

[54] **COAXIAL CONNECTOR MOUNTING MEANS**

[72] Inventor: **George William Ziegler, Jr.**, Carlisle, Pa.

[73] Assignee: **AMP Incorporated**, Harrisburg, Pa.

[22] Filed: **Sept. 18, 1970**

[21] Appl. No.: **73,652**

**Related U.S. Application Data**

[62] Division of Ser. No. 732,447, May 27, 1968, Pat. No. 3,566,334.

[52] U.S. Cl. ....339/64 M

[51] Int. Cl. ....H01r 13/62

[58] Field of Search.....339/64, 177, 91, 184

[56] **References Cited**

**UNITED STATES PATENTS**

3,091,748 5/1963 Takes et al.....339/177 R

3,235,834 2/1966 O'Keefe et al. ....339/177 R  
3,471,825 10/1969 Huber.....339/177 R

**FOREIGN PATENTS OR APPLICATIONS**

773,012 12/1957 Great Britain .....339/91 R

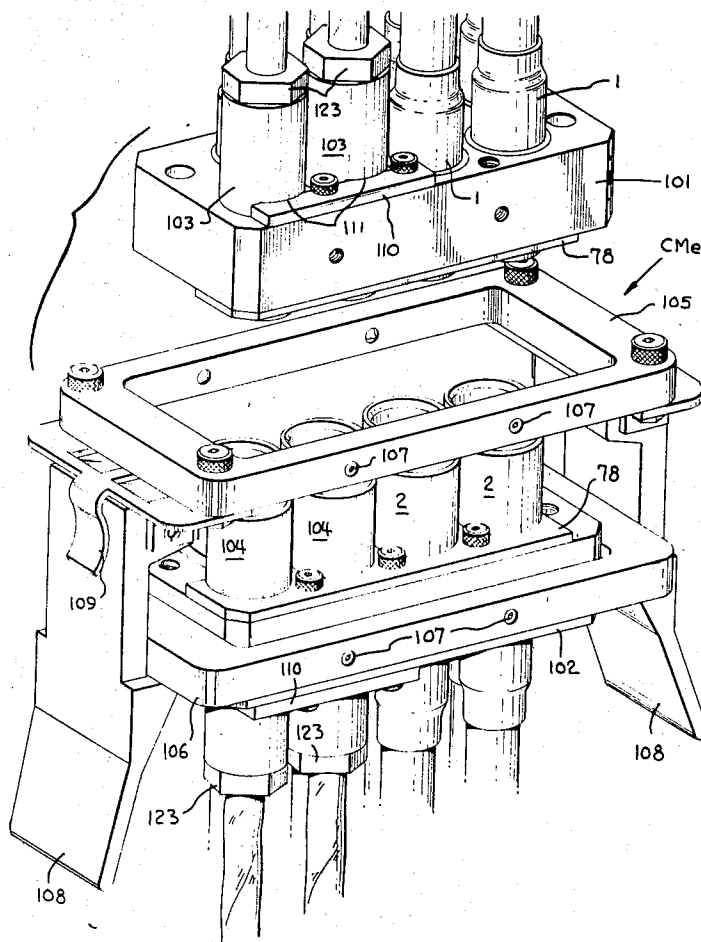
*Primary Examiner*—Joseph H. McGlynn

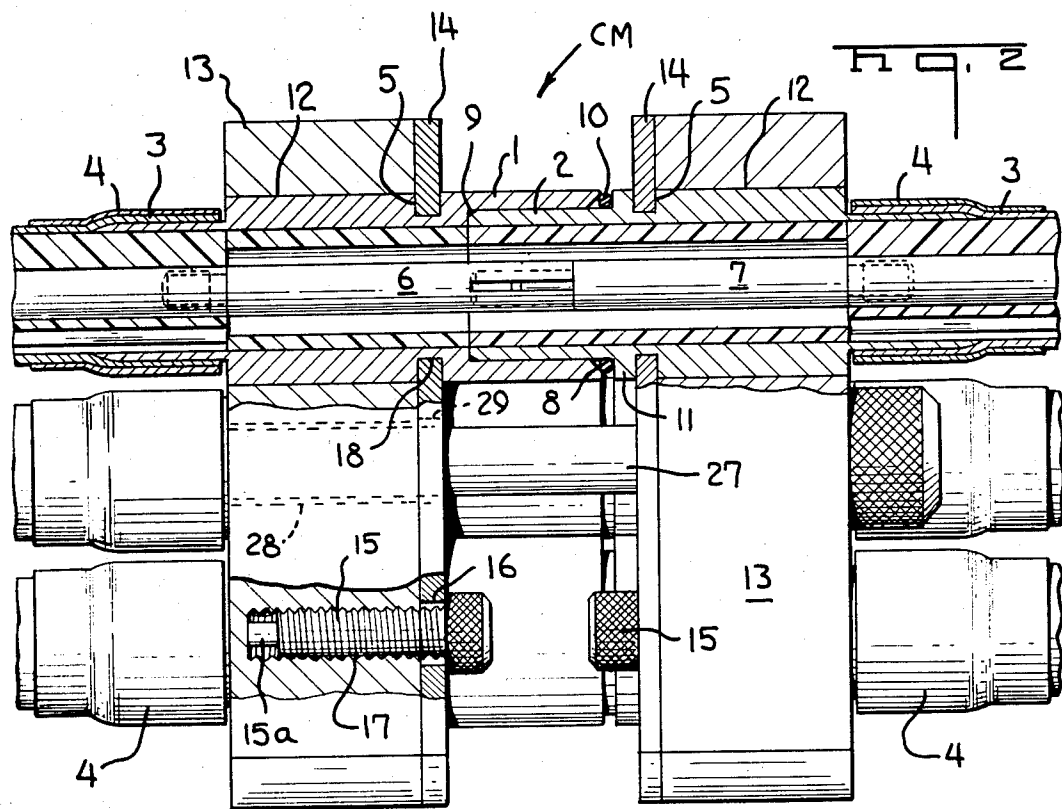
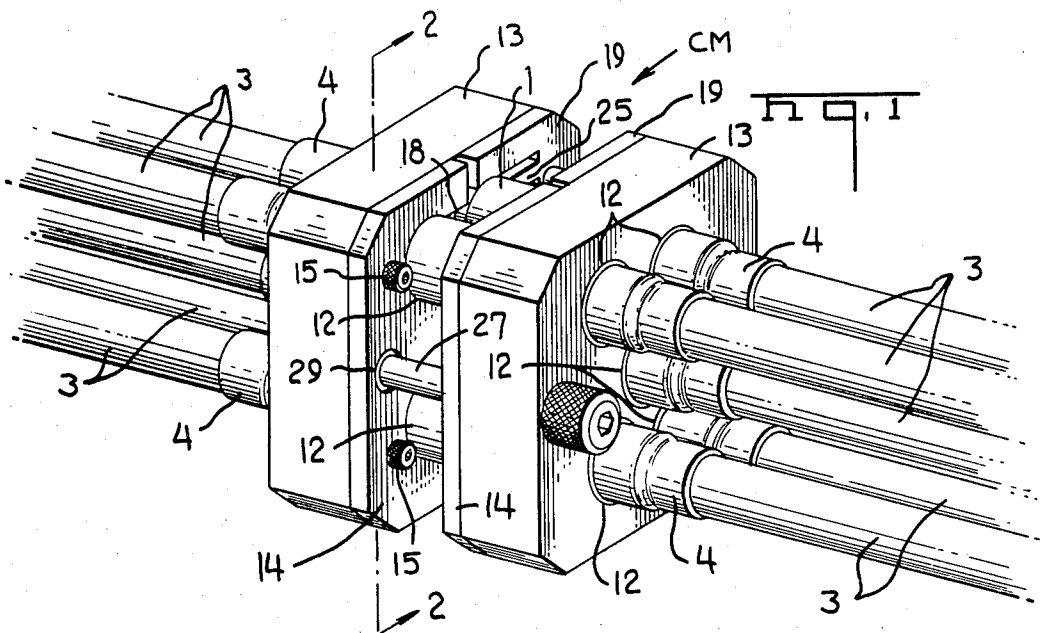
*Attorney*—Curtis, Morris and Safford, Marshall M. Holcombe, William Hintze, William J. Keating, Frederick W. Raring, John P. Hopkins, Adrian J. La Rue and Jay L. Seitchik

