

Feb. 25, 1969

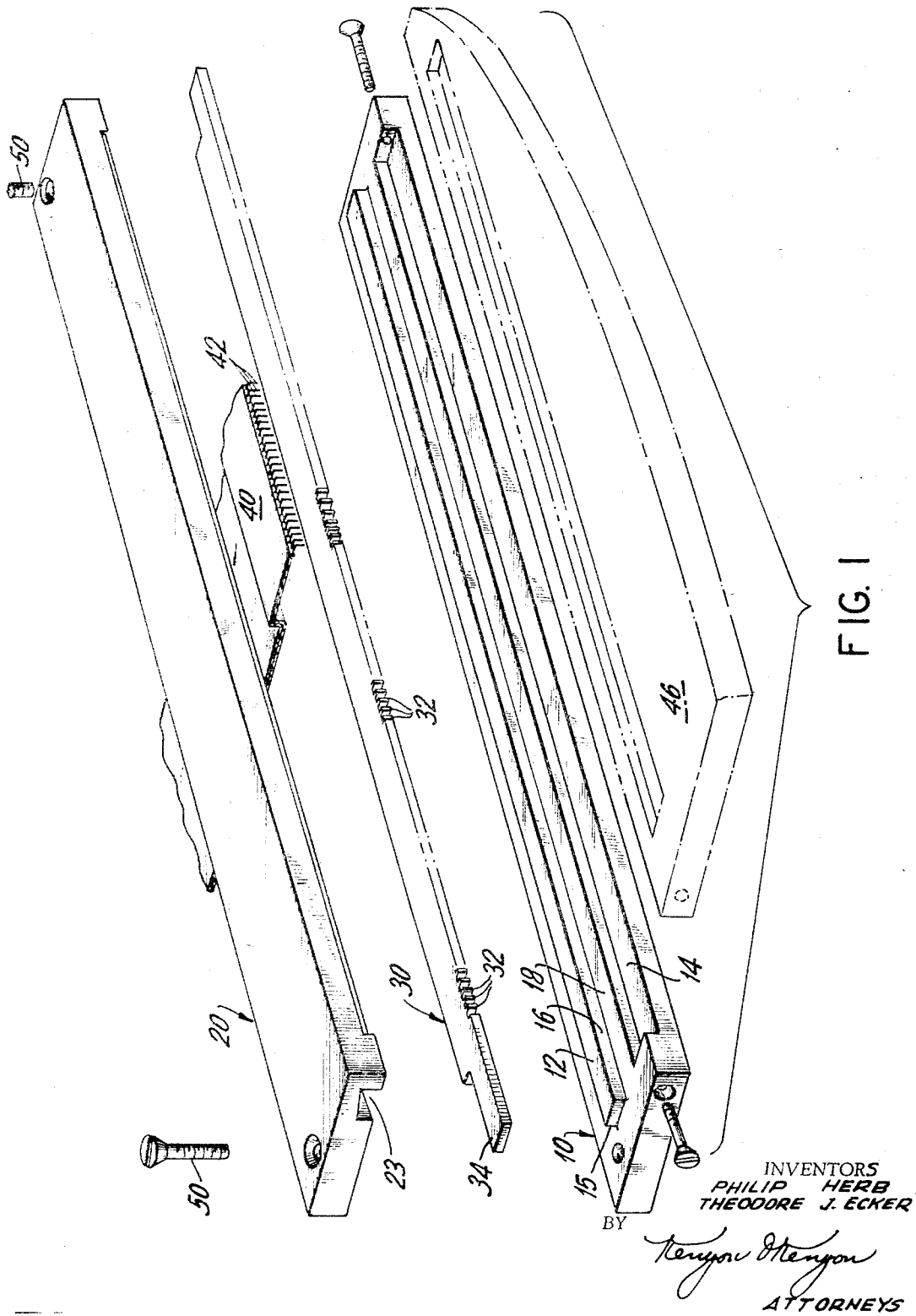
P. J. HERB ET AL

3,430,186

CONNECTOR ASSEMBLY

Filed Sept. 7, 1967

Sheet 1 of 2



Feb. 25, 1969

P. J. HERB ETAL
CONNECTOR ASSEMBLY

3,430,186

Filed Sept. 7, 1967

Sheet 2 of 2

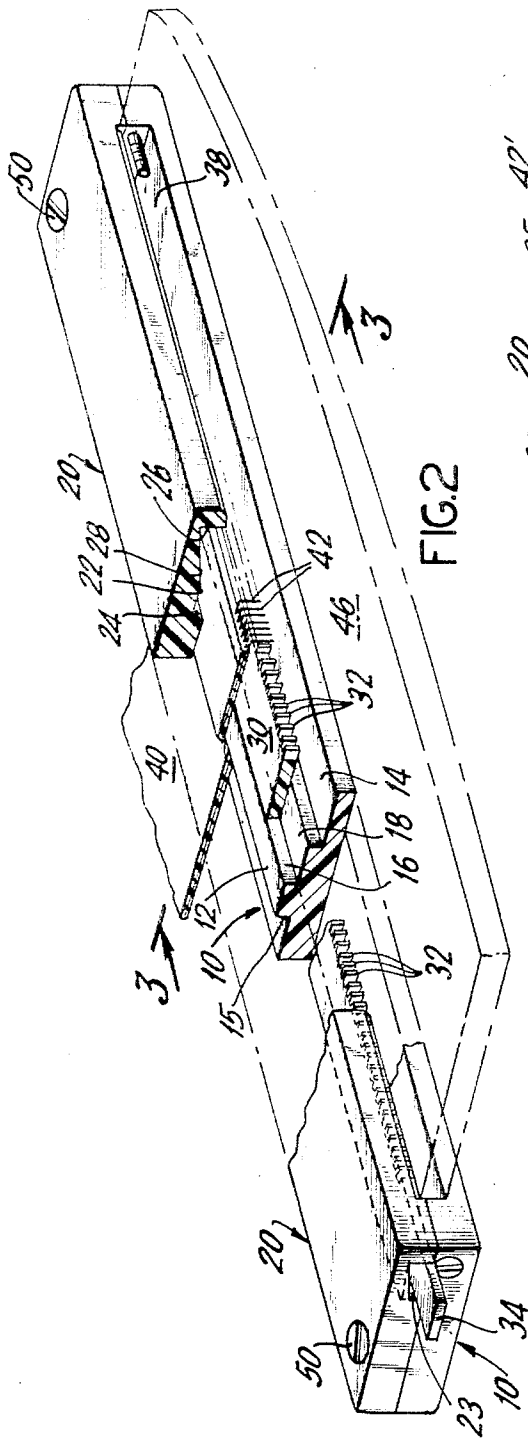


FIG. 2

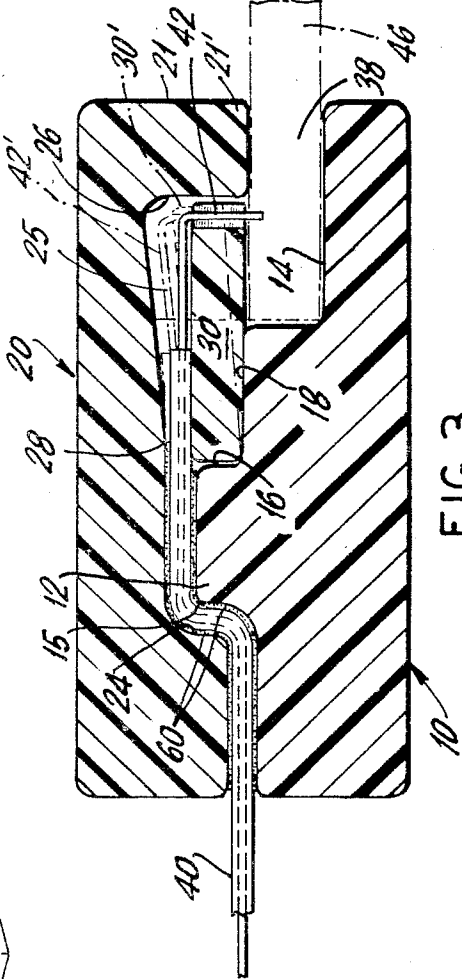


FIG. 3

INVENTORS
PHILIP HERB
THEODORE J. ECKER
BY
Merion Merion
ATTORNEYS

1

2

3,430,186

CONNECTOR ASSEMBLY

Philip J. Herb, North Branch Station, N.J., and Theodore J. Ecker, Chalfont, Pa., assignors to Thomas & Betts Corporation, Elizabeth, N.J., a corporation of New Jersey

Filed Sept. 7, 1967, Ser. No. 666,054

U.S. Cl. 339-74

6 Claims

Int. Cl. H01r 13/46; H05k 1/00

ABSTRACT OF THE DISCLOSURE

The invention relates to a connector assembly having particular application in cryogenic memory systems for connecting the individual conductors of a multi-conductor flat cable to the conductors on a printed circuit board. Basically, the connector is comprised of a base member, a cover plate, and a lifter bar which fits in an internal cavity in the connector that is formed when the cover plate and the base plate are assembled. More particularly, the cover plate is formed with a longitudinal recess while the base member is formed with a longitudinal relief to receive a memory board and with a longitudinal rib that fits in a portion of the longitudinal recess of the cover member. The portion of the recess which is