United States Patent [19]

Baker

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[54] **ANGULARLY POSITIONABLE ELECTRICAL CONTACT HOUSING**

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[52] **U.S. Cl.** ..... **339/91 R**

[51] **Int. Cl.** **H01r 13/54**

[58] **Field of Search** 339/75, 91

[56] **References Cited**

UNITED STATES PATENTS

1,364,335	1/1921	White	339/75 R
3,171,704	3/1965	Meile	339/75 R
3,744,009	7/1973	Teagno et al.	339/91 R

FOREIGN PATENTS OR APPLICATIONS

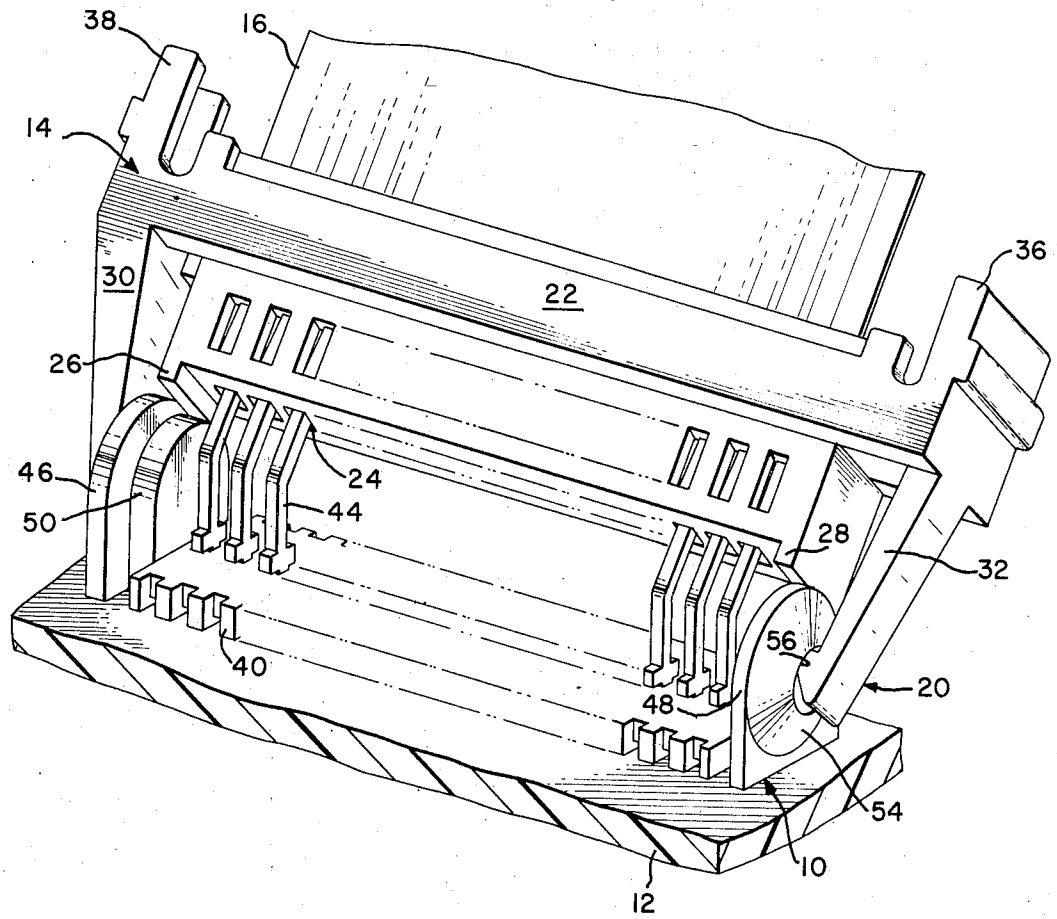
1,131,744	10/1956	France	339/91 R

Primary Examiner—Joseph H. McGlynn

[57] **ABSTRACT**

An electrical contact housing assembly is disclosed in which the male and female members can be mated at any relative angle up to 90° to either side of a rectilinear aligned position. The male member is provided with a pair of spaced conical lead-in surfaces and receives therein a plurality of pins which are bent to the desired angle about an axis defined by the conical lead-in surfaces. The female member includes passageways for holding therein alike plurality of receptacle contacts fixed to appropriate leads, such as flexible flat cable, and a pair of spaced locking ears which engage the lead-in surfaces.