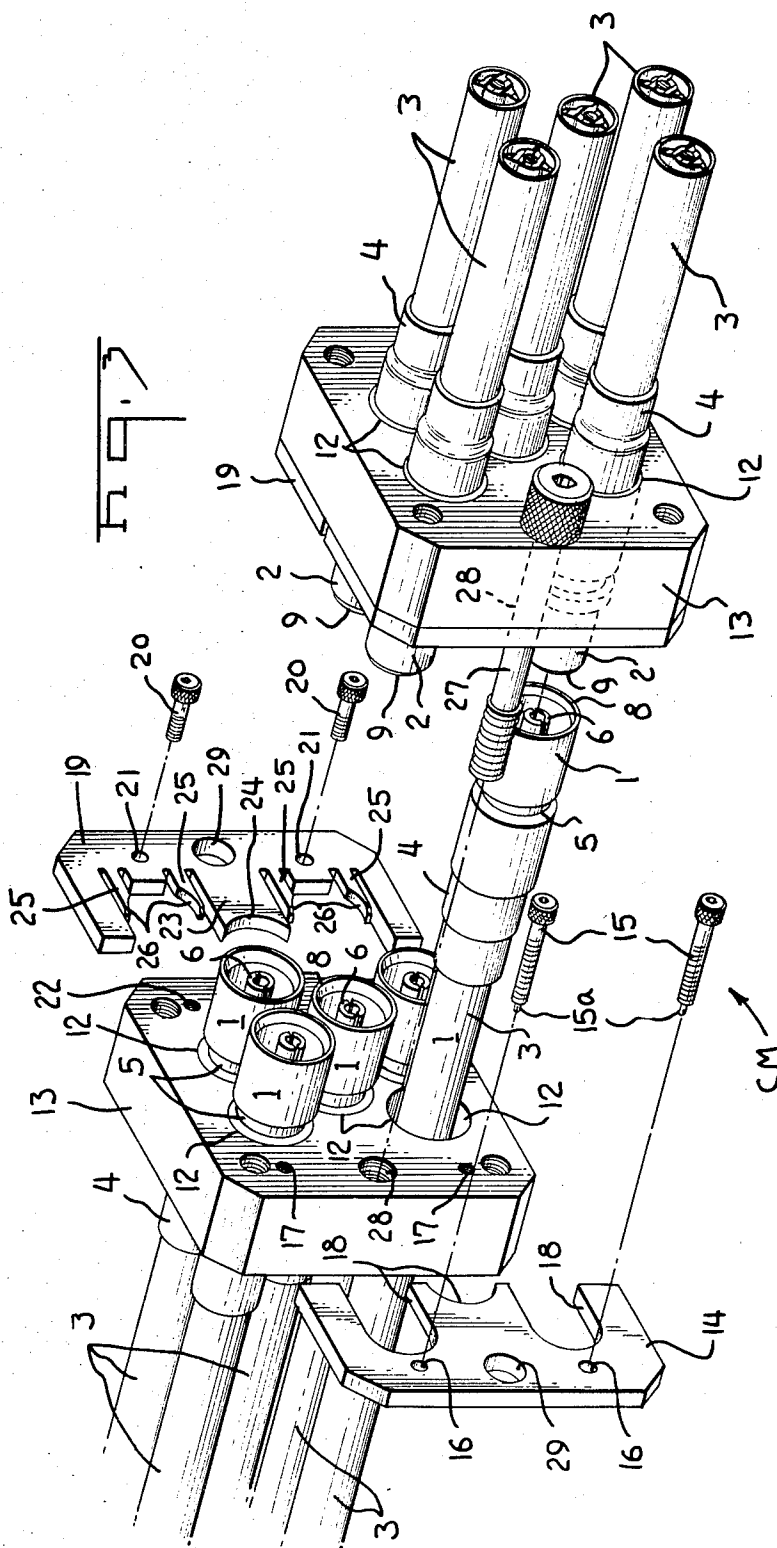
[57] **ABSTRACT**

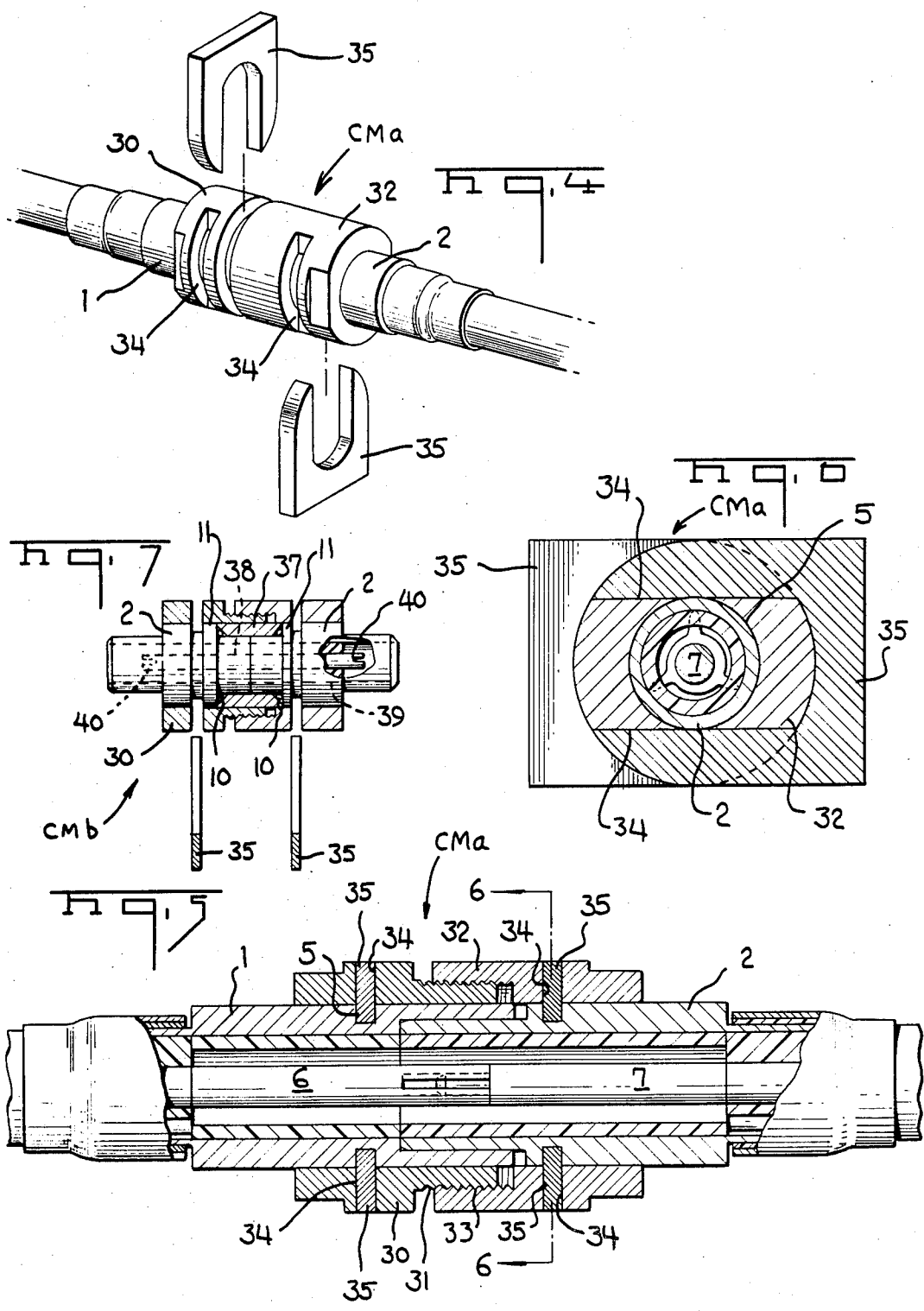
Coaxial connector mounting means comprises mounting block means connectable together to connect coaxial connector means floatably mounted in the mounting block means.