not occupied by the rib is designed to accommodate the lifter bar for tilting movement. The lifter bar is provided with slots that extend along one longitudinal edge and serve to separate and appropriately orient each of the individual conductors of the multi-conductor flat cable. To assemble the connector, the lifter bar is placed on the base member adjacent to the rib in such a manner that the slots for the individual conductors overlie the relief in the base member provided for the memory board. The multiple conductor cable is then placed on the connector assembly base member with each connector fitting through one of the lifting bar slots and depending downwardly. The cover plate is then secured to the base member by appropriate means and thereby exerts a compressive force on the flat conductor cable sufficient to deform the cable around the rib in the base member to effect strain relief at that point. The lifter bar is then tilted in a counterclockwise direction to raise the conductors from the relief in the base member that cooperates with the cover member to form a slot in the assembly that the printed circuit memory board is designed to occupy. The printed circuit memory board is then inserted into the slot and the lifter bar is subsequently tilted in a clockwise direction to allow the depending individual conductors to positively contact the conductors on the printed circuit memory board.

BACKGROUND OF THE INVENTION

Field of the invention

The invention relates to a connector designed to facilitate connection of multi-conductor flat cable to printed circuit boards. In particular, the connector is directed to the problem of connecting individual fine gauge conductors of a multi-conductor cable to conductors on printed circuit boards in a cryogenic memory environment.

Prior art

A variety of connectors for securing multi-conductor flat cables to printed circuit boards exist. Among the connectors presently available for connecting the individual conductors to the conductors of a printed circuit board are clamping devices, which positively force the conductors of the cable into engagement with the conductors of the printed circuit board, adhesive substances which effectively glue the cable conductors to the printed circuit

board and the printed circuit board terminals into which the cable conductors may be inserted. However, due to the fineness of the conductors necessary for use in cryogenic memory systems, the prior art connectors are all unsuitable.

Cryogenic memory systems were developed to take advantage of the superconductive characteristics which certain metals exhibit at low temperatures. These superconductive metals, when placed in a cryogenic environment, may perform logical as well as memory functions. Hence, the superconductive metals can be used in a memory system to replace most of the active components normally required in a typical memory system.

