is radiated by the loudspeaker 25 so that a person carrying, wearing, or otherwise using the case can hear it. If there is an incoming call on the telephone 21, the control equipment (which is conventional, and known to the skilled person) mutes the audio output from the loudspeaker 25. The incoming call may be answered by an auto-answer function of the telephone 21 (this function being common to mobile telephones); alternatively the user may open the case 1 to answer the call. When the telephone call is answered, the caller's voice is heard by the user via the loudspeaker 25, and the user's voice is communicated to the caller via the microphone 17. The control equipment operates in a half-duplex mode, i.e. it sends and receives signals but not simultaneously, such that when the user is speaking into the microphone the loudspeaker does not operate, and vice versa. However when the user speaks into the microphone the control equipment cuts the

operation of the loudspeaker. When the telephone call is terminated, the loudspeaker resumes radiating the audio output from the audio equipment 23.

Figure 3 shows an alternative embodiment of carrying device 41 according to the invention. In this embodiment, the electromechanical transducer capsule(s) 29 is/are attached to an internal surface 43 of an external wall 45 of the carrying device and concealed by a lining 46. The external wall 45 preferably is made from a tough, non-porous material, for example polyvinyl chloride (PVC).

The carrying device 41 shown in Figure 3 is of a more simple construction than that shown in figures 1 and 2, in which the support means for the equipment comprises a pocket 47 formed in a simple manner from a single sheet 48 (which may be a composite, as shown) of material. The sheet of material is folded generally in a U-shape (in cross-section), thereby forming the external wall 45 of the carrying device 41. An upper portion 49 of the sheet 48 may be folded downwardly (as indicated by the arrow) to close the device, the device being securable in its closed configuration by interlocking fastening devices 51 and 53. Control equipment 55 for the communications and/or audio equipment is stored in a zip-fastened pocket 57.

The transducer capsule 29 used in the invention preferably comprises an electromechanical transducer contained within a protective housing. Preferably, the transducer capsule comprises an exciter capsule substantially as disclosed in UK patent applications GB 0126602.2 or GB 0126603.0 (Hosiden Besson Limited) the entire disclosures of which are incorporated herein by reference

The capsule housing may conveniently be of a durable plastics material. The capsule may be adapted for attachment to the resonant surface by any suitable means including but not limited to peelable adhesive, clips, pins, bayonets, screws, velcro, magnetism, suction etc. Preferably, the perimeter of the housing is used to fix the capsule to the resonant surface, permitting the transducer to excite the surface without obstruction. The

capsule may be any shape suitable for housing the transducer including novelty moulded shapes. A preferred option is one which is substantially dome shaped. Any known type of electromechanical transducer may be incorporated including but not limited to, electromagnetic, dynamic or bender transducers and/or piezo-ceramic transducers.

A particularly preferred form of transducer capsule as shown in Figure 4. A transducer comprises a magnet assembly 61 and a voice coil ring 62 carried in a robust, lightweight plastic housing 63. The housing 63 has a top surface 63a and a base 63b with a central aperture 64. The base may be attached to the resonant surface to provide amplification of sound vibrations transmitted by the transducer. The magnet assembly 61 is suspended in the housing 63. The voice coil ring 62 is enlarged and housing 63 is secured thereto, such that the housing moves in sympathy with the voice coil ring 62. The magnet assembly 61 moves to provide a reactional force within the housing 63 which in turn vibrates the resonant surface (not shown) to which the capsule is attached. The top face 63a of the housing 63 has a substantially cruciform shape having four substantially triangular spaces to permit good airflow through the capsule. Protrusions 66 extend from the bottom surface of the cruciform to maintain the magnetic assembly 61 in a suspended position away from the sides of the housing 63. The base of the housing 63b is provided with an electrical connector tab 67 with connectors 67a and 67b to which electrical wiring (not shown) can be attached. The voice coil ring 62 is seated in supporting structure 68 provided around the periphery of the aperture 64 in the base 63b.

The material for the housing 63 is selected to be lightweight, yet robust so as to minimise weight whilst still providing protection against damage to the transducer. Typically, the capsule comprises a thermosetting plastics material. The venting in the top surface 63a of the housing 63 is to provide good airflow within the capsule and thereby minimise resistance against motion of the assembly. The voice coil ring 62 may be made of a rigid or flexible material. A flexible ring may minimise the effective area of the drive point of the capsule.

It is to be understood that dimensions shown in the figures are merely for guidance and are not essential to the invention. Other embodiments will no doubt occur to the skilled addressee without departing from the true scope of the invention.