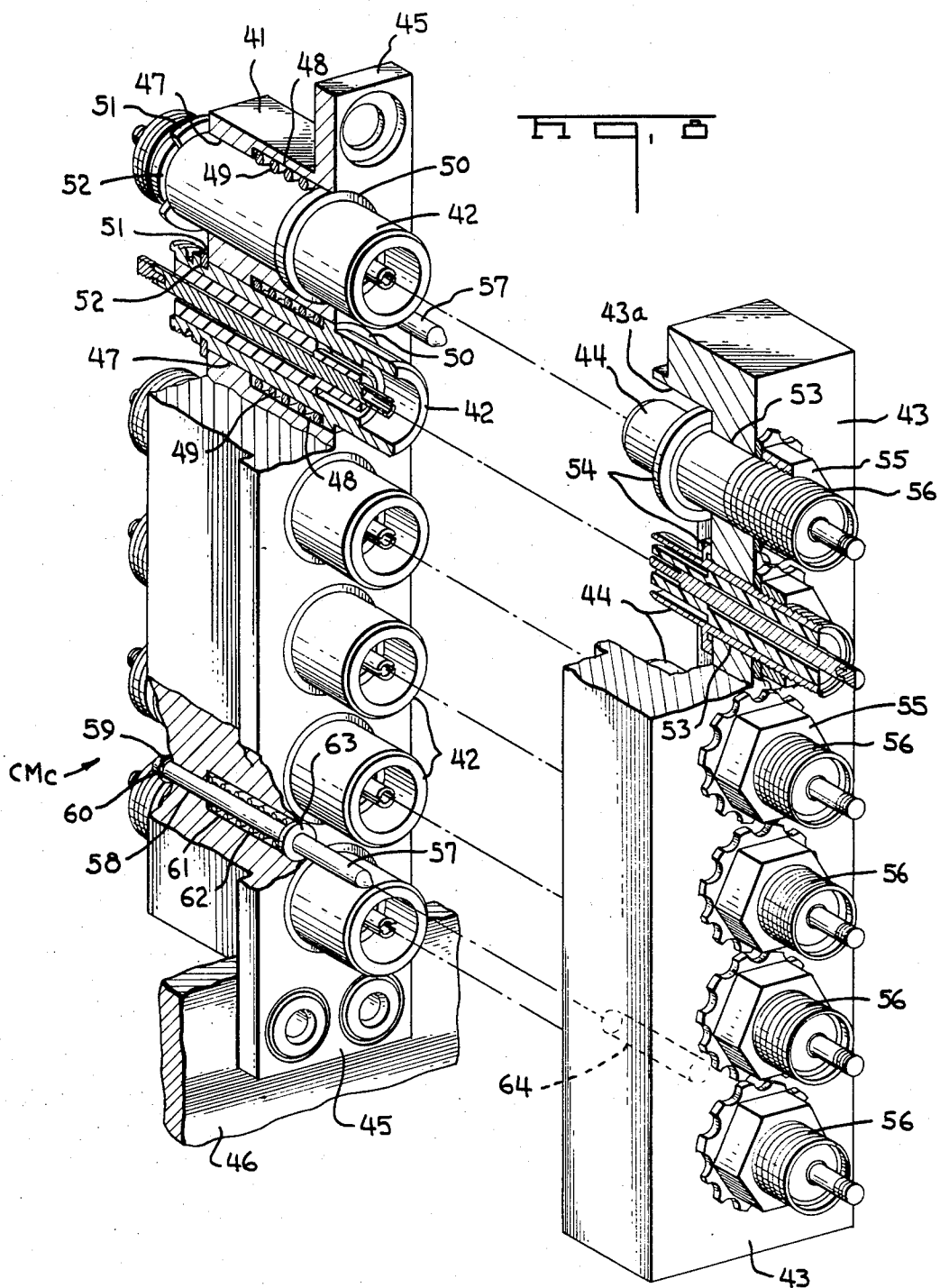
**7 Claims, 17 Drawing Figures**

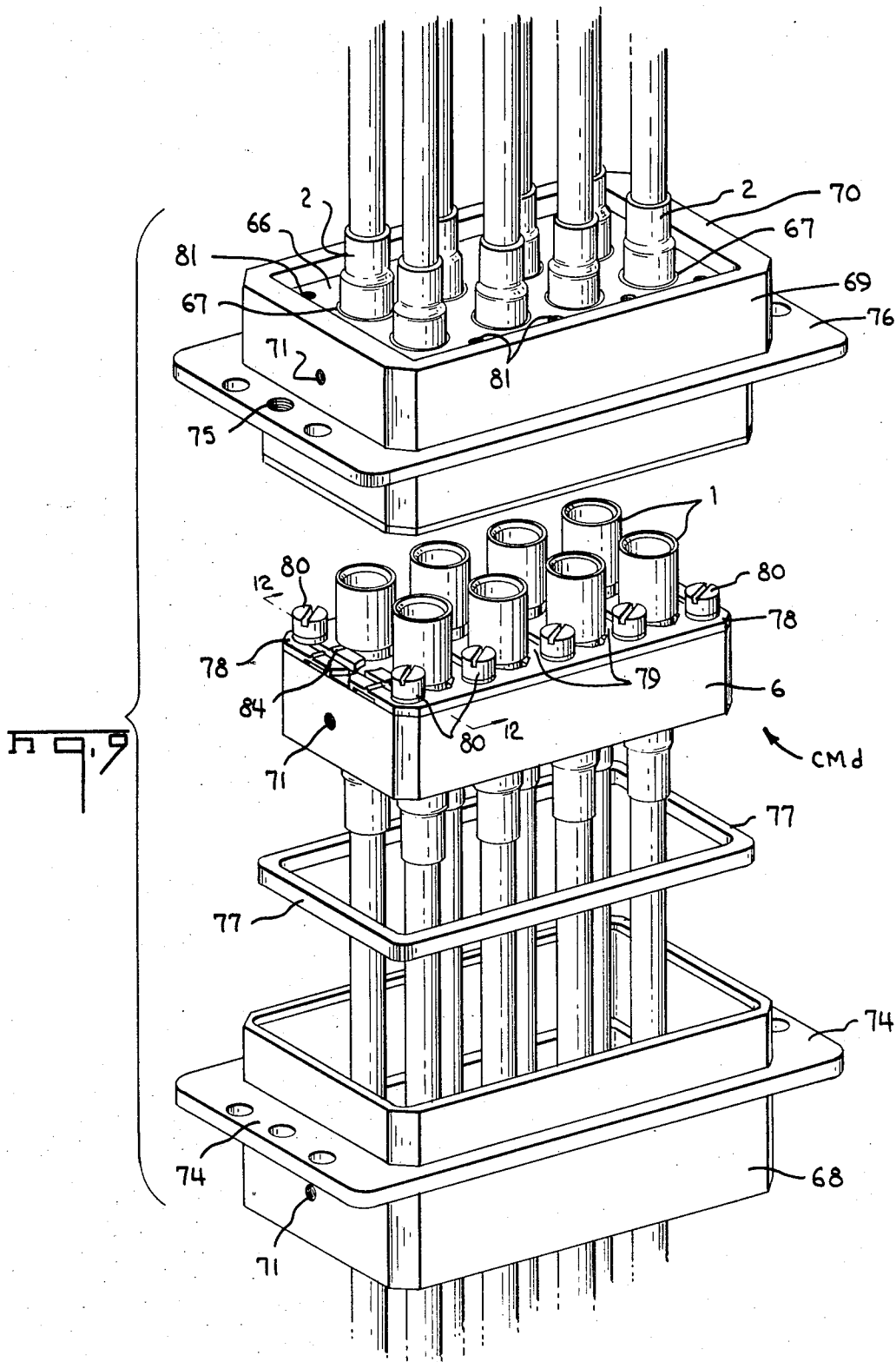