The use of superconductive metals to perform logical and memory functions also facilitate miniaturization of the system. Furthermore, optimum design of a cryogenic memory system requires that the cryogenic environment occupy as small a volume as possible. Therefore, the cryogenic memory system is normally miniaturized. Consequently, a space requirement problem arises when paths to the system components must be provided for the printed circuit memory boards, which may number as many as 1500. This problem has been solved by using conductors of fine gauge beryllium copper.

In addition, it has been found that only glass memory boards will operate satisfactorily in a cryogenic application. However, glass memory boards are somewhat delicate and therefore, susceptible to being scratched by conductors sliding thereon. Accordingly, the combination of using miniaturized components and glass printed circuit memory boards in a cryogenic memory application requires the use of a specially designed connector capable of connecting fine gauge conductors to the glass printed circuit memory boards without damaging either.

Therefore, it is an object of the present invention to provide a device designed to connect the individual conductors of a multi-conductor flat cable to the appropriate conductors on a glass printed circuit memory board.

It is another object to provide a device which will facilitate connecting the thin gauge conductors of a multi-conductor flat cable to a printed circuit board that has particular use in cryogenic memory systems.

Another object of the present invention is to provide a connector that will facilitate lowering the individual members of a flat conductor cable into direct positive contact with the conductors on a printed circuit board having particular application in cryogenic memory systems.

The invention contemplates as an additional object thereof, a connecting device capable of utilizing the inherent resiliency of beryllium copper conductors to effect positive contact with the conductors on a printed circuit board.

A still further object of the invention is to provide a connecting device which will have provisions to separate the individual conductors of a multi-conductor flat cable and maintain them in proper orientation.

Still another object of the present invention is to provide a connector device for multi-conductor flat cable to printed circuit boards which has strain relief provisions for the cable inherently designed therein.

Yet a further object of the present invention is to provide a connector adapted to facilitate connection of multi-conductor flat cable in the individual conductors thereof to the appropriate conductors on a glass printed circuit memory board which has the inherent capacity to lift or drop the individual conductors out of or into contact with the appropriate conductors on the board.

A further object of the invention is to provide a connector directed to the problem of connecting the individual conductors of multi-conductor flat cable to the conductors on a glass printed circuit memory board which

connector will occupy a minimum of space and which is particularly suitable for cryogenic memory systems.

SUMMARY OF THE INVENTION

The invention is a connector for securing the individual conductors of multi-conductor flat cable to appropriate conductors on a glass printed circuit memory board. The connector consists of a base member, a cover member, and a lifter bar appropriately slotted to accommodate the individual conductors of the multi-conductor flat cable. The base member and cover member are adapted to be secured together and are internally structured such that, when assembled, they provide both an internal cavity for the lifter bar, which cavity is sized to allow the lifter bar to deflect, and strain relief means for the multi-conductor flat cable. The contour of the base member also includes a longitudinal relief for the insertion of a printed circuit memory board therein. Functionally, the connector assembly secures the multi-conductor flat cable between the cover and base plate with the insulation stripped ends of the individual conductors depending through the slots of the lifter bar into the relief in the base member provided for the printed circuit memory board. As a final step, the lifter bar is tilted upwardly to raise the conductor ends from the printed circuit board opening, the printed circuit board is inserted in the opening and the lifter bar is returned to its normal position to thereby allow the conductor ends to contact the conductors of the printed circuit board.

DESCRIPTION OF THE DRAWINGS

A better appreciation of the invention can be had from the following detailed specification taken in conjunction with the attached drawings in which:

FIG. 1 is an exploded perspective view of the connector assembly with a multi-conductor flat cable;

FIG. 2 is a perspective view of the connector in its assembled form with the flat conductor cable secured therein and with a cut-away to show the detail of the connector interior;

FIG. 3 is a sectional view along the plane 3—3 of FIG. 2.

DESCRIPTION OF PREFERRED EMBODIMENT

In order to better illustrate the invention, one example of the connector assembly will be described.

