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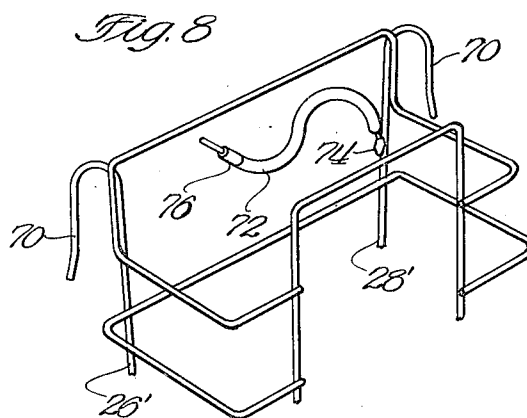
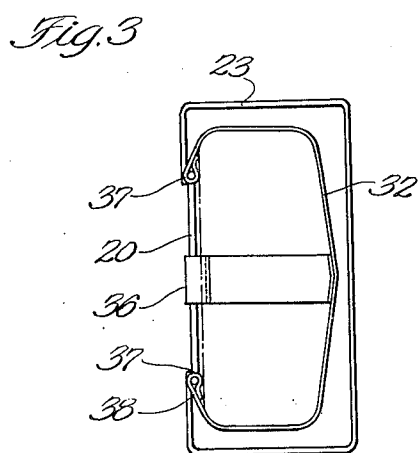
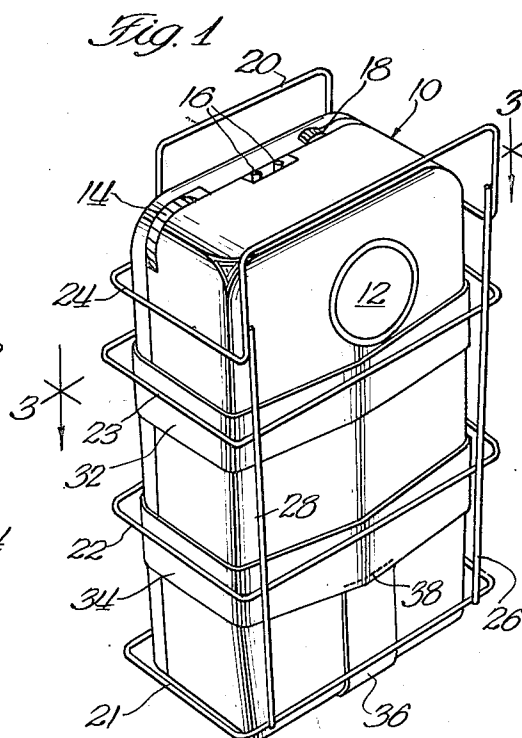
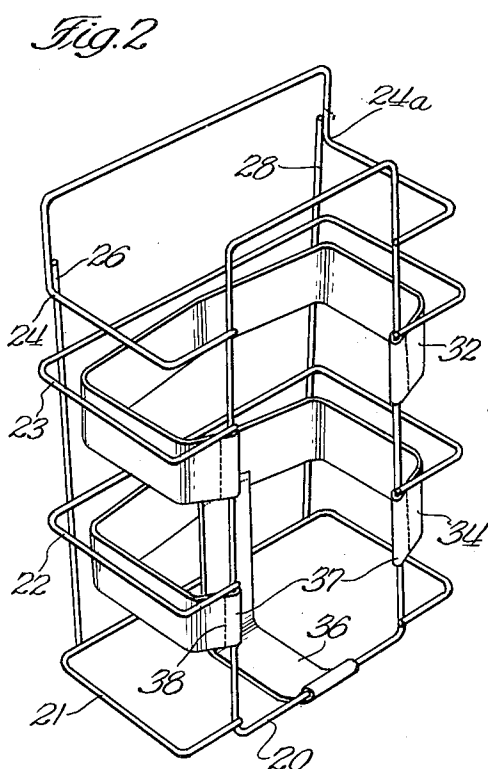
Feb. 22, 1955