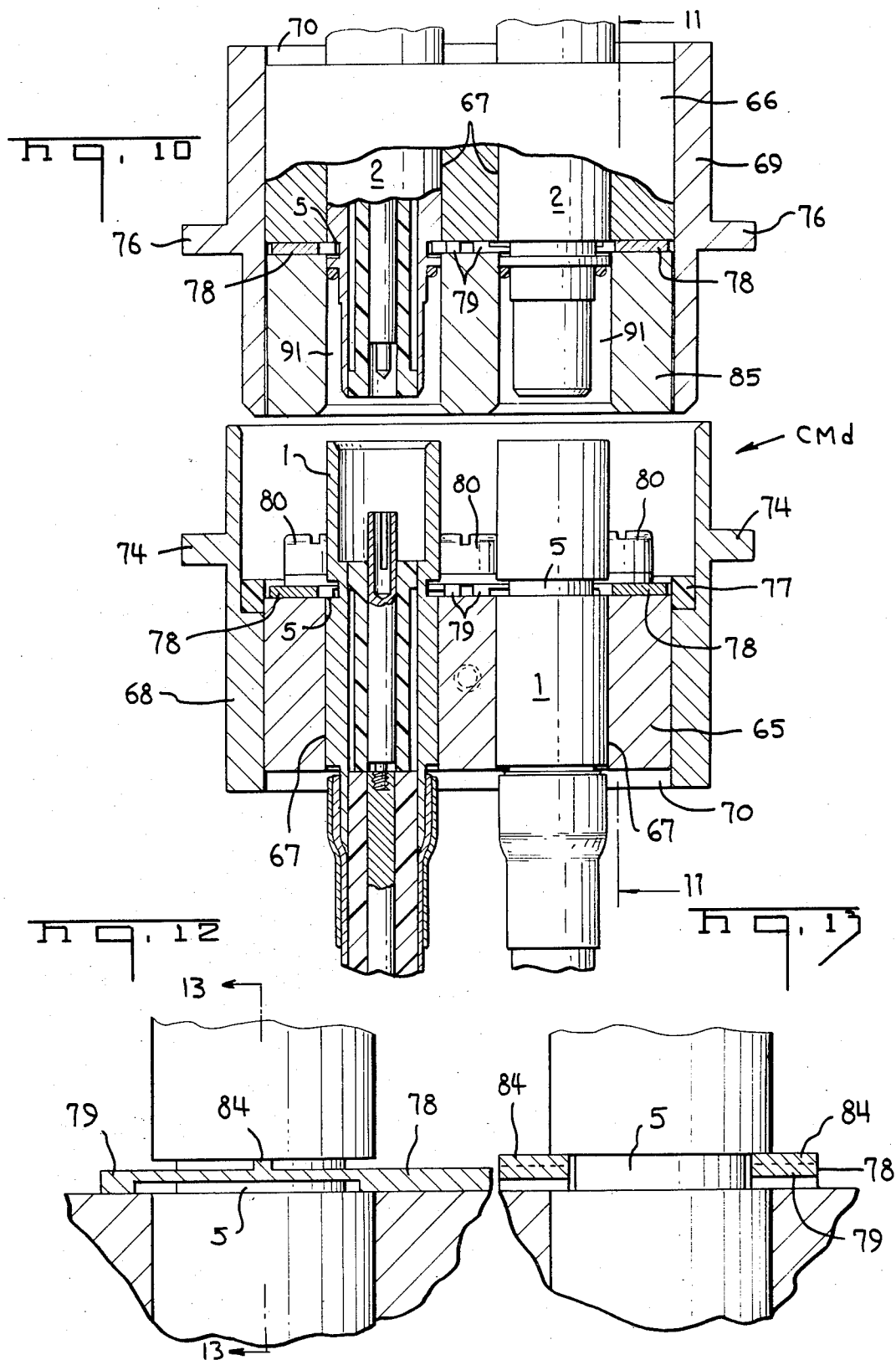


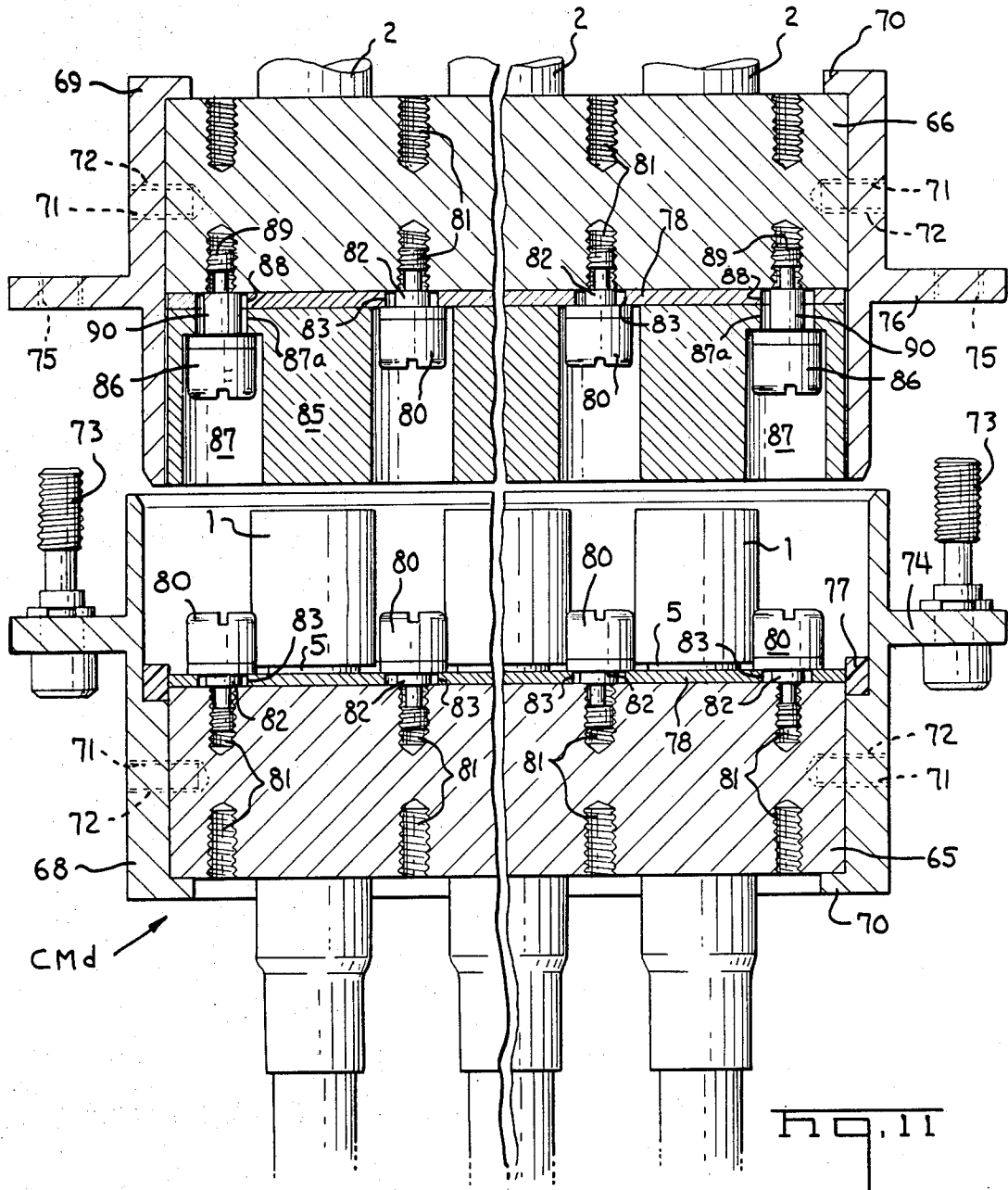