This particular embodiment of the invention consists of a base plate 10, a cover plate 20, and a lifter bar 30. As best seen in FIG. 1, the base plate 10 is substantially rectangular and is provided with a longitudinal rib 12 and a frontal relief 14.

The cover plate 20 is also substantially rectangular since its outside dimensions are virtually identical to those of the base plate 10. In addition, the cover plate 20 is provided with a longitudinal recess 22. The longitudinal recess 22, seen in FIG. 2 and FIG. 3, extends from the rear wall 24 to the forward wall 26 with the depth of the recess remaining constant from the rear wall 24 to an intermediate point 28. From the intermediate point 28 to the forward wall 26, the depth of the recess continually increases with the recess 22 extending the entire length of the cover plate 20 at the fore section to form side openings 23. The recess 22 is shaped to cooperate with the rib 12 formed on the lower base member 10 to provide the assembly with strain relief means for the multi-conductor flat cable 40 and to define, with both surface 18 on base member 10 and wall 16 of rib 12, a cavity 25 to accommodate the lifter bar 30 for tilting movement. The forward extension 21 of the cover member 20 and the lifter bar 30 cooperates with the frontal relief 14 of base plate 10 to form an opening 38 for insertion of the printed circuit memory board 46. As an option, the forward extension 21 of the cover member 20 may be provided with a chamfer 21' to facilitate inserting the printed circuit memory board 46 therein.

The lifter bar 30 is provided with a multiplicity of slots 32 extending along the entire leading edge thereof through which each of the conductors 42 of the multi-conductor flat cable 40 are arranged to extend. To provide means for tilting of the lifter bar 30, the sides 34 thereof are sized to extend through openings 23 as best seen in FIG. 2. Consequently, by appropriately rotating the sides 34 of the lifter bar 30, the lifter bar 30 can be tilted in either a clockwise or a counterclockwise direction.

To assemble the connector, the lifter bar 30 is placed on surface 18 of the base member 10 with its rear surface 36 in proximity to surface 16 of rib 12 and with the frontal slots 32 overlying the relief 14 in the base member 10 as best seen in FIG. 3.

The flat conductor cable 40, with the insulation stripped from the leading edge of the cable to expose each of the individual conductors 42, is then placed on the lower base member 10. The individual conductors 42 are bent at a 90 degree angle to project downwardly and placed in the individual slots 32 of the lifter bar 30 from which they protrude slightly into the relief 14 as seen in FIG. 3.

When precise alignment of the conductors 42 with the conductors on the printed circuit memory board 46 is certain, the cover member 20 is secured to the base member 10 by bolts 50 or similar attachment means. A sufficient compressive force between the cover plate 20 and the base member 10 must be effected by the attachment means 50 to deform the multi-conductor flat cable 40 to conform to the contour of the rib 12 and rigidly secure the cable 40 thereto to provide strain relief for the cable 40. Additional strain relief can be afforded by applying an adhesive substance 60 shown in FIG. 3 on the rear surface 15 of rib 12 and the rear wall 24 of recess 22 to further assure anchoring the multi-conductor flat cable 40 at that location.

In addition, the extension 21 of the cover member 20 now is in position to cooperate with recess 14 in base member 10 and the undersurface of lifter bar 30 to give final definition to the opening 38 for memory board 46.

The lifter bar 30 must then be rotated in a counterclockwise direction by exerting an appropriate force on the lifter bar extension 34 protruding from the openings 23 in the assembly to lift the ends of conductors 42 from opening 38. With the lifter bar 30 tilted in the position indicated by dotted line 30' and the conductors 42 in the position shown by dotted lines 42', the printed circuit memory board 46 can be inserted in slot 38 and secured therein by appropriate means such as bolts 52. The lifter bar 30 is then rotated in a clockwise direction to allow the conductors 42 to descend into engagement with the appropriate conductors on the printed circuit board 46. Positive contact between the conductors of the printed circuit board 46 and the conductors 42 is insured by the force developed in the conductors 42 as the inherent resiliency thereof biases them toward their original position. It has been found that conductors 42 when made of beryllium copper possess sufficient inherent resiliency to deflect into contact with the conductors on the printed circuit memory board 46. However, it is obvious that the connector of the present invention can be used with any conductor material which is inherently resilient.