R. W. HOCKS ET AL
PROTECTIVE CARRIER FOR PORTABLE
AUDIO DEVICE AND THE LIKE

2,702,604

Filed March 7, 1950

2 Sheets-Sheet 1



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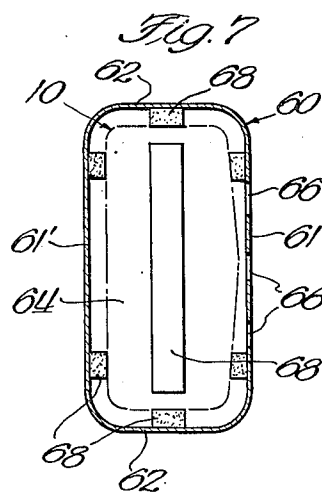
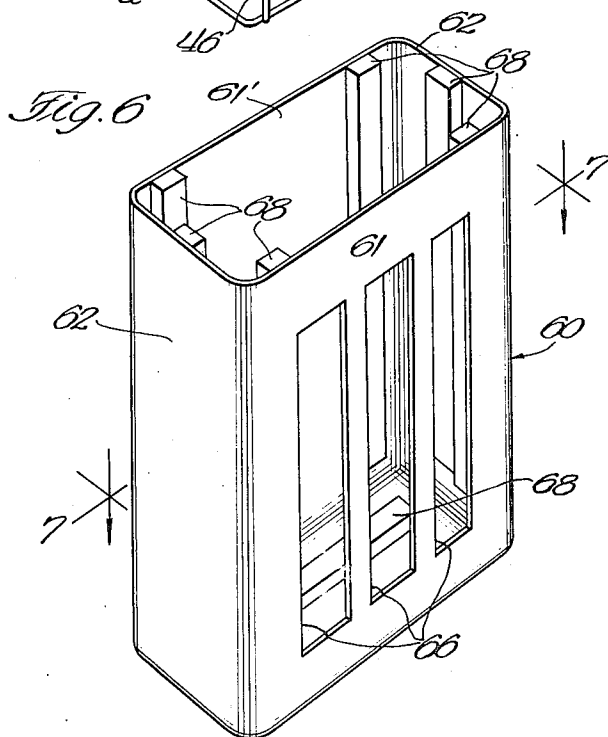
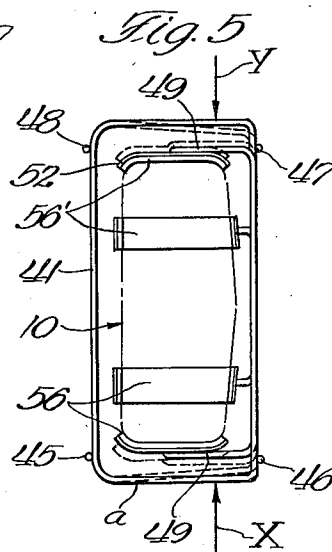
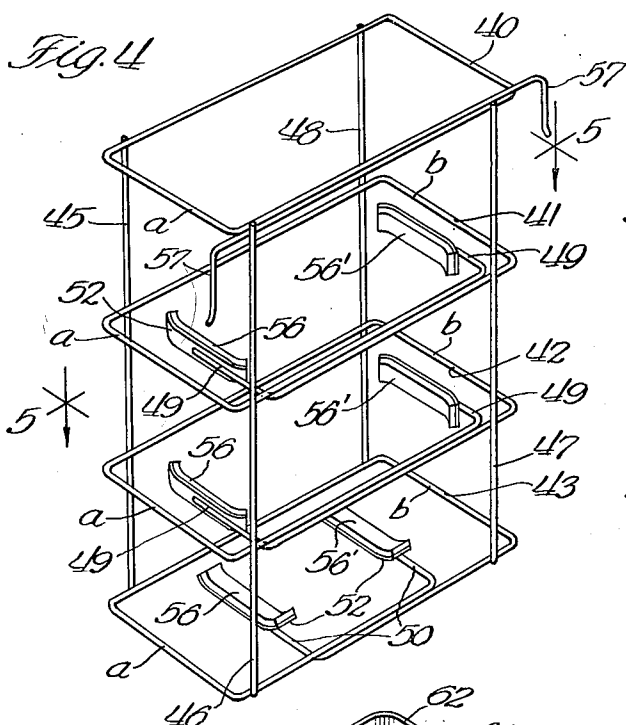
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PROTECTIVE CARRIER FOR PORTABLE AUDIO DEVICES AND THE LIKE