Claims

1. A carrying device for mobile communications equipment and/or audio equipment, comprising support means for supporting the equipment, and a loudspeaker for radiating sound from the equipment, the loudspeaker comprising a resonant surface of the carrying device and an electromechanical transducer attached thereto.
2. A carrying device according to Claim 1, comprising a bag, or case, or other portable container for the equipment.
3. A carrying device according to Claim 1 or Claim 2, in which the resonant surface comprises a surface of a generally flat panel of the carrying device.
4. A carrying device according to any preceding claim, in which the resonant surface is flexible.
5. A carrying device according to any preceding claim, in which the resonant surface comprises a surface of a panel contained within the carrying device.
6. A carrying device according to any one of claims 1 to 4, in which the resonant surface comprises an internal surface of an external wall of the carrying device.
7. A carrying device according to any preceding claim, in which the electromechanical transducer is contained within a housing, the housing and transducer together comprising an exciter capsule.
8. A carrying device according to any preceding claim, in which the support means comprises one or more pockets for holding the equipment.

9. A carrying device according to any preceding claim, in which the mobile communications equipment comprises a mobile telephone.
10. A carrying device according to any preceding claim, in which the audio equipment comprises a radio and/or a cassette player and/or a compact disc player and/or a mini disc player and/or an MP3<sup>RTM</sup> player and/or a computer.
11. A carrying device according to any preceding claim, further comprising a microphone electrically connectable to the equipment to allow a user to speak into the equipment.
12. A carrying device according to any preceding claim, in which the loudspeaker is connectable to the equipment by means of an acoustic coupler and/or an electrical connection to an output port of the equipment.
13. A carrying device according to any preceding claim, comprising support means to enable both mobile communications equipment and audio equipment to be carried by the device simultaneously.
14. A carrying device according to Claim 13, comprising two parts which may be brought together to close the device, each part including support means for mobile communications equipment, and audio equipment, respectively.
15. A carrying device according to any preceding claim, further comprising support means for supporting control equipment which, in use, controls the loudspeaker, and optionally controls a microphone forming part of the equipment or according to Claim 11.
16. A carrying device according to Claim 15, further comprising control equipment according to Claim 15.

17. A carrying device according to any preceding claim, further comprising attachment means for attaching the device to a belt or other article.
18. A carrying device substantially as described herein with reference to the accompanying drawings.
19. A carrying device substantially as illustrated in the accompanying drawings.



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Application No: GB 0202097.2  
Claims searched: 1-19

Examiner: Mike Leaning  
Date of search: 4 September 2002

### Patents Act 1977 Search Report under Section 17

#### Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:  
UK CI (Ed.T): A4G; H4J (JL).  
Int CI (Ed.7): A45C 3/02, 3/10, 15/00; A45F 5/00; G06F 1/16; G11B 31/02; H04B 1/38; H04R 7/04.  
Other: Online: WPI, EPODOC, JAPIO.

#### Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
Y	GB 2293941 A (BRIAN BUCALO) See especially page3 lines 6-16 and page 5 lines 3-5.	1-4,7-9 &11
Y	WO 01/08447 A2 (DIGITAL SONICS LLC.) See figure 1 and page 2 lines 27-34 and page 10 lines 32-34.	1-4,7,8, 10,12,13, 15,16&17
&	US 2002/0085730 A1 (HOLLAND) Included as it provides an English language equivalent to DE 20019525 U. Please see the final sentence of paragraph 7, the first of paragraph 9 and the entirety of paragraph 13.	
Y	US 5409152 (TREVINO) See the figures and also column 4 lines 34-42 & 50-59 and column 5 lines 21-24 & 51-56.	1-4,7,8, 10,12,13, 15,16&17
Y	US 4939912 (LEONOVICH, Jr) See the figures, noting the electrical coupler 20 between the radio receiver 14 and the speakers 16 and also column 1 lines 43-56.	1-4,7,8, 10,12,15 &16
Y	US 4571740 (KIRBY et al.) See the figures and column 12 lines 30-32.	1-4,7,8, 10,15&16

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.





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INVESTOR IN PEOPLE

Application No: GB 0202097.2  
Claims searched: 1-19

Examiner: Mike Leaning  
Date of search: 4 September 2002

Category	Identity of document and relevant passage	Relevant to claims
Y,&	DE 20019525 U1 See the figures and also note the text of US 2002/0085730 above.	1-4,7,8, 10,11, 15&16
Y	JP 20013320756 (CASIO COMPUTER CO. LTD.) Discloses a cd-player casing with an external planar speaker comprising a resonant surface. See WPI Abstract 02/286179-33.	1,3,4,7,8, 10,12,13, 15,16&17

JP 20013320756 discloses a cd-player casing with an external planar speaker comprising a resonant surface which comprises the features of claims 3&7. It can thus be combined with the above carrying devices to show the listed claims to be obvious.

WO 01/08447 discloses a flexible planar speaker which appears to have the features of claims 3,4&7. It can be combined with the above carrying devices to show the above listed claims to be obvious.

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.