

Nov. 23, 1965

M. F. O'KEEFE

3,219,963

COAXIAL CONNECTOR CONSTRUCTION

Filed July 2, 1963

2 Sheets-Sheet 1

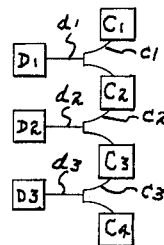
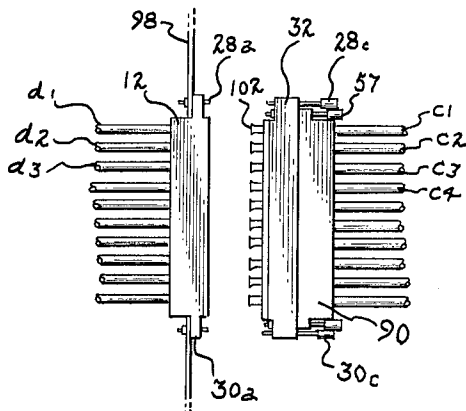
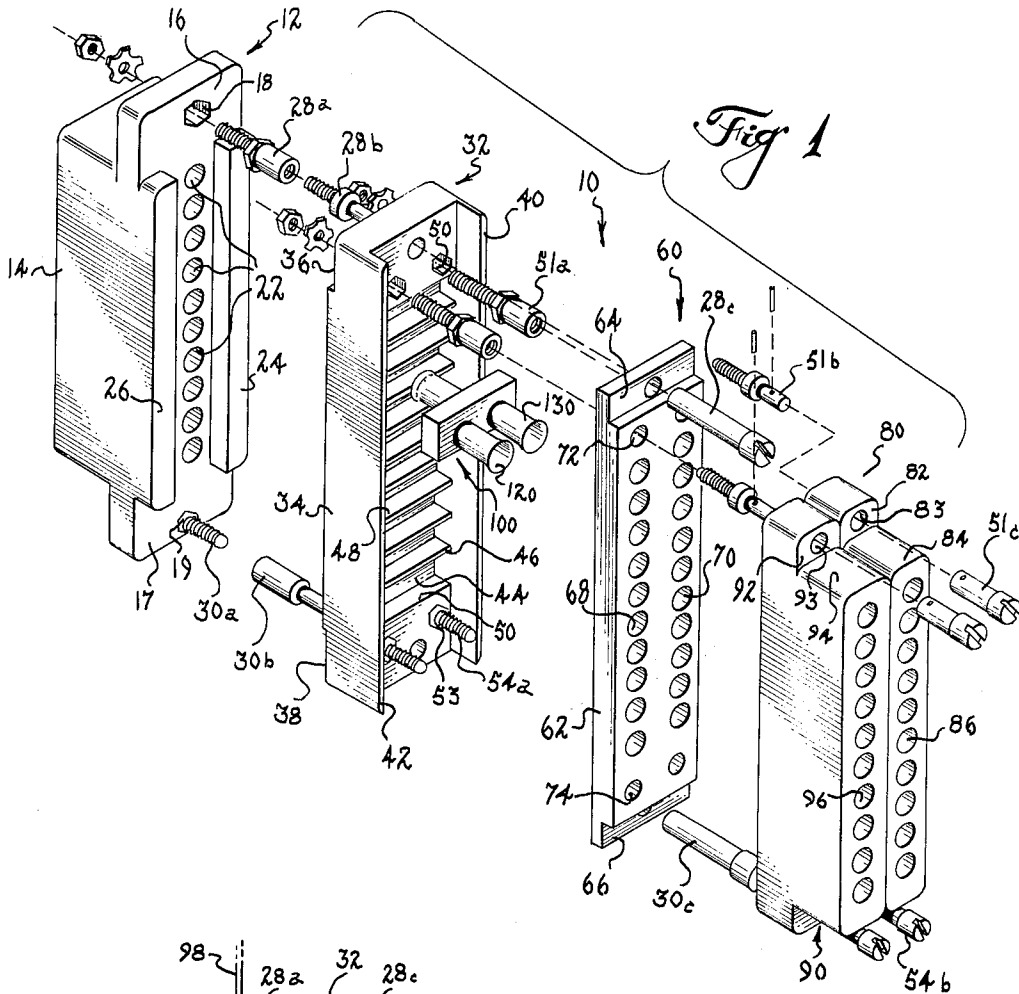


Fig. 1A

INVENTOR.