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This invention relates to a protective carrier frame or guard for a portable, sensitive device, such as a hearing aid amplifier, radio, and the like, which conventionally is carried about the person of the user. While the carrier has many uses and advantages, it is particularly designed for use with hearing aid amplifiers to eliminate the static noises introduced into the amplifying system by frictional engagement with the clothing of the wearer. It has the secondary advantage of protecting the instrument from damage and in providing a support for the instrument. When used with a portable radio of the pocket type, the frame may be designed to function both as a carrier and as an antenna.

It is well known in the art, as attested to by U. S. patents, Nos. 2,417,153 to Darr; 2,477,698 to Little; 2,253,216 to Wengel; and 2,304,339 to Cubert, that hearing aid amplifiers of the electronic type are susceptible to generation of static-like noises caused by the relative movement between the case of the amplifier and the clothing of the wearer. Such noises cause considerable discomfort and annoyance to the user, as well as reduce the efficiency and clarity of the audio tone.

It is, accordingly, an object of the invention to provide a carrier frame for a hearing aid or other portable instrument in which the hearing aid device is received in acoustically insulated relation, with the frame functioning as a guard to keep the clothing of the wearer away from the case of the device.

It is a further object of the invention to provide a supporting frame which functions as a carrier for a hearing device or other portable instrument, in which the instrument is resiliently supported, so that said frame will protect the instrument against damage from sudden jars or blows received by the frame.

It is a further object of the invention, as a variation thereof, to make such protective carrier frame of metal, so that when used with a portable radio, it may also function as an aerial.

It is a still further object to provide such protective carrier frames of simple design so that they can be economically manufactured.

Other objects, features and advantages of the invention will become apparent from a study of the following specification, taken in connection with the accompanying drawings, wherein like reference characters designate corresponding parts throughout the several views; and wherein:

Figure 1 is a perspective view of a preferred embodiment of the carrier, illustrated with a hearing aid device supported therein;

Figure 2 is a perspective view of the same embodiment viewed from the rear face of the frame, and with the hearing aid instrument removed;

Figure 3 is a sectional view taken on the line 3—3 of Figure 1, showing the hearing aid in phantom;

Figure 4 is a perspective view of a modified embodiment of the invention;

Figure 5 is a sectional view taken on the line 5—5 of Figure 4 with a hearing aid delineated in phantom line to illustrate the manner of supporting the hearing aid therein;

Figure 6 is a perspective view of a third embodiment of the invention;

Figure 7 is a sectional view taken on the line 7—7 of Figure 6, also illustrating by phantom line an instrument in position;

Figure 8 is a fragmentary perspective view illustrating a variation of the invention wherein the carrier frame is provided with support hooks, and a lead for a radio antenna.

Referring to the drawings, there is illustrated in Fig-

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ures 1, 2 and 3 a preferred embodiment of the invention of a protective carrier frame for a hearing aid device or other pocket-type instrument. Figure 1 shows in received position a hearing aid instrument 10 of substantially rectangular solid shape, which is the prevailing design at the present time for hearing aids of the electronic type. The microphone 12 of the hearing aid is seen on its front face. The volume control 14, lead connections 16 to the speaker, and switch 18, are seen at the top rear edge.