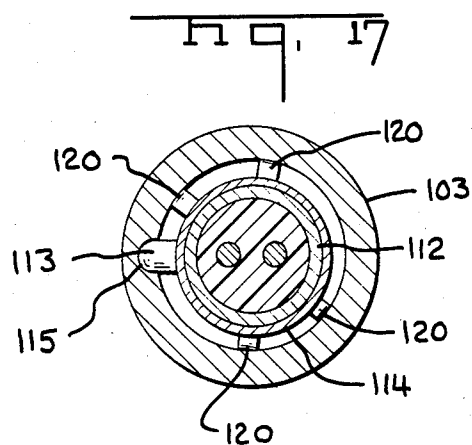
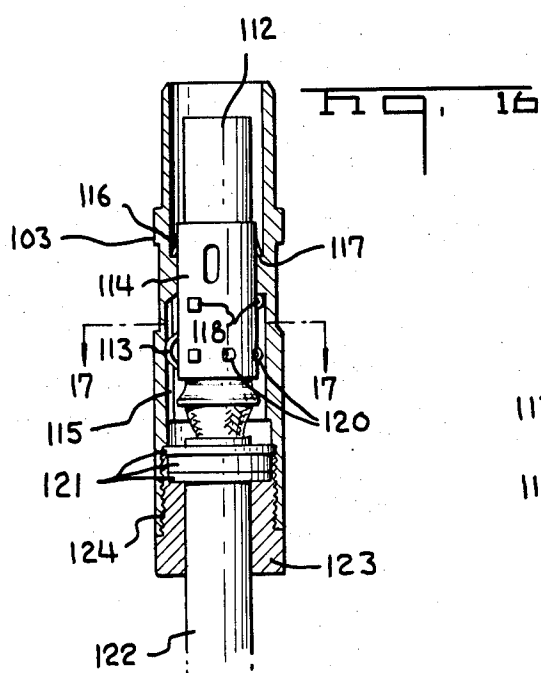
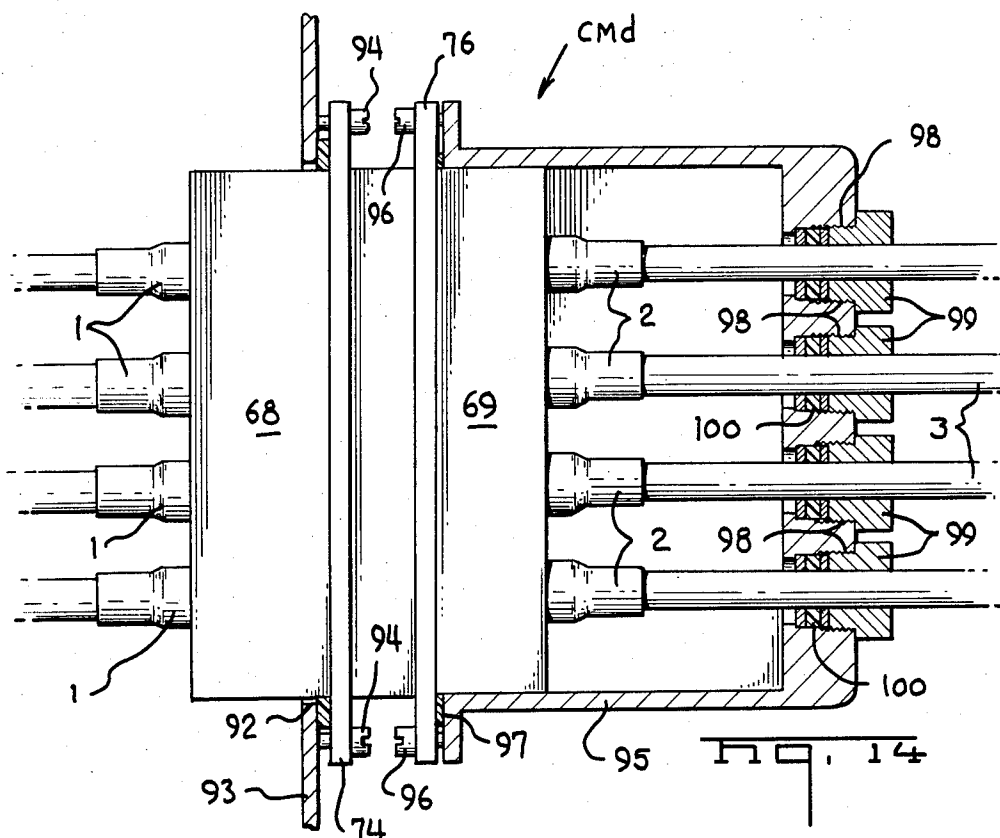