6 Claims, 3 Drawing Figures



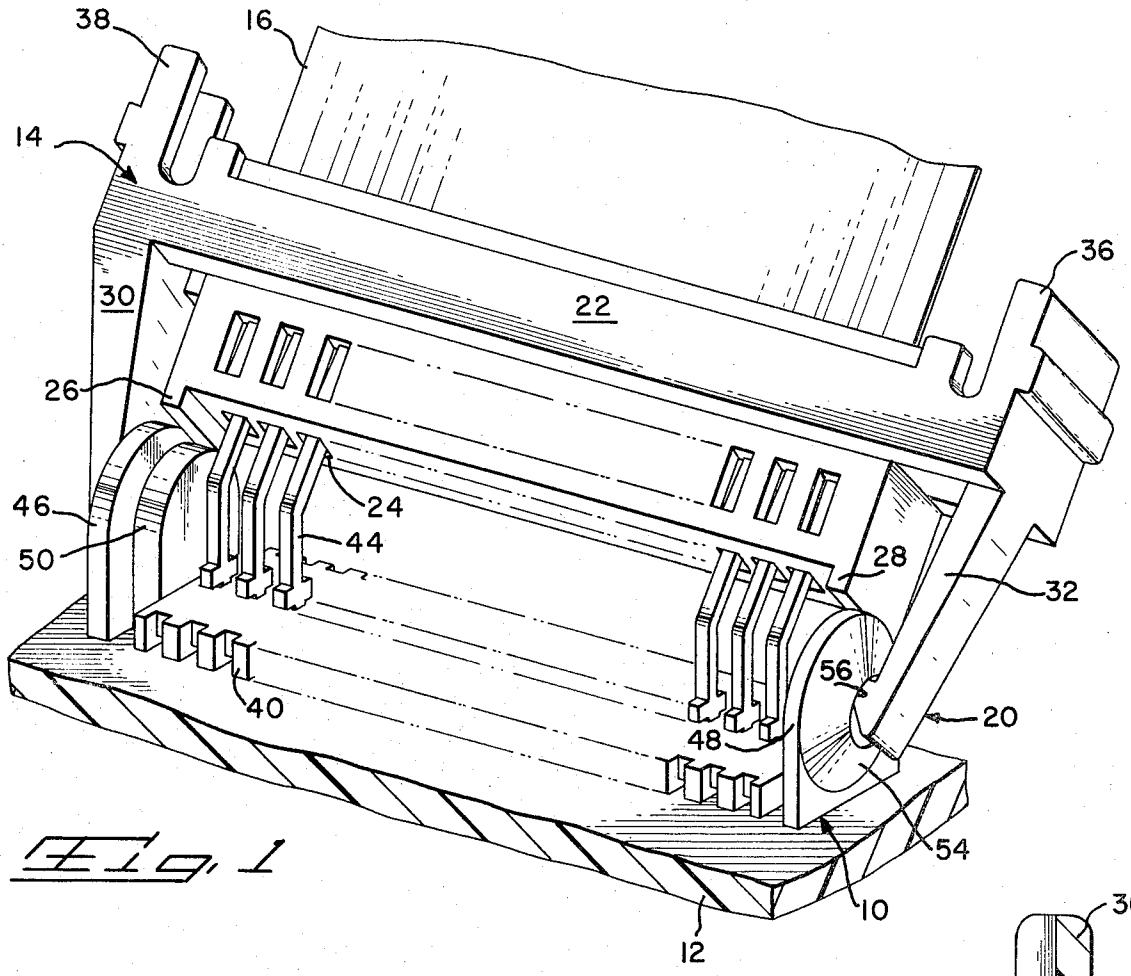


Fig. 1

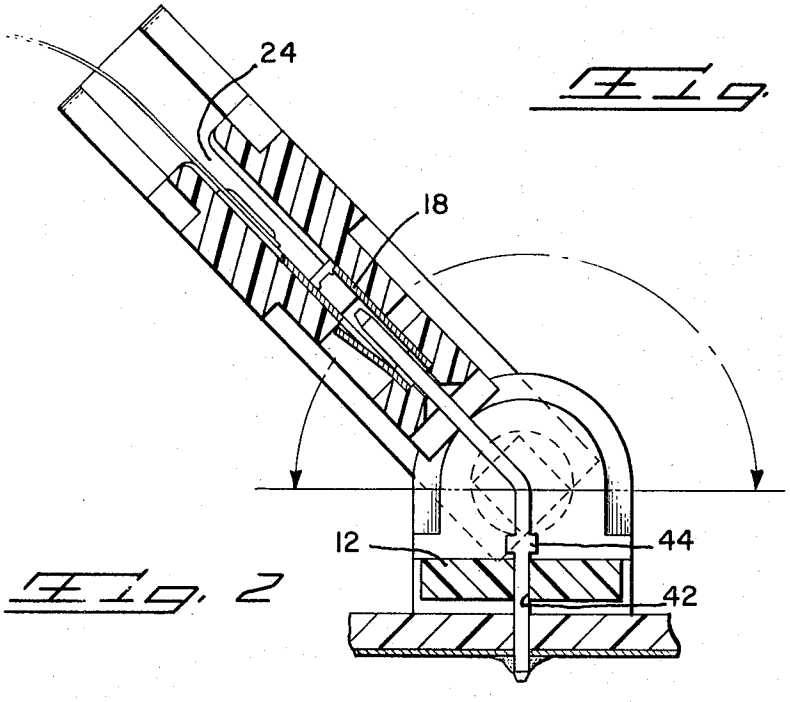


Fig. 2

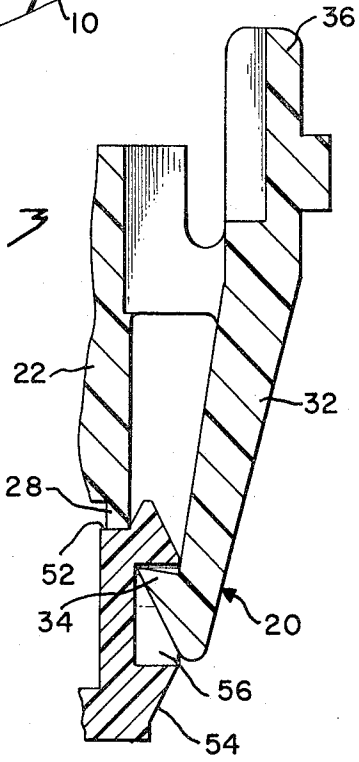


Fig. 3

ANGULARLY POSITIONABLE ELECTRICAL CONTACT HOUSING

BACKGROUND OF THE PRESENT INVENTION

1. The Field of the Invention

The present invention relates an electrical contact housing assembly in which the male member can be mated with an existing female at any angle up to 90° degrees to either side of the normal rectilinear engagement direction. In particular, the members can be mated at any desired angle simply by bending the associated posts about a particular axis relative to the male member thus eliminating any housing modifications necessary for any particular mating angle.

2. The Prior Art

There are many well known contact housing assemblies which comprise a pair of mating housing members arranged to be engaged or disengaged by relative rectilinear movement. Normally the electrical contacts mounted in the housing members and the associated wires extend from the members in the direction of movement. This, in some instances, presents some problems where, for example, it is desirable for the wiring to extend from the contact housing assembly in a different direction due to limited access space. It has been proposed, as one possible solution for this problem, to lead the wiring from a contact housing assembly at an angle inclined with respect to the mating direction through lateral apertures in the contact housing assembly. This, however, requires different housing members or special adapters for each contact application requiring a particular angle of wiring leadout. There may be difficulty in assembly of such contacts and wiring in a contact housing member because of the inclination of the wiring leadout direction to the mating direction.