Before proceeding to a detailed description of the carrier frame, it may be observed, generally, that the frame comprises a plurality of longitudinally disposed rods corresponding to the length dimension of the hearing aid device, and a plurality of transversely disposed rods corresponding to the width and depth dimensions of the hearing device. The over-all dimensions of both the longitudinally disposed rods and the transversely disposed rods exceed the dimensions of the hearing aid device. The frame is so constructed and arranged as to have one end open for receiving the hearing aid device and the other end provided with a stop or support for the bottom of the hearing aid device, thereby forming substantially a cup-shaped structure. When the hearing aid device is received within the frame, the rods serve as guard rails to prevent clothing of the user from contacting the case of the hearing aid instrument. Means are also provided in the form of elastic filled fabric bands for receiving and supporting the hearing aid instrument in firm engagement with the frame. The elastic filled fabric is an acoustically insulating material and the hearing aid device is spaced from the frame by at least one thickness of the fabric band and is acoustically insulated therefrom. It will thereby be seen that the frame not only serves the function of keeping the clothing away from the case, but also protects the device against damage or injury resulting from falling or other impact. The tension with which the audio device is held prevents dislocation of the same from the frame in the event of such a fall or impact, and also insures spacing of the instrument out of contact with the walls of the frame.

As illustrated, the carrier of Figures 1, 2 and 3 comprises an endless rod 20 forming a rectangle having a width less than the width of the hearing aid instrument and a length greater than the length of the hearing aid instrument. The rectangle 20 thereby serves as a support for one face of the hearing aid instrument. Rigidly connected to the rectangular rod 20 are a series of spaced, parallel transverse rods 21, 22, 23 and 24 which delimit rectangular-like loops transverse to rectangle 20, having depth and width of greater dimension than the corresponding dimensions of the hearing aid instrument. The uppermost of these transverse rods 24 has a greater distance between its parallel front and rear portions than the other transverse rods, and has its front side turned upward at 24a to bring it into alignment with the front sides of the rectangles formed by rods 21, 22 and 23, and also, as thus upwardly turned, it projects to a greater height than the hearing aid instrument, thereby giving the carrier frame a greater longitudinal dimension than the longitudinal dimension of the hearing aid instrument. The longitudinal rods 26 and 28 are rigidly attached to the front portions of the transverse rods relatively near the corners, and preferably at a distance apart in excess of the width of the hearing aid instrument. These rods are not absolutely necessary, but they serve the two useful functions of providing greater rigidity for the frame and of being particularly useful to provide additional guards to prevent clothing from entering between the transverse rods and coming in contact with the case of the hearing aid instrument.

It will be understood that the rods may be of any suitable structural material, and that the connections therebetween may be made in any manner conventional in the art for the particular material of which the rods are made. A preferred material for the rods is relatively stiff steel wire, in which case the connections are welded or soldered. The rods may be of plastic, in which case the connections may be made by cementing,

or self-bonding in case the plastic material is of the thermoplastic type.

The hearing aid instrument is supported within the frame by means of bands of elastic filled fabric 32, 34 and 36, commonly known as elastic webbing or "elastic." The bands of elastic used to support the instrument in the frame are attached by making a loop 37 (Figure 3) of their free ends around the endless rectangular rod 20 and sewing or otherwise securing the same, as at 38, through the double thickness. The two transverse bands 32 and 34 are found to be adequate to support the instrument vertically, and band 36 is attached to the bottom of the rectangular rod 20 and may have its other end attached, as by sewing 38, either to the middle of the lowermost transverse band 34 or to the transverse rod 22.

It will be observed from the construction thus described that the hearing aid instrument 10 is maintained in firm engagement against the back of the carrier frame, with the rectangular endless rod 20 serving as a support. The elastic band 36 provides a bottom support for the hearing aid instrument. While the instrument is urged firmly against the frame by the tension of the elastic, it is acoustically insulated therefrom by virtue of the loops of elastic 37 which are formed around the rectangular rod 20 so that at no place does the nonresilient, sound transmitting material of the hearing aid case come in contact with the non-resilient, sound transmitting material of the carrier frame. It will also be observed that the microphone 12 is spaced away from the front face of the frame, thereby providing the maximum distance possible between it and the clothing of the wearer.