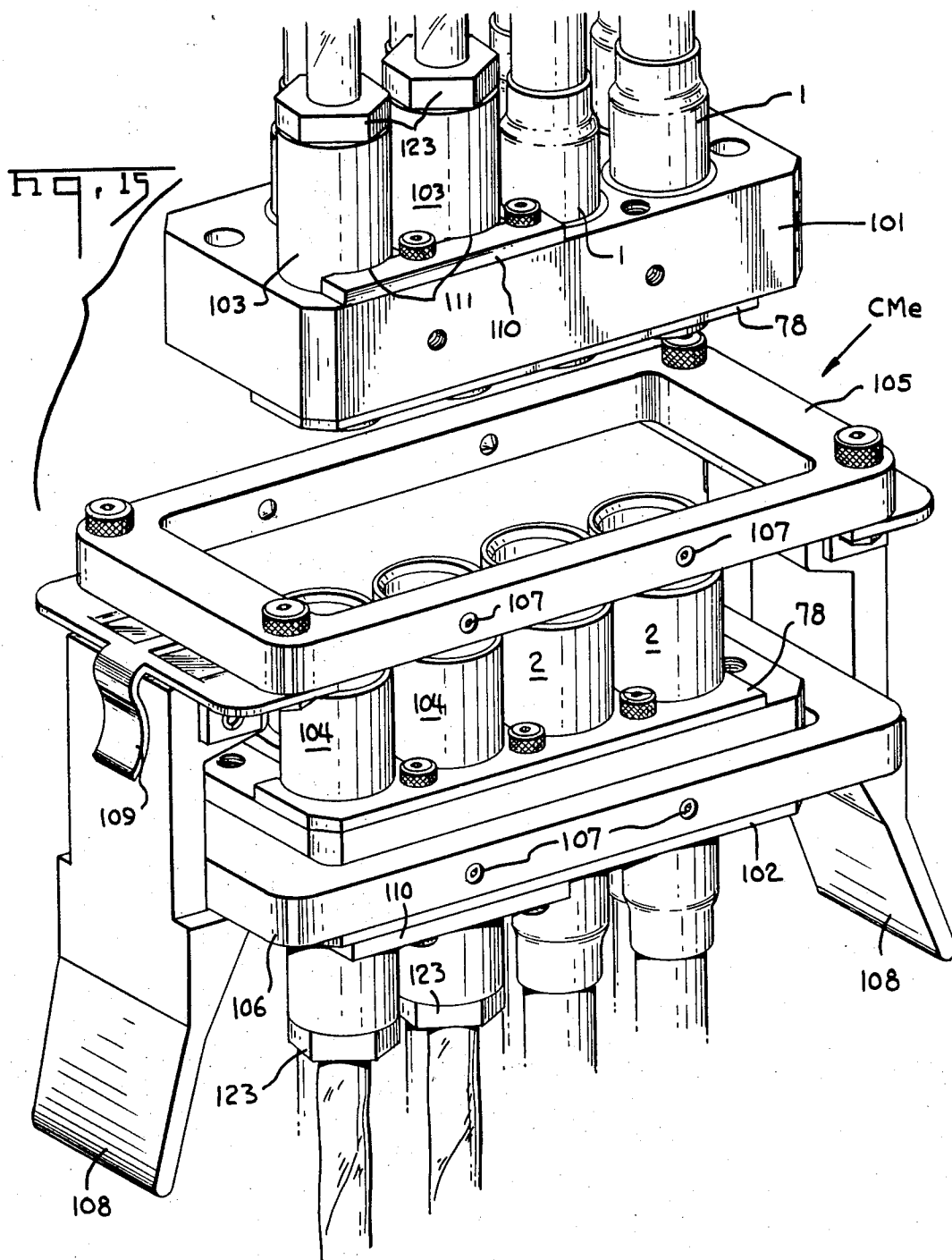












**COAXIAL CONNECTOR MOUNTING MEANS**

This is a divisional application of application Ser. No. 732,447, filed May 27, 1968, now U.S. Pat. No. 3,566,334.

This invention relates to mounting means and more particularly to mounting means for floatably mounting coaxial connector means therein.

Mounting coaxial connectors in mounting means so that they can be mated is conventional practice in the field of coaxial connectors. Such conventional mounting means does not provide for the misalignment between mating connectors as well as for inherent tolerances which impedes mating between the connectors and improperly mated connectors detracts from the operational characteristics of the connectors.

It is a primary object of the present invention to provide a coaxial connector mounting means which compensates for misalignment between mating connectors and inherent tolerances therebetween.

Another object of the invention is the provision of floatably mounting all of the coaxial connectors in coaxial connector mounting means so that proper mating engagement between the connectors is effected.

A further object of the invention is to provide coaxial connector mounting means wherein at least some of the coaxial connectors are springably mounted thereon to compensate for all errors including manufacturing tolerances.

An additional object of the invention is the provision of floatably mounting the mounting blocks of coaxial connector mounting means in housing means so that compensation for tolerances is overcome therebetween.

A still further object of the invention is to provide cantilever spring means for the coaxial connector mounting means which have projection means thereon for engagement with the coaxial connectors, the projection means providing more uniform spring action during deflection thereof.

Still an additional object of the invention is the provision of guide block means floatably mounted on one mounting block means.

Still a further object of the invention is to provide mounting means for connecting individual connectors together whether they be sexed or sexless.

Other objects and attainments of the present invention will become apparent to those skilled in the art upon a reading of the following detailed description when taken in conjunction with the drawings in which there are shown and described illustrative embodiments of the invention; it is to be understood, however, that these embodiments are not intended to be exhaustive nor limiting of the invention but are given for purposes of illustration in order that others skilled in the art may fully understand the invention and the principles thereof and the manner of applying it in practical use so that they may modify it in various forms, each may be best suited to the conditions of a particular use.

In the drawings:

FIG. 1 is a perspective view of coaxial connectors connected together via the coaxial connector mounting means;

FIG. 2 is a view taken along lines 2—2 of FIG. 1;

FIG. 3 is an exploded perspective view of the mounting means of FIGS. 1 and 2;

FIG. 4 is a perspective view partially exploded of a coaxial connector mounting means for a single sexed coaxial connector;

FIG. 5 is a longitudinal cross-sectional view of FIG. 4;

FIG. 6 is a view taken along lines 6—6 of FIG. 5;

FIG. 7 is a longitudinal cross-sectional view of an alternative embodiment of FIGS. 4 through 6 illustrating connection means for a sexless connector;

FIG. 8 is an exploded perspective view partially in section of an alternative embodiment of the coaxial connector mounting means;

FIG. 9 is an exploded perspective view of a further embodiment of the coaxial connector means;

FIG. 10 is a cross-sectional view of FIG. 9 with elements and each part of the housing means in an assembled condition;

FIG. 11 is a view taken along lines 11—11 of FIG. 10;

FIG. 12 is a view taken along lines 12—12 of FIG. 9;

FIG. 13 is a view taken along lines 13—13 of FIG. 12;

FIG. 14 is a partially sectioned view illustrating a hood mounted on one of the housing means of the embodiment of FIGS. 9 through 13;

FIG. 15 is an exploded and perspective view of an additional embodiment of the coaxial connector;

FIG. 16 is a longitudinal cross-sectional view of a jack sleeve having a jack connector secured in position therein; and

FIG. 17 is a view taken along lines 17—17 of FIG. 16 illustrating the polarization between the jack sleeve and jack connector.

Turning now to the drawings and more particularly to FIGS. 1 through 3, a coaxial connector mounting means CM is illustrated which is preferably used for mounting jack connectors 1 and plug connectors 2 of the type disclosed in U.S. Pat. No. 3,245,027 for terminating the connectors on semi-rigid coaxial cables 3 via ferrules 4. Connectors 1 and 2 are provided with annular grooves 5 and mateable center contacts 6 and 7, center contacts 6b and d, jack center contact and center contacts 7b and d, plug center contact. Beveled surfaces 8 and 9 are provided respectively on the jack counter 1 and plug connector 2 and similar beveled surfaces are provided on the mateable sections of center contacts 6 and 7. Sealing O-rings 10 are provided on plug connectors 2 adjacent shoulders 11 thereof.

Jack connectors 1 and plug connectors 2 are respectively mounted in openings 12 extending through a mounting block 13. Of course, a mixture of jack and plug connectors can be mounted in each of one of blocks 13. Retaining plate 14 is mounted on a surface of each of blocks 13 via screws 15 through holes 16 in plates 14 and threaded holes 17 in blocks 13. Holes 16 are large enough to permit limited freedom of movement in the X-Y plane about screws 15 and screws 15 are provided with projections 15a which permits the screws to bottom in threaded holes 17 and not hold retaining plates 14 in snug engagement with the surfaces of blocks 13 so that retaining plates 14 are movable in limited direction in the Z direction. Retaining plates 14 are provided with U-shaped recesses 18 which mate with annular grooves 5 in three connectors in each of blocks.

A spring retaining plate 19 is also mounted on the surfaces of mounting blocks 13 that retaining plates 14 are mounted via screws 20 through holes 21 in plate 19 and threaded holes 22 in mounting block 13 thereby snugly mounting plate 19 thereto. Plate 19 is provided with a leg 23 having an arcuate recess 24 for engagement with the groove 5 in the center connector and cantilever springs 25 are provided with arcuate areas 26 for engagement with annular grooves 5 of the other connectors thereby springably securing these connectors in position in blocks 13. Blocks 13 are secured together via jack screws 27 which are screwed into position in one of blocks 13 via threaded hole 28 and mateable with a corresponding threaded hole 28 in the other mounting block 13 thereby securing the blocks together. Plates 14 and 19 are provided with holes 29 through which jack screws freely pass.

The connectors held in position via floatable retaining plate 14 define three points of a plane at the outer ends of the connectors so that connection between the corresponding mateable connectors can be established.

