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[33] **Japan**
[31] **44/8379, 44/17256**

[54] **HOUSING FOR ELECTRONIC APPARATUS**
2 Claims, 4 Drawing Figs.

[52] **U.S. Cl.** **174/50,** 174/58, 317/120
[51] **Int. Cl.** **H05k 5/00**
[50] **Field of Search** 174/50, 52, 58; 317/120, 99

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ABSTRACT: Several unit casings including electronic units respectively are disposed in side-to-side relationship and detachably fixed to a side member. Two covers are fitted onto the opposite ends of the united side member and unit casings and formed into a unitary structure along with the latter by means of a single screw engaging the covers.

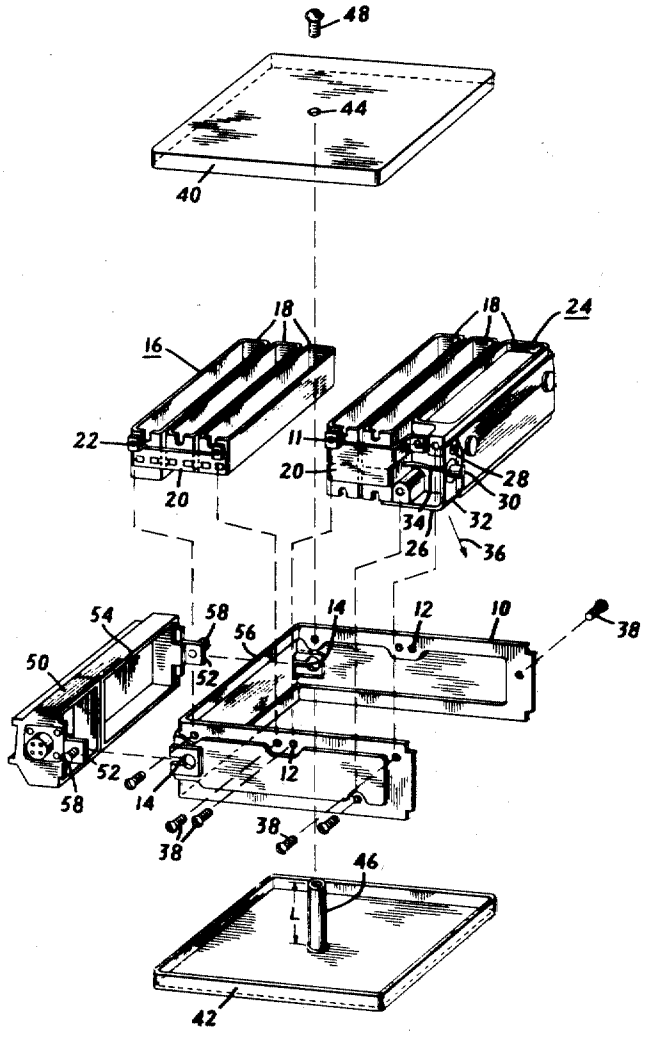


FIG. 1

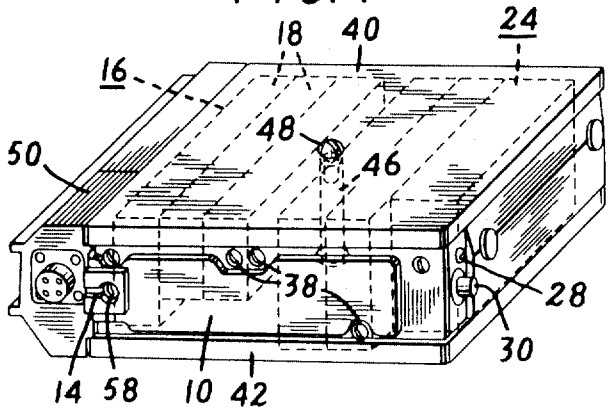


FIG. 3

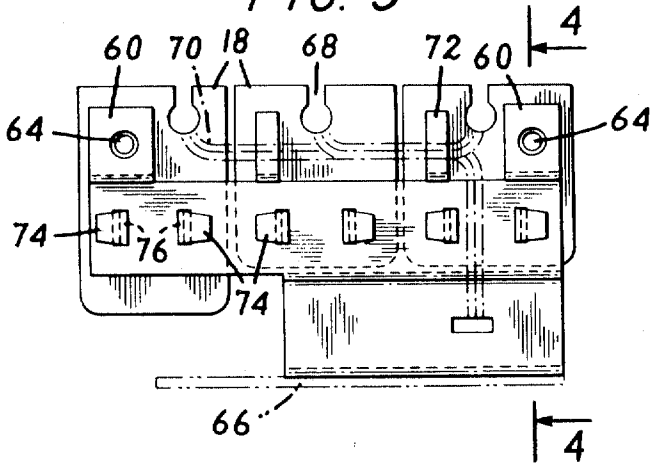


FIG. 4

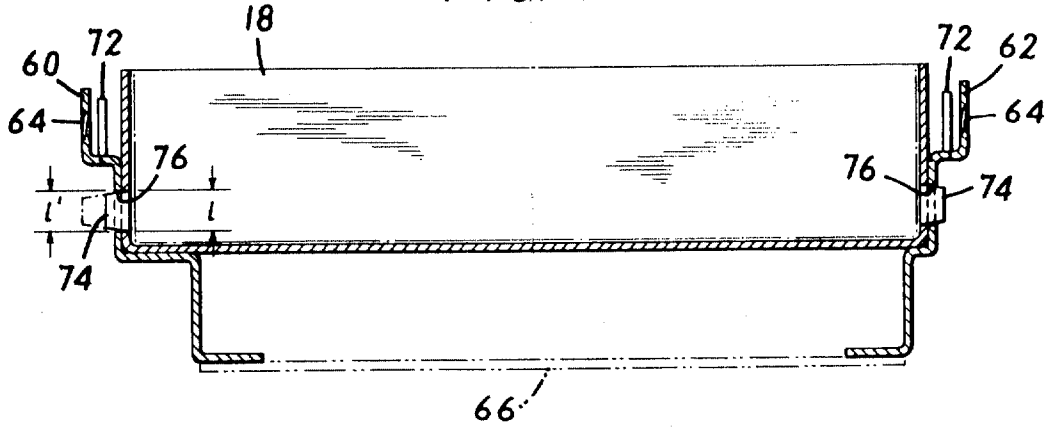
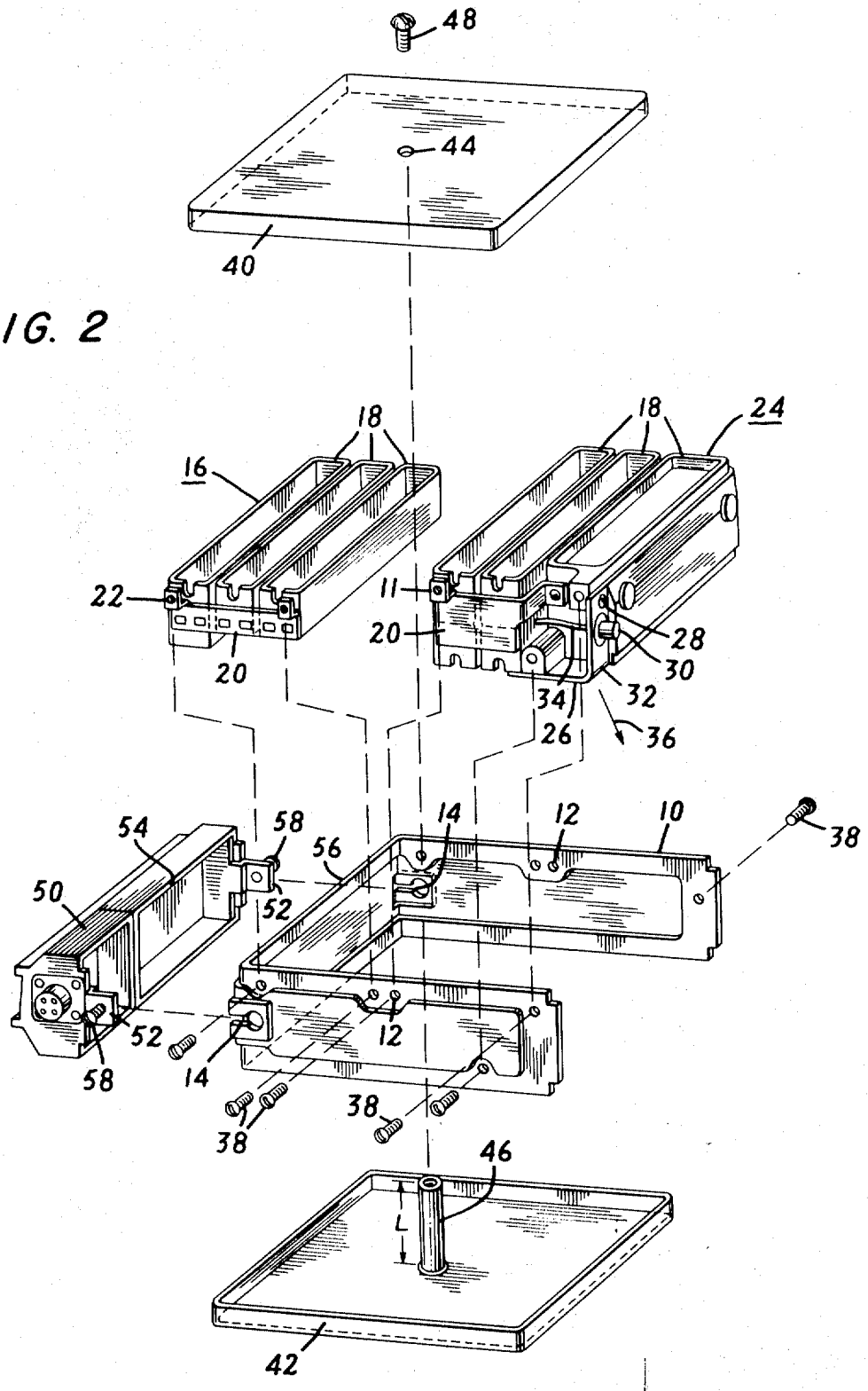