Proceeding now to the discussion of the embodiment illustrated in Figures 4 and 5, it will be seen that the carrier frame is a cup-shaped structure comprising a plurality of transversely disposed, rectangularly shaped rods and a plurality of longitudinally disposed rods rigidly connected to said transverse rods, spacing said transverse rods, and maintaining same in substantially parallel relation. As illustrated, there are four transverse rods 40, 41, 42 and 43 forming rectangular loops, and four longitudinal rods 45, 46, 47 and 48, one at each corner of the frame. The central two of the transverse rods 41 and 42 have their terminal ends 49 disposed at opposite sides of the frame for the purpose of engaging the device being carried as more fully hereinafter explained. The lowermost transverse rod 43 has its ends 50 likewise disposed at opposite sides of the frame and sufficiently toward the center to provide a bottom support for the instrument being carried.

In this modification of the invention, the transverse rods 40, 41, 42 and 43 are made of flexible, resilient material, such as spring wire. The transverse rods, except upper rod 40, are shaped to form a loose, rectangular coil or loop of more than one convolution, overlapping a substantial distance on one side of the width dimension and partially overlapping on each of the two ends. The end portions *a* and *b* of the rods, corresponding to the depth dimension of the hearing aid, are free for relative movement toward and away from each other as illustrated in dotted line in Figure 5. The terminal ends 49 of the rods 41 and 42 are provided with gripping or supporting bars 52 adapted frictionally to engage the hearing aid instrument under the tension provided by the resiliency of the spring wire of the loop. The lowermost transverse rod 43 is likewise provided with supporting bars 52 attached thereto to support the bottom of the device being carried. To each of the bars 52 is affixed a facing or pad 56 of resilient, acoustically insulating material, such as foam rubber, sponge cellulose, or the like. The pads at the right edge of Figure 4 as designated 56' for purposes of contradistinction in Figure 5. The upper rod 40, as illustrated, completely overlaps on the width dimension and has its free ends 57 conveniently shaped to provide downwardly directed hooks for supporting engagement of the frame with the clothing of the wearer, or for other uses. However, it will be understood that the free ends of rod 40 may be otherwise disposed, as desired.

It will now be observed from Figure 5 that the hearing aid 10 or other instrument, when positioned in the carrier frame of Figure 4, is centrally disposed with reference to all sides of the frame and is yieldably supported therein in firm engagement by the pads 56, so that it is acoustically insulated from the non-resilient material of the frame. Each of the longitudinal rods 46 and 47 is

attached to only one of the convolutions of the transverse rectangular rods, which is the same relative portion *a*, or *b*, of the convolution of each of the transverse rods. By virtue of this arrangement, pressure exerted upon the edges of the frame results in movement away from each other of the oppositely facing grip bars 52, thereby facilitating insertion and removal of the hearing aid. For example, see the dotted line view in Figure 5, wherein it will be seen that pressure, indicated by arrow X on one side of the frame, displaces pads 56' at the opposite side of the frame in the same direction of the force. Likewise, force applied in the direction of the arrow Y on the other side of the frame displaces pads 56 in the same direction of the force applied.

Still a third embodiment of the invention is illustrated in Figures 6 and 7 wherein the carrier frame comprises a cup-shaped casing, made either from a blank of material, or by a molding process. The frame comprises an integral, more or less continuous wall 60 forming front and back faces 61 and 61', respectively, and side faces 62. It is also provided with a bottom wall 64. The front face has formed therein an opening for the passage of audio waves to a microphone or from a speaker disposed within the casing, the opening being illustrated in the form of a grill composed of three longitudinal slots 66. The inner faces of the walls of the cup-shaped frame have secured to them, as by cementing, strips or bars 68 of resilient acoustically insulating material such as foam rubber, sponge cellulose and the like, and also a strip of the same material is provided across the bottom. Figure 7 illustrates the manner in which the hearing aid instrument 10 is then received in such frame spaced from the walls by the acoustically insulating strips 68. It will be appreciated that the frame may be drawn from a single blank of metal, shaped from sheet plastic, or it may be molded in final form from plastic molding material.