Limited axial movement is provided by the difference between the width of grooves 5 on the connectors and the thickness of the retaining plate 14 which is threadably mounted along the X-Y plane and motion restricted in Z direction by screws 15 on the mounting block. Spring retaining plate 19 is rigidly mounted on the mounting block via screws 20 and cantilever springs 25 permit restricted motion in the Z direction plus restricted movement along the X-Y plane due to the spacing between arcuate areas 26 of each pair of cantilever springs 25. Cantilever springs 25 extend slightly above the plane of the retaining plate 14 in order to pick up all of the errors or manufacturing tolerances such as: lack of planarity of block surfaces, lack of planarity of both surfaces of both retaining plates and distance between the pressure edges of grooves 5 of the plug and plug fitting nose and between the pressure edges of grooves 5 of the jack fittings and jack fitting mating plane or shoulders.

The retaining plates allow unrestricted motion of the connectors in the X-Y plane and limited motion in the Z direction, the openings in the block in which the connectors are retained by the retaining plate limit the movement in the X-Y plane. Each surface of each mounting block 13 can be used to mount the retaining plates thereon. Beveled surfaces or chamfers 8 on the internal surfaces at the nose of jack fittings 1 provide a target for the beveled surfaces of chamfers 9 of the plug connectors and the chamfers of the jack connectors capture and compress the sealing rings 10 against shoulders 11. The chamfers of the plug and jack connectors have to be fully engaged before mating starts between the plug center contact and the entry end of the jack center contact spring fingers. The chamfers at the plug and jack connector noses have to be at a minimum of size which is equal to or greater than the sum of the true position and tolerance errors of the holes in the blocks, the fitting diameter tolerances plus the space are nominal plus any set on those plug connectors that may have spring finger settings.

Mounting blocks 13 are preferably of the thickness of one and one-half times the diameter of openings 12 in order to minimize the deviation of connector axes relative to the Z direction which is normal to the X-Y

block faces when used in conjunction with rack and panel applications and the like. Otherwise, the mounting block thickness can be equal or approximately equal to the diameter of openings 12 of the mounting blocks. One or more connectors can be mounted in the mounting blocks with dummy connectors in position in the block openings to provide stability. If more than three connectors are mounted in mounting blocks, spring retaining plates 19 must be used or the plug connectors have to have spring fingers secured via retaining plates 14 on the mounting blocks depending upon the application. Also, a combination may be used when only three or fewer connectors require butt joints and its concomitant improved performance as compared to wiping contacts in an array of connectors, the remainder of which are of less critical application (wiped contacts) wherein the wipe type contacts are held by a retaining plate that is of proper dimension so as to position three or less connectors to positively provide butt contact by another plate or portion of the same plate that advances into Z direction the three (or fewer) connectors positively by an amount equal to or exceeding the sum of the Z direction tolerances.

FIGS. 4 through 6 illustrate coaxial connector mounting means CMa including a sleeve 30 provided with an external threaded section 31 and sleeve 32 having an internal threaded section 33. Sleeves 30 and 32 are disposed on a jack connector 1 and a plug connector 2 and each of these sleeves is provided with diametrical slots 34 for receiving therein legs of U-shaped retaining members 35 which also mate with annular grooves 5 in connectors 1 and 2 so that when sleeves 30 and 32 in position on connectors 1 and 2 and retaining members 35 in position in slots 34 and grooves 5 sleeves 30 and 32 are threadably connected via sections 31 and 33 to move the connectors into engagement with each other and also center contact 6 and 7 in engagement with each other. Connector mounting means CMa therefore defines mounting means for connection and holding together a single jack connector and plug connector. Diametrical flat surfaces 36 are provided in each of sleeves 30 and 32 to enable a wrench to be engaged thereon to tighten sleeves 30 and 32. Sleeves 30 and 32 can be a single sleeve provided with slots 34 and retaining members 35 can be V-shaped spring members to drive the connector members together in the single sleeve.

FIG. 7 shows plug connectors 2 butted together at their noses and inserted within sleeve 37 which extends between shoulders 11 so that O-rings 10 are engaged by the internal beveled surfaces thereof. Center contact 38 is disposed in a dielectric bushing, sections 40 of center contact 38 electrically engageable with the center conductors of coaxial cables 3. Sleeves 30 and 32 and retaining members 35 maintaining plug connectors 2 in engagement and center contact 38 in engagement with the center conductors of coaxial cables 3. The embodiment of FIG. 7 defines a sexless connector whereby no male or female connector parts are utilized.

FIG. 8 illustrates coaxial connector mounting means CMc which comprises a metallic mounting block 41 carrying jack connectors 42 and metallic mounting block 43 carrying plug connectors 44. Mounting block 41 is provided with mounting sections 45 for mounting

block 41 in position on a mounting panel 46 and openings 47 in which connectors 42 are disposed. Openings 47 are provided with enlargements 48 in which coil springs 49 are disposed surrounding connectors 42, coil springs 49 extending between the inner ends of enlargements 48 and shoulders 50 on connectors 42. Snap rings 51 mate with grooves 52 and connectors 42 to limit movement of connectors 42 in openings 47 while coil springs 49 and shoulders 50 limit movement of the connectors in openings 47 in the other direction. Coil springs 49 permit connectors 42 to be floatably movable in an axial direction when being mated with corresponding jack connectors 44 to compensate for any tolerance variation.

Connectors 44 are mounted in openings 53 and block 43 which communicate with a slot 54 in the front of block 43 thereby accommodating the noses of connectors 44 and flanges 54 which limit movement of the connectors in one direction in openings 53. Nuts 55 threadably engage threaded sections 56 of connectors 44 as a preferable means of securing these connectors in openings 53.

Guide pins 57 are mounted in openings 58 (only one being shown) in block 41. Snap rings 59 are disposed in grooves 60 at one end of guide pins 57 to limit movement thereof in one direction. Openings 58 are provided with enlargements 61 wherein coil springs 62 are disposed surrounding sections of guide pins 57 and disposed between flanges 63 of guide pins 57 and the inner ends of enlargements 61 so that the guide pins are floatably mounted in block 41. Guide pins 57 mate with holes 64 in block 43 when blocks 41 and 43 are mated together to connect jack connectors 42 with plug connectors 44. Thus, guide pins 57 are spring loaded via coil springs 62 on mounting block 41 to compensate for tolerances of the mounting blocks 41 and 43 and mounting means 45 for mounting onto mounting member 46. Connectors 42 and 44 are preferably connected to semi-rigid coaxial cable but can be connected to flexible coaxial cable if desired.

FIGS. 12 through 14 illustrate coaxial connector mounting means CMd which is a further embodiment of the invention. Mounting blocks 65 and 66 carry jack connectors 1 and plug connectors 2 respectively in openings 67 thereof. Block 65 is mounted in a jack housing 68 and block 66 is mounted in a plug housing 69 against inwardly-directed flanges 70 thereof to limit movement of blocks 65 and 66 in the Z direction. Blocks 65 and 66 are held in position in housings 68 and 69 by means of set screws 71 threadably disposed in the sides of blocks 65 and 66 and loosely mounted in oversize holes 72 located in opposing sides of housings 68 and 69 to provide movement of mounting blocks 65 and 66 in the X-Y plane and in the Z direction within housings 68 and 69. Jack housing 68 is mateable with plug housing 69 to effect the inner connection between connectors 1 and 2 and the housings are held in engagement by means of jack screws 73 disposed in a flange 74 on housing 68 and threaded openings 75 and flange 76 of housing 69. A gasket 77 is disposed within housing 68 and is engageable by the flange front end of housing 69 to provide a seal and also to apply pressure for spring clip means if such are used in place of jack screws 73.