Thus, there has been described a connector assembly having particular application in cryogenic memory systems for connecting the individual conductors of multi-conductor flat cable to the conductors of a printed circuit board. The connector assembly is characterized by the contour of the mating members which, by their design, provide strain relief for the multi-conductor flat cable and the capacity to make positive and accurate contact between the individual conductors of multi-conductor flat cable and the conductors on a printed circuit board. Therefore, it can be seen that the connector, as described will have application in any environment wherein inherently resilient fine gauge conductors are employed.

Accordingly, it is intended that the Abstract of Disclosure and the description be interpreted as merely illustrative of the invention and should not be construed to limit it in any way.

We claim:

1. A connector for effecting positive contact between the individual conductor ends of multi-conductor flat cable which are stripped of insulation and are bent at an angle and the conductors of a printed circuit board comprising:

a base member having an intermediately disposed longitudinal rib and a longitudinal relief which forms part of the opening into which a printed circuit board is to be inserted;

a cover member designed for attachment to the base member having a recess formed therein which recess cooperates with the longitudinal rib of the base to deform and anchor the multi-conductor flat cable and which recess also cooperates with the base member to define a cavity within the connector;

a lifter bar provided with a multiplicity of grooves extending along one longitudinal edge thereof for aligned passage therethrough of the individual conductor ends which are bent at an angle, the lifter bar being sized to fit within the cavity in the connector such that the grooves extending along one side longitudinally overlie the relief which is provided for the printed circuit memory board; and

means to tilt the lifter bar.

2. A connector as described in claim 1 wherein the longitudinal recess in the cover member has a constant depth along the portion which extends from one side to an intermediate portion thereof, which section of the recess substantially covers the longitudinal rib on the base member when the connector is assembled and which recess is of continuously increasing depth from the intermediate point to the opposite side thereof to form the cavity within the connector to accommodate the lifter bar whereby the cavity is accordingly of sufficient size and shape to afford tilting movement of the lifter bar therein.

3. A connector as described in claim 1 wherein the portion of the recess formed in the cover member which is

adapted to define the cavity in the connector designed to accommodate the lifter bar extends the entire length of the cover plate and terminates in openings; and

the lifter bar which nests within the cavity in the connector is sized to extend through the openings in the side of the cover plate to afford the means for tilting the lifter bar.

4. A connector as described in claim 2 wherein the portion of the recess formed in the cover member which is adapted to define the cavity in the connector designed to accommodate the lifter bar extends the entire length of the cover plate and terminates in openings; and

the lifter bar which nests within the cavity in the connector is sized to extend through the openings in the side of the cover plate to afford means for tilting the lifter bar.

5. A connector as described in claim 1 wherein adhesive material is applied to the wall of the longitudinal rib on the base member and the side of the recess in the cover member which, when in assembled form, is in proximity to the longitudinal rib on the base member, whereby the adhesive material serves to further anchor the multi-conductor flat cable.

6. A connector as described in claim 2 wherein adhesive material is applied to the wall of the longitudinal rib on the base member and the side of the recess in the cover member which, when in assembled form, is in proximity to the longitudinal rib on the base member whereby the adhesive material serves to further anchor the multi-conductor cable.

References Cited

UNITED STATES PATENTS

2,811,700	10/1957	Kuch	339—17
3,319,216	5/1967	McCullough	339—176
3,329,926	7/1967	Aksu et al.	339—176

MARVIN A. CHAMPION, *Primary Examiner*.

JOSEPH H. MCGLYNN, *Assistant Examiner*.

U.S. Cl. X.R.

339—17, 176