There are also situations where the use of a mating contact housing assembly is made difficult due to lack of access space for engaging or disengaging the housing members when assembled in apparatus, for example, in the confined space between conventional circuitry panels.

One solution for the above problem is found in U.S. Pat. No. 3,601,746. The electrical contact housing assembly disclosed in this patent comprises two housing members one of which is adapted to receive blade shaped electrical contacts and the other of which is adapted to receive complementary fork shaped contacts. The members have complementary means for releasably connecting them together so that one housing member can be rotated to different angular positions relative to the other housing member. The members are held in the preferred set position by a trunnion on one housing member engaging with a complementary bearing on the other housing member. The fork shaped contacts merely rotate on the blade contacts during this movement and do not serve to hold the members in any particular orientation.

Other proposed solutions are found in U.S. Pat. Nos. 3,171,704 and 3,190,978. However, these solutions appear to have only limited application because of structural considerations. The first of these patents shows a quick-connect type housing which cannot be locked at any given angle and the second of these patents shows a rotatable connector which can handle only a limited number of contacts.

SUMMARY OF THE PRESENT INVENTION

The present electrical contact assembly includes two mating members that can be engaged and disengaged at any angle between a normal position for relative rectilinear movement and positions perpendicular to either side of the normal position. One of the members is provided with a pair of spaced conical lead-in surfaces and adapted to receive a plurality of pins which project therefrom and are bent in the desired direction about an axis defined by the lead-in surfaces. The other of said members has a plurality of passageways adapted to receive a like plurality of complementary receptacle contacts therein and is provided with an opposed set of locking ears which engage the conical lead-in surfaces on the other member.

It is an object of the present invention to provide an electrical contact housing assembly in which the members may be engaged or disengaged at any relative angle within a 180° arc without modifying either member for any particular angle.

It is a further object of the present invention to teach a method for assembling members of an electrical contact housing assembly at any desired angle by bending the pins of the male member about an axis which is coaxial with conical lead-in means receiving locking ears of the other member.

It is a further object to produce a male member of an electrical contact housing assembly which can economically be produced and receive female members at any angle up to 90° to either side of the normal rectilinear mating direction.

The foregoing and other objects and advantages of the present invention will become apparent to those skilled in the art from the following detailed description taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of the subject electrical contact assembly with the members mated at an angle with respect to the normal mating direction;

FIG. **2** is a vertical section through the electrical contact assembly of FIG. **1**; and

FIG. **3** is an enlarged detailed sectional view of the mating locking portions of the assembly.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The present adjustable angle electrical contact housing assembly comprises a male member **10** mounted on a fixed support **12**, such as a printed circuit board, and a detachable female member **14** adapted to receive therein a plurality of leads and contacts, such as the illustrated flat flexible cable **16** and associated receptacle contacts **18**. The two members are detachably secured together by locking means **20**.

The female member **14** is of a generally well known type and is somewhat similar to the one shown in U.S. Design Pat. No. 210,533. The female member **14** has a body portion **22** with a plurality of parallel through passageways **24** each adapted to receive therein a contact receptacle **18** fixed to the end of a lead, such as the flat flexible cable **16** shown. Flanges **26, 28** extend forwardly from opposite ends of the body portion **22** and locking ears **30, 32** are fixed to opposite ends of the female member extending transversely to the

longitudinal axis of the member and capable of limited pivotal movement. One free end of each locking ear is provided with a projection **34** extending inwardly toward the other of the ears while the other end of each locking ear forms an actuating tab **36, 38.**

the male member **10** includes a body portion **40** having a plurality of orifices **42** therein each adapted to receive a pin **44.** At each end of the male member there is an integral upstanding portion **46, 48** each having an arcuate shoulder **50, 52** formed on the inner side and a truncated conical lead-in portion **54** formed on the outer side. An axial bore **56** is formed in the conical lead-in portion. Each pin **44,** after being inserted into the male member **10,** is bent to the desired angle about an axis defined by the bores **58.**