FIG. 2


48
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28
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HOUSING FOR ELECTRONIC APPARATUS

BACKGROUND OF THE INVENTION

This invention relates to improvements in a housing for an electronic apparatus such as communication apparatus wherein a plurality of casings having electronic units disposed therein respectively are mechanically interconnected into a unitary structure.

One type of the conventional housings referred to has comprised a main chassis fixedly secured to a U-shaped side member, for example by welding, screws or riveting, to form a unitary structure having the requisite rigidity. Then a plurality of casings having disposed therein respective electronic units have been screwed to or plugged into the opposite surfaces of the chassis after which a pair of covers are fixedly secured to the upper and lower ends of the side member as by screwing. Another type of the conventional housings has comprised a U-shaped side member fixedly secured to a front member along with the associated main chassis to form a unitary structure having the requisite rigidity. Then a plurality of casings having disposed therein respective electronic units and a pair of covers have been fixedly secured to the united front member, main chassis and side member respectively in the similar manner as in the above-mentioned one type of housings.

Those types of conventional housings, however, have caused some problems. Firstly, they have been relatively large in the number of structural members required and complicated in construction. In every event the housing has included those portions thereof each formed of two- or three-ply parts of the sheet material constituting housing resulting Lin excessive increases in rigidity and quantity of those portions. Secondly, the number of screws, rivets or welded joints used for fixing the castings together into a unit has increased leading to the necessity of performing the assembling operation with manual labor and resulting time being wasted and so on. The problems just described have been an obstacle to the attempts to increase the productivity of housings for electronic apparatus while relieving their weights.

SUMMARY OF THE INVENTION

Accordingly it is an object of the invention to provide a new and improved housing for electronic apparatus good in productivity and maintenance and easily accessible to parts involved.

It is another object of the invention to provide improved means for easily assembling the housings of the type described in the preceding paragraph.

The invention accomplishes these objects by the provision of a housing for an electronic apparatus comprising, in combination, a plurality of unit casings having respective electronic units accommodated therein, a side member having detachably secured thereto the plurality of unit casings, and a detachable cover for closing in common the interiors of the unit casings.

In order to detachably secure the plurality of unit casings to the side member, screws may be preferably used. Alternatively, a plurality of claws may be provided on either of the opposite side faces of each casings and fitted into the complementary holes disposed at their predetermined positions corresponding to those of the claws on the side member after which the claws are bent over the side member.

Advantageously an L-shaped mounting plate having a receptacle seat disposed on one face thereof may be detachably secured to a predetermined portion of the side member or each of selected ones of the unit casings.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will become more readily apparent from the following detailed description taken in conjunction with the accompanying drawings in which:

FIG. 1 is a perspective view of a housing for an electronic apparatus constructed in accordance with the principles of the invention with the unit casings illustrated in phantom;

FIG. 2 is an exploded perspective view of the device shown in FIG. 1;

FIG. 3 is a fragmental side elevational view of a modification of the invention; and

FIG. 4 is a sectional view taken along the section line IV—IV of FIG. 3.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

While the invention will be described in terms of a communication apparatus it is to be understood that the same is equally applicable to electronic apparatus other than the communication apparatus.