The fragmentary view shown in Figure 8, which illustrates a frame constructed generally in accordance with the design of Figure 1, illustrates two variations which can be made with any of the modifications of the invention. One is that hooks may be provided for engagement with the corners of a pocket of the user, further to secure the frame in the pocket. However, the hooks may serve any number of useful purposes, as for suspending the hearing aid from the upper edge of a garment such as a bodice, or for hanging the instrument when not in use. In Figure 8, the front longitudinal rods 26' and 28' have their upper ends continued in length to form the hooks 70. However, it will be apparent that the hooks may be formed from the ends of any of the various rods, or may be separately made and attached. It will also be understood that the hooks are not limited to use with the embodiment shown in Figure 1, but may be employed with the embodiments of Figures 4 and 6.

The other variation of the invention illustrated in Figure 8 is the provision of an electrical lead 72 connected to the frame, when the same is made of metal, for quick detachable connection with a pocket radio, to enable the frame to serve as an aerial. This variation, as illustrated in the drawing, comprises the electrically insulated wire lead 72 having a soldered connection 74 to the frame and a terminal plug 76 for making connection to the radio.

It is to be understood that the invention is not limited to the details of construction and the particular embodiments illustrated, as numerous constructions, arrangements, and combinations of the rods or of sheet material may be designed which will provide the essential requirements of shielding the hearing aid or other device from the clothing of the wearer, and that means and methods in addition to those illustrated herein for resiliently mounting the hearing aid device in acoustically insulated, firm engagement to the frame are contemplated within the teaching of the invention. For example, the transverse rods in Figure 1 may completely describe a rectangle. The longitudinal rods employed for supporting the transversely arranged rods may be connected diagonally between corners to provide triangular support. The front longitudinal rods 26 and 28, as employed in Figure 1, may themselves be joined in an endless rectangular shape, and the upper transverse rod 24 may be made of the same size and shape as the other transverse rods. Likewise, different arrangements of elastic webbing or other resilient, flexible, acoustically insulating material

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may be employed for supporting the hearing aid instrument within the frame, the arrangement shown in Figure 1 being illustrative only.

As variations of the construction in Figures 4 and 5, it may be mentioned by way of illustration that the terminal ends of the transverse rods may themselves be shaped by doubling back on themselves to provide the gripping bars 52. Likewise, the terminal ends of the transverse rods 41, 42 and 43 may be coated with soft plastic or rubber, or encased in a tube of such material, which will then provide the necessary gripping and acoustical insulating engagement with the hearing aid in lieu of grip bars 52 and pads 56 illustrated in the drawing. Variable numbers of centrally disposed transverse loops, similar to 41 and 42, may be provided, but usually two will be adequate. Any number of modifications may be devised for the bottom supports in Figure 5. For instance, the inwardly presenting rod ends 50, gripping bars 52 and pads 56 may be eliminated and a band of elastic may be fastened to the opposite long sides of the lowermost transverse loop 43. An additional wire loop or series of rods, acoustically insulated in the manner herein disclosed, may be rigidly connected across the depth dimension and centrally of the width dimension of lowermost rectangular rod 43. In the event the rods 41 and 42, provided with pads for gripping the edges of the hearing aid, are constructed of a stiffness and resiliency sufficient to maintain the hearing aid in fixed position against displacement forces of ordinary proportions, no bottom support need be provided.

The embodiment illustrated in Figure 6 is also susceptible of many variations, as, for example, the frame wall may be made of substantially mesh material. Various disposed perforations and openings may be made in the frame. The acoustically insulating spacers 68 may be of various materials, shapes, and arrangements.

It will further be understood that while the invention has been illustrated herein with reference to a hearing aid instrument of substantially rectangular solid shape, the novel teachings of the invention are applicable to carrier frames for instruments of other shapes.

Having thus described the invention, what we desire to protect by Letters Patent is as defined in the following claims:

1. A protective carrier for a pocket-type audio device comprising a frame having larger cross sectional dimensions than said device, said frame comprising a plurality of stiff, resilient, transverse guard wires for defining the cross sectional dimensions of said frame, and a plurality of longitudinally disposed guard wires rigidly connected to said transverse guard wires to maintain said transverse guard wires in fixed spaced relationship, certain of said transverse guard wires having their free ends disposed at opposite sides of said frame and having formed thereon a grip bar faced within acoustical insulating material adapted frictionally to engage and support said audio device between said oppositely disposed free ends within the enclosure defined by said guard wires.