The male member of the contact assembly is mounted on an appropriate board or chassis **12** by first securing the pins **44** in the body **40** of the male member **10** and associated board **12** by any well known means, such as dip soldering, to make an appropriate electrical connection therewith. The pins **44** are then bent to the desired angle, by means not shown, about an axis coaxial with the bores **56** in the conical lead-in portions **54.** The female member is assembled in the conventional manner with the flat flexible cable **16** and attached receptacles **18.** The female member **14** is then mated with the male member **10** simply by bringing the members together at the desired angle until the flanges **26, 28** abut shoulders **50, 52,** respectively, and the projections **34** of the locking ears **30, 32** engage in the bores **56** of the conical lead-in portions **54.** The flanges **26, 28** on the body **22** of the female member **14** abut the arcuate shoulders **52** of the male member **10** to prevent relative overtravel of the female member.

The only thing that is necessary to change in order to have a different relative mating angle between the members is the bend angle of the pins. It is not necessary to structurally change either the male or female members of the housing to achieve an assembly angle of up to 90° to either side of the normal rectilinear assembly direction.

The present embodiment has been shown with a single row of pins but is suitable for application with a wide variety of pin arrangements and configurations. The present embodiment is therefor intended to be merely illustrative and not restrictive. All changes which come within the meaning and range of equivalency are therefore to be specifically embraced therein.

What is claimed is:

1. A electrical contact housing assembly comprising:

first and second housing members of electrically insulating material, a plurality of female receptacles fixedly mounted in one of said members and a like plurality of male pins fixedly mounted in the other of said members arranged to be linearly slidably received in a corresponding female receptacle,

complementary locking means on said housing members releasably connecting the housing members together such that one housing member can be engaged at different angular positions relative to the other housing member so that the receptacles are aligned with the pins, and

said pins being bent prior to engagement to a predetermined fixed angle of engagement about an axis defined by said locking means.

2. An electrical contact housing assembly according to claim **1** wherein said locking means comprises a pair of spaced locking ears on one of said housing members, each said ear having on a free end a tab extending inwardly toward the other said ear, and

a pair of spaced outwardly directed truncated conical lead-in surfaces formed on the other housing member, each said lead-in surface having an axial bore the axis of which corresponds to the axis of the bends of said pins.

3. An electrical contact housing assembly which can be linearly mated along any preset relative angular direction within a 180° arc, comprising:

a male member including a body of insulating material, a plurality of pin contacts fixedly mounted in said body, and a pair of spaced lead-in surfaces integral with said body, said pin contacts extending from said member to an axis defined by said lead-in surfaces and being bent about said axis to extend linearly along said preset direction; and

a female member including a body of insulating material a plurality of female receptacle contacts fixedly mounted in said body, and a spaced pair of locking ears integral with said body having tab means adapted to engage said lead-in surfaces,

whereby said male and female members can be linearly mated only at the preset angle determined by the bent portion of said pin contacts.

4. An electrical contact housing assembly according to claim **3** wherein:

said lead-in surfaces extend integrally from opposite ends of said male member body and comprise a pair of oppositely directed, truncated conical surfaces each having an axial bore therein.

5. An electrical contact housing assembly according to claim **3** wherein:

said contact pins extend through said male members body whereby said body is fixedly mounted on associated circuitry means.

6. An electrical contact housing assembly according to claim **4** wherein:

said locking ears on said female member body comprise lever members pivotally mounted at opposite ends of said body extending transversely to the longitudinal axis thereof, and

said tab means extend in opposite directions from the free ends of said lever members to engage in said bores of said male member lead-in surfaces.

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