Referring now to the drawings and FIGS. 1 and 2 in particular, it is seen that an arrangement disclosed therein comprises a frame 10 formed of any suitable thin sheet metal in a U-shaped cross section for example and has mounting holes 12 and notches 14 disposed at their predetermined positions on both legs of the "U" as best shown in FIG. 2 and for a purpose as will be apparent hereinafter. A receiver casing is generally designated by the reference numeral 16 and shown as including a plurality, in this case, three, of unit casings 18 interconnected in side-to-side relationship and into a unitary structure by a side member 20. The side member 20 may be similarly formed of the same material as the frame 10 into U-shaped cross section and provided with a plurality of screw-threaded mounting holes 22 at their predetermined positions on both legs of the "U." A transmitter casing generally designated by the reference numeral 24 is similar in construction to the receiving casing 16 and the components thereof are designated by the same reference numerals denoting the corresponding components of the receiving casing 16. The transmitter casing 24 is shown in FIG. 2 as including further an L-shaped mounting plate 26 fixed thereto by a screw 28 and having a receptacle seat 30 disposed on one face, in the illustrated embodiment, the exposed right-hand face 32 as viewed in FIG. 2 of the mounting plate. After the screw 28 has been removed from the transmitter casing 24 with a connecting line 34 extending from the interior of the unit casing(s) 18 to the receptacle seat being preliminarily slacken, mounting plate 26 can be pulled out in the direction of the arrow 36 and then rotated through an angle of about 180°. Thereafter the mounting plate 26 can be again fixed to the casing 24 by means of the screw 28. In this way, the mounting plate 26 can vary in its mounted position through the simple operation without the necessity of removing the receptacle seat 30 and/or the connecting line 34 from the mounting plate 26 and/or the casing respectively.

The unit casings 18 forming the receiver and transmitter casings 16 and 24 include the respective electronic units (not shown). Both the casings 16 and 24 are brought into their predetermined positions in a space confined by the frame 10 as shown by the broken lines in FIG. 2 and then fixedly secured in those positions to the frame 10 by having screws 38 extending through the associated mounting holes 12 on the frame 10 and screw-threaded into the aligned threaded holes 22 on the side members 20 as shown in FIG. 1. In their fixed positions the receiver casing 16 is separated away from the transmitter casing 26 by a predetermined distance as shown in FIG. 1 for the purpose as will be apparent later.

Then a pair of upper and lower covers 40 and 42 are snugly fitted onto the upper and lower ends of the side member 10 having disposed therein the receiver and transmitter casings 16 and 24 to close those ends. The upper and lower covers 40 and 42 are provided on those portions thereof facing the above-mentioned space between the casings 16 and 24 with a hole 44 and a stud 46 in axially aligned relationship with the free end portion of the stud 46 having a threaded hole 48. The hole 46 and the stud 44 are preferably disposed on the central portions of the covers 40 and 42 respectively. Both the covers 40 and 42 are fixedly secured to the frame 10 by having a fastening screw 48 screw threaded into the threaded hole 44 on the end portion of the stud 40. It is noted that the stud 46 such a length that the upper and lower covers 40 and 42 in their assembled position are applied with tensioning forces.

In the arrangement illustrated, the receiver casing **16** has been mechanically connected to the transmitter casing **24** through the frame **10** by means of the screws **38** engaging the mounting holes **12** on the frame **10** and the threaded holes **22** on the casings **16** and **24** aligned to the respective holes **12** whereby both the casings have been formed into a unitary structure having a mechanical strength resulting from the composition of the mechanical strengths of both casings and a rigidity increased to the requisite magnitude.

In addition, the upper and lower covers **40** and **42** have been snugly fitted onto the outer periphery of the frame **10** on the opposite ends and the fastening screw **48** extending through the hole **44** on the upper cover **40** then is put in screw threaded engagement with the stud **46** on the lower cover **42** to pull both the covers toward each other until the covers are recessed on the central portions enough to contact the internal surface of the upper cover **40** with the free end of the stud **46** on the lower cover **42**. At that time the proper fastening force is provided with the result that the covers **40** and **42** are completely fixed to each other. Under such assembled conditions, the housing for an electronic apparatus, in this case the communication apparatus, according to the invention has been completed including various components such as the frame **10**, the upper cover **40**, the lower cover **42** etc., disposed around the receiver and transmitter casings **16** and **24** and effectively cooperating to one another to exhibit a rigidity required for the housing and also a mechanical strength sufficient to withstand any external force applied to the housing.

Thus it will be appreciated that the upper cover **40** can readily be engaged by and disengaged from the lower cover **42** through the operation of the single screw **48**. Thus after the covers **40** and **42** have been removed, the interior of the receiver and transmitter casings are permitted to be readily inspected and adjusted whenever it is necessary to do so.