MICHAEL F. O'KEEFE

BY

Burtis, Morris + Lafford

Fig. 2

Nov. 23, 1965

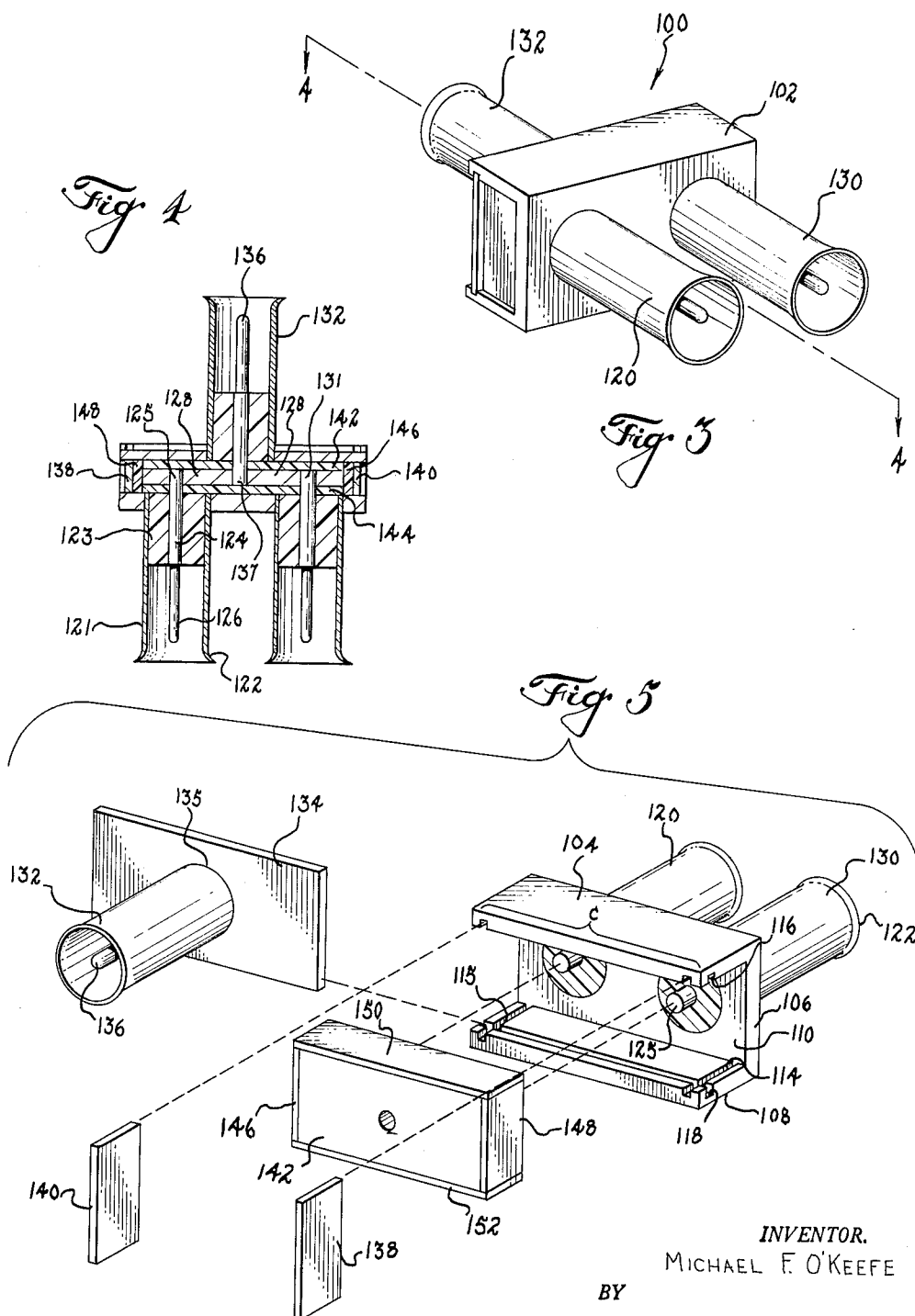
M. F. O'KEEFE

3,219,963

COAXIAL CONNECTOR CONSTRUCTION

Filed July 2, 1963

2 Sheets-Sheet 2



1

3,219,963

COAXIAL CONNECTOR CONSTRUCTION
Michael F. O'Keefe, Mechanicsburg, Pa., assignor to
AMP Incorporated, Harrisburg, Pa.
Filed July 2, 1963, Ser. No. 292,375
7 Claims. (Cl. 339-157)

This invention relates to an improved multiple coaxial connector housing and, particularly, to a novel coaxial connector assembly for use therewith.