2. A protective four-sided enclosing frame for a pocket-type audio device comprising a plurality of transverse guard wires shaped to define cross sectional areas of greater dimensions than the cross sectional dimensions of said device and formed by more than one convolution of said wire, said wires having their free ends disposed at opposite sides of said frame, longitudinally disposed guard wires rigidly connected to corresponding portions of each of said transverse guard wires for normally maintaining same in fixed, spaced, parallel registering arrangement, the free ends of said transverse guard wires being faced with acoustically insulating material and being adapted frictionally to engage said device between said oppositely disposed free ends to support said device within the enclosure defined by said guard wires.

3. A protective frame as defined in claim 2 wherein said transverse guard wires have overlapping portions extending between said opposite sides of said frame to cause said free ends to move away from each other and disengage said device when constrictive pressure is applied to said opposite sides of said frame.

4. A carrier for removably receiving a pocket-type audio device comprising a frame to extend around at least the four lateral sides and bottom of the device in its normal pocket position to hold the clothing of the wearer out of contact with said four sides and bottom of the device, said frame having an opening for inserting

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and removing the device, and a plurality of resilient members for frictionally engaging and clamping said device securely within said frame and spaced from said frame, said members having acoustical insulating material at least at all points of contact with the device.

5. A carrier for removably receiving a pocket-type audio device comprising a frame composed of widely spaced narrow bars extending around at least the four lateral sides of the device in its normal wearing position to hold the clothing of the wearer out of contact with said four sides of the device with minimum areas of contact between said bars and the clothing, and resilient acoustical insulating members frictionally engaging and clamping said device securely within said frame in spaced relation to said frame, said members engaging said device only at widely spaced points and over relatively small contact areas on the device.

6. A carrier as defined in claim 5 in which at least some of said bars are resiliently deformable and said insulating members are mounted on said deformable bars whereby said device is clamped by said deformable bars and unclamped by applying pressure to said deformable bars.

7. A protective carrier for removably receiving a pocket-type audio device to be worn on the person, comprising a rectangular wire frame to hold the clothing of the wearer out of contact with all parts of the device, said frame having vertical wires of greater length than the height of the device opposite the front and back faces of the device and horizontal wires connected with said vertical wires extending around four sides of the frame in spaced relation to the device, resilient end portions on certain of said horizontal wires disposed on opposite sides of said frame for clamping said device in the frame, and acoustical insulating means on said end portions arranged to hold the device in spaced relation to said wires.

8. A protective carrier for removably receiving a pocket-type audio device comprising a resilient frame having overlapping portions extending in opposite directions between opposite sides of the carrier and terminating in acoustically insulated gripping fingers disposed within said opposite sides of the carrier to grip opposite side edges of an audio device within the carrier, said fingers being movable away from each other to release said grip when constrictive pressure is applied to said opposite sides of the carrier.

9. A protective carrier for removably receiving a pocket-type audio device comprising a metallic frame composed of widely spaced narrow bars extending substantially around at least the four lateral sides of the device in its normal wearing position to hold the clothing of the wearer out of contact with the device with minimum areas of contact between said bars and the clothing, and resilient insulating members at the bottom and two opposite sides of said frame for supporting and frictionally engaging and clamping an audio device securely within said frame in spaced relation to said frame.

10. A protective carrier for removably receiving a pocket-type audio device comprising a metallic frame composed of widely spaced narrow bars extending substantially around at least the four lateral sides of the device in its normal wearing position to engage the inside surfaces of a pocket of the wearer at widely spaced points and hold said pocket out of contact with the device with minimum areas of contact between said bars and the pocket, spring fingers at the bottom and at least two opposite sides of said frame for supporting the device and clamping the device in said frame in spaced relation to the sides of the frame, and insulating material on the supporting and clamping surfaces of said fingers.

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