If necessary, a control panel **50** may be fixedly secured to the frame **10** in the manner as will be subsequently described and as shown in FIG. **1**. The control panel **50** can be attached to one side, in this case, the bottom of the "U" of the frame **10** by having a pair of mounting lugs **52** on the opposite sides thereof fitted into the above-mentioned notches **14** on the frame **10** until the rear side **54** of the control panel **50** abuts against the exposed surface **56** of the bottom of the U-shaped side member **10**. Then screws **58** extend through the lugs **52** and engage the associated threaded holes on the frame **10**.

FIGS. **3** and **4** illustrate a modification of the invention wherein claws are used in place of the screws for the purpose of fixedly securing the casings **16** and **24** to the frame performing the same operation as the side members **20** shown in FIG. **2**. The frame is shown in FIG. **4** as being of a pair of mounting brackets **60** and **62** attached to a unit casing **18** such as the unit casing **18** shown in FIGS. **1** and **2** in the manner as will be described hereinafter. The mounting brackets **60** and **62** have disposed at one end mounting threaded holes **64** serving to rigidly secure the associated bracket **60** or **62** to the frame **10** not shown in FIGS. **3** and **4**. If desired, the mounting brackets **60** and **62** may have attached thereto two or more unit casings. The unit casing **18** can be operatively associated with a baseplate **66** on which a printed circuitry (not shown) is disposed, fixed to the other ends of the mounting brackets **60** and **62** by means of screws or the like (not shown). The unit casing **18** is provided on those opposite sides thereof attached to the brackets **60** and **62** with a plurality of notches **68** through which electric conductors **70** extend, and a plurality of guides **72** for the electric conductors **70**. Further a plurality of tapered claws **74** are embossed at their predetermined positions on that portion attached to each bracket **60** or **62** of either of the opposite side surfaces of the unit casing **18** while a plurality of rectangular holes **76** complementary to the claws **74** are disposed at their positions corresponding to those of the claws on that portion thereof attached to the unit casing **18** of the individual bracket. Then the claws **74** are snugly fitted into the respective holes **76** as best shown by broken lines on the right-hand portion of FIG. **4** and then bent over the associated brackets **60** and **62** as shown by solid lines on the left-hand portion of FIG. **4** and also in FIG. **3**. As shown in FIG. **4**, each of the claws **74** includes its root portion having a dimension of "**1**" substantially equal to the dimension "**1**" of the rectangular hole **76**. Therefore the unit casing **18** is mechanically fixed to the frame **60–62** to form a unitary structure as in the previous embodiment. This provides an advantage that the unit casing **18** is maintained electrically connected to the side member or the mounting brackets **60** and **62** without any fear that jog will occur between the unit casing and the brackets in response to any mechanical vibration.

Also in order to electrically connect one to another casing **18**, electric conductors such as shown by the reference numeral **70** can extend through the associated notch or notches **68** preventing the same form floating off while at the same time the conductors are clamped by the guide or guides **72** thereby to eliminate the necessity of bundling the conductors together. In addition, the baseplate **66** for a printed circuitry (not shown) can be easily secured to the brackets **60** and **62** on the other bent end portion as shown in FIG. **4** and by means of screws or the like.

While the invention has been illustrated and described in conjunction with a few embodiments thereof it is to be understood that various changes and modifications may be resorted to without departing from the spirit and scope of the invention. For example, the frame **10** may be in a flat shape rather than in a U-shape Also, to fix one to another component, any suitable fasteners may be used instead of the screws as previously described as long as they are possible to be engaged by and disengaged from the associated components. Further the L-shaped mounting plate **36** may be secured to a selected one of the unit casings **18**.

What is claimed is:

1. A housing for electronic apparatus comprising in combination, a plurality of unit casings for accommodating therein respective electronic units constituting an electronic apparatus, at least one side member having detachably secured thereto said plurality of unit casings, a frame detachably secured to said one side member, each of said unit casings having claws disposed on either of the opposite faces of each of said unit casings, said side member having a plurality of holes complementary in shape and corresponding in position to said claws for receiving said claws fitted into said respective holes, said claws being bent over said side member, and a cover and a bottom detachably secured to said frame to close in common the interiors of said unit casings.

2. A housing for an electronic apparatus comprising, in combination, a plurality of unit casings for accommodating therein respective electronic units forming an electronic apparatus, at least one side member having detachably secured thereto said plurality of unit casings, a frame detachably secured to said one side member, each of said casings having a plurality of claws disposed on either of the opposite faces of each said unit casings, said side member having a plurality of holes complementary in shape and corresponding in position to said claws receiving said claws fitted into said respective holes, said claws being bent over said side member, top and bottom covers detachably mounted closing the interior of said casings, one cover having a hole and the other cover having a stud with a threaded hole on a free end thereof, and a fastening screw extending through said hole of said one cover and engaging said threaded hole on the free-end portion of said stud on the said other cover.

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