In U.S. patent application, Serial No. 124,192, filed July 14, 1961, now Patent Number 3,160,456, in the name of Michael F. O'Keefe et al., there is described an improved coaxial connector block adapted to handle T-type connectors for comming a plurality of coaxial cables. The connector construction shown therein, while generally satisfactory in operation, does not lend itself to economy of cost and use with respect to Y-type connector applications. Accordingly, it is an object of this invention to provide a Y-type coaxial connector of an improved construction and a connector block adapted to house the improved connector in multiple. It is a further object of the invention to provide a Y-type coaxial connector of a construction which simplifies manufacturing tolerance problems. It is yet a further object of invention to provide a coaxial connector for accommodating three or more coaxial cable paths in a construction having an external geometry facilitating assembly of the connector in an insulating housing. It is a still further object of invention to provide an interconnecting means for electrical or electronic components such that any one of a number of coaxial cables may be disconnected without disturbing the interconnection between other connections. It is a still further object of the invention to provide a multiple interconnection means for coaxial cables wherein defined shielded signal paths are maintained throughout the interconnection between coaxial cables.

These and other objects are attained by the present invention through the use of standard coaxial cable terminals commoned by a channel member of generally rectangular shape into which an assembly of generally rectangular insulating and metal plates are fitted together to insulate and complete an interconnection between the signal paths. In conjunction therewith, an insulating housing is provided having a number of blocks with apertures adapted to readily receive and position each channel member with means to hold the various blocks together to lock the connectors therein in position.

In the drawings:

FIGURE 1 is an exploded perspective view of the insulating housing of the invention including one connector positioned relative to the members of the housing;

FIGURE 1A is a schematic diagram showing the use of the invention in conjunction with electrical and/or electronic components;

FIGURE 2 is a plan view of the invention as assembled;

FIGURE 3 is a perspective showing the connector of the invention;

FIGURE 4 is a cross-sectional view taken along lines 4-4 of FIGURE 3; and

FIGURE 5 is an exploded view of the connector of FIGURE 3 rotated ninety degrees.

Referring first to FIGURE 1A, blocks C₁-C₄ may be taken to represent stages of electronic equipment such as a computer serially interconnected by paths c₁, c₂, c₃. Blocks D₁-D₃ may be taken to be associated computer equipment adapted to be individually driven by one of the stages C₁-C₄. In applications of this type, it is necessary that the interconnection between stages be maintained, except when it is necessary to replace a particular stage. The interconnection with any associated equip-

2

ment D₁-D₃ varies from time to time, depending upon the particular system function being carried out by the computer. The interconnection such as d₁ must therefore at times be disconnected without interrupting the path between C₁ and C₂. It is this type of interconnection problem that the connector assembly of the invention is adapted to serve; it, of course, being contemplated that it may be utilized in other applications to provide interconnections between various coaxial signal paths.

Referring now to FIGURE 1, an assembly 10 representing the invention is shown with various housing portions exploded and in alignment to accommodate a connector 100. In use, assembly 10 houses ten connectors such as 100 with each such connector adapted to provide the interconnection paths c₁ and d₁ shown in FIGURES 1A and 2. Thus, barrel 132 of 100 receives a coaxial cable terminating d₁ and barrels 120 and 130 receive coaxial terminals interconnecting C₁ to C₂. The terminal construction may be of the type shown and described in the above-mentioned O'Keefe application, and a detailed description of connector 100 will be given hereinafter.

The connector block assembly 10 includes a base block 12, a Y block 32, a block cover 60 and two cable blocks 80 and 90 of insulating material such as phenol-formaldehyde, phenol-furfurol, melamine formaldehyde, silicone, diallyl phthalate, or thermoset molding compounds molded and/or machined to interfit in the manner shown in FIGURE 2. Base block 12 includes a body portion 14 with integral end flange portions 16 and 17 having centrally disposed hexagonal apertures 18 and 19 adapted to receive screw members which hold the various blocks together. Disposed along a longitudinal center line of block 12 are a plurality of apertures 22 forming cavities adapted to receive, at the near end, barrels 132 of connectors 100 and, at the other end, not shown, terminals interconnected to cables such as d₁. Spaced on either side of the row of apertures 22 are transversely extending flange members 24 and 26 defining bearing surfaces for Y block 32. Flanges 24 and 26 are of a height to provide proper axial spacing for each barrel 132 of 100 secured in block 32. At each end of block 12, secured in the hexagonal apertures 18 and 19, are socket and stud members 28a and 30a, respectively, adapted to receive complementary portions 28b and 30b, which in turn include portions extending through Y block 32 and cover 60 to hold such members against base block 12 by engagement with male and female jack screws 28c and 30c, respectively.

Y block 32 is comprised of a base portion 34 having relieved faces 36 and 38 at the ends on one side adapted to provide spacing for the nuts and washers for stud and socket members which are secured thereagainst. Integrally formed and extending from base 34 are side walls 40 and 42 of a width and depth adapted to receive cover plate 60 in nesting relation therewith. Within the base 34 are transverse channels 44 of rectangular cross section defined by transverse walls such as 46 and 48 end walls such as 50. The dimensions of channels 44 are such as to accommodate connectors 100 adapted to be fitted therein with the body of each connector below the upper edge of walls 46 and 48. Not shown in FIGURE 1, centrally disposed apertures are positioned in base 34 in alignment with apertures 22 of base block 12, such that the barrel members 132 of 100 may be extended through the Y block and into apertures 22. At each end of block 32 are pairs of hexagonal apertures 50 and 53 adapted to receive pairs of socket and stud members 51a and 54a, respectively, which are held by the nuts and washers fitted against faces 36 and 38.

Cover plate 60 is comprised of a body portion 62 relieved at either end as at 64 and 66 and including pairs

3

of apertures 72 and 74 aligned to receive the studs 51b and studs 54a for interconnection with Y blocks 32 and cable blocks 80 and 90 through female tips formed on studs 51b at one end and male jack screws at the other end adapted to intermate with jack studs 54a. Cover 60 further includes two columns of ten apertures 68 and 70 positioned such that pairs of apertures receive barrels 120 and 130 of each connector assembly 100. With 60 positioned to lock connectors 100 within 32, the upper surface thereof is flush with the edges of walls 40 and 42.

Adapted to be fitted against cover plate 60 are cable blocks 80 and 90, which are substantially identical to include end flange portions such as 82 and 92 with similar end portions at the opposite edge. Flange portions 82 and 92 are apertured as at 83 and 93 to receive the tips of jack screws 51b which intermate with female jack screws 51c adapted to hold blocks 80 and 90 against cover 60. Jack screws 54b are fitted through apertures of each cable block at the other end such as to intermate with studs 54a. The jack screws 51c are adapted to slide over the tip of each stud 51b and be attached thereto by a pin member as indicated. The cable blocks 80 and 90 each include body portions 84 and 94, respectively, with a series of apertures 86 and 96 forming cavities to receive terminal portions of coaxial cables inserted therein to engage barrels 120 and 130 of connectors 100.

The assembly of the device 10 is accomplished by placing assemblies 100 within Y block 32; fitting cover 60 thereover with the pairs of barrels of the assemblies 100 fitted through the apertures 68 and 70; securing the pairs of socket and stud members 51, 54; positioning Y block 32 on base block 12 with the single barrels fitted therein and then securing the remaining socket and stud members 28, 30. If the assembly is to be utilized in a bulkhead mount as shown in FIGURE 2, the threaded outer ends of 28a and 30a may be utilized to mount block 12 to the bulkhead 98 as shown. Thereafter, blocks 80 and 90 may be added and various coaxial terminals inserted within the appropriate apertures to form the paths d_1 - d_3 and c_1 - c_3 . If it is desirable to disconnect any one of the d_1 paths, such may be accomplished by merely withdrawing the d_1 terminal from block 12. If it is desired to replace one of the stages C_1 - C_4 , adjacent terminal leads may be withdrawn from the blocks 80 and 90, respectively, and replaced by leads from the stage being inserted. As an important consideration with respect to the ability of the assembly to withstand vibration is the clearance provided at each end of the parts 12, 32, 60, 80 and 90. Thus, between 12