Spring retaining plates are provided with cantilever springs 79 which are diametrically disposed in annular grooves 5 of connectors 1 and 2 in the same manner as spring retaining plate 19 of FIGS. 1 through 3. Spring retaining plates 78 are movably mounted on mounting block 65 and 66 via screws 80 which are threadably mounted in threaded holes 81 and which are provided with shoulders 82 which mate with openings 83 in retaining plate 78, shoulders 82 abutting against mounting blocks 65 and 66 and openings 83 being large enough to permit retaining plate 78 to be floatably mounted thereon. The outer ends of spring 79 are chamfered for easy engagement with the grooves of the connectors.

Cantilever springs 79 at each mounting position along the spring retaining plate 78 define cantilever beams supported at both ends but free to move and each cantilever spring includes a projection 84 engageable by the pressure edge of a groove 5 of a connector to effect the spring action, the projections of spring 79 for each connector being coincident with the axis of the connector along a diameter thereof and engageable thereby so that the pressure surface of the groove 5 of the connector engages the projections and not the cantilever beams during spring action thereof thereby providing uniform spring action during deflection. The engagement of the connector on the projections 84 tends to make the torsion of the cantilever beams more nearly uniform during deflection thereof. Also, projections 84 tend to minimize the effect of the float of the fitting within the holes of the block and the float of the retaining plate 78 about its nominal position.

A guide block 85 is floatably mounted on mounting block 66 by means of screws 86 disposed in holes 87 of guide block 85 and extend through holes 88 in plate 78 and into threadable engagement with threaded holes 89 in block 66. Screws 87 are provided with shoulders 90 which abut against block 66 and openings 88 are large enough to permit retaining plate 78 to be floatably mounted thereon. Also holes 87 are provided with reduced sections 87a permitting guide block 85 to be floatably mounted in the X-Y plane as well as in the Z direction over the floatably mounted spring retaining plate.

Guide block 85 is provided with openings 91 extending therethrough and in which the outer ends of plug connectors 2 are disposed as illustrated in FIG. 10. The entrances to openings 91 are chamfered. The floatability of guide block 85 in its mounting arrangement on mounting block 66 is such that there is no restricted motion of the plug connectors 2 within the mounting block. The chamfered entrances of openings 91 are of such magnitude as to pick up the float in the X-Y plane of the blocks within the housings and the float of the plug housing and the jack housing as well as the mismatch of the connectors themselves. The guide block projects spring finger contacts of plug connectors as well as joint type connectors.

Instead of external jack screws in the housings, internal jack screws between mounting blocks directly can be used thereby enabling the use of spring retaining member plates which are required for butt contact connectors together with housings and hoods.

Turning now to FIG. 14, jack housing 68 is disposed in an opening 92 of a mounting panel 93 and screws 94

extend through flange 74 and in threadable engagement with mounting panel 93 to secure housing 68 in position thereon. A hood 95 is secured onto flange 76 of housing 69 via screws 96 with a gasket 97 disposed therebetween. Coaxial cables 3 extend through respective threaded openings 98 in hood 95 and nuts 99 are threadably mounted in openings 98 thereby compressing seal means 100, such as for example, plastic or rubber washers, into sealing engagement around cables 3 thereby providing a sealed environment. Rubber grommets can be used in place of nuts 99 and seal means 100 with the grommets snugly engaging the cables to provide the sealing arrangement.

Turning now to FIGS. 15 through 17, coaxial connector mounting means CMe is illustrated which includes mounting blocks 101 and 102 which are provided with jack sleeves 103 and plug sleeves 104 which are mateable with each other as well as jack connectors 1 and plug connectors 2 which are mateable with respect to one another. Blocks 101 and 102 are secured in frames 105 and 106 via roll pins 107 to provide stiffly-flexible mounting between the mounting frames and blocks. The mounting frames act as cantilever beams to pick up accumulated tolerances enabling use of latch arms 108 which are secured to frame 105 and are spring-biased by spring means 109.

Jack sleeves 103 and plug sleeves 104 along with jack connectors 1 and plug connectors 2 are mounted in blocks 101 and 102 by means of spring-retaining plates 78 to provide the floatability therefore as discussed hereinabove. In the case of jack sleeves 103 and plug sleeves 104, a bar 110 is secured onto the rear surfaces of blocks 101 and 102 and they are disposed in slots 111 formed in sleeves 103 and 104 to maintain sleeves 103 and 104 in a promptly oriented position so that connectors 112 of the type disclosed in U.S. Pat. No. 3,144,292 can be properly oriented in sleeves 103 and 104 via projection 113 on carrying member 114 mating with slot 115 disposed in sleeves 103 and 104. Securing member 114 is provided with lances 116 in engagement with a shoulder 117 within the sleeves 103 and 104 and forward projections 118 on securing member 114 engage shoulder 119 in sleeves 103 and 104 to limit movement of the connector in one direction within the sleeves. Projections 120 on securing member 114 are stabilizing projections to stabilize connectors 112 in sleeves 103 and 104. Sealing means 121 is sealingly compressed onto flexible coaxial cable means 122 via nuts 123 threadably disposed in threaded openings 124 in sleeves 103 and 104. Other types of connectors than that disclosed in U.S. Pat. No. 3,144,292, can, of course, be used.

While the mounting blocks in the above described embodiment are made from metal, it is to be understood, where needed, the mounting blocks can be made of a suitable thermosetting plastic and this would be true in the case of flexible cables having dielectric sheathing around the outer conductive means.

It will, therefore, be appreciated that the aforementioned and other desirable objects have been achieved; however, it should be emphasized that the particular embodiments of the invention, which are shown and described herein, are intended as merely illustrative and not as restrictive of the invention.

The invention is claimed in accordance with the following:

1. A coaxial connector mounting means for mounting mateable coaxial connectors thereonto, which comprises:

- a. mounting block means having openings extending therethrough for receiving coaxial connectors therein;
- b. retaining plate means floatably mounted on said mounting block means;
- c. cantilever spring means provided by said retaining plate means for securing said coaxial connectors on said mounting block means, said cantilever spring means including projection means engageable by said coaxial connectors; and
- d. securing means provided by said mounting block means for securing said mounting block means together with mateable ones of the coaxial connector means in mating arrangement.

2. A coaxial connector mounting means according to claim 1 wherein said mounting block means are mounted in a stiffly-flexible manner in frame means which act as cantilever beams to pick up accumulated tolerances.

3. A coaxial connector mounting means according to claim 1 wherein said securing means are spring-biased latch arms.

4. A coaxial connector mounting means for mounting coaxial connector means thereonto, which comprises:

- a. mounting block means having opening therethrough for receiving the coaxial connector means therein,
- b. retaining plate means floatably mounted on said mounting block means, said retaining plate means including spring retaining means having cantilever beams for engagement with areas of said coaxial connector means to retain the coaxial connector means in said openings and to permit movement of said coaxial connector means in an X-Y plane and in a Z direction, said spring retaining means supported at both ends on the mounting block means.

5. A coaxial connector mounting means according to claim 4 wherein said cantilever beams include projection means for engagement with the areas of the coaxial connector means.

6. A coaxial connector mounting means for mounting coaxial connectors thereonto comprising mounting block means having openings extending therethrough for receiving first coaxial connectors in some of said openings, sleeve means disposed in the remainder of said openings for receiving therein second coaxial connectors, means provided by said sleeve means and on said second coaxial connectors for polarizing said second coaxial connectors in said sleeve means, retaining plate means mounted on said mounting block means and including retaining means engageable with areas of said first coaxial connectors and said sleeve means for retaining the first coaxial connectors and said sleeve means in said openings, and means provided by said sleeve means and said mounting block means polarizing said sleeve means in position on said mounting block means.

7. A coaxial connector mounting means according to claim 6 wherein spring-biased latch means are provided on one of said mounting block means for latching engagement with another of said mounting block means to hold the mounting block means in a latched condition.

tion and the coaxial connectors thereon in mating en-  
gagement.

\* \* \* \* \*

5

10

15

20

25

30

35

40

45

50

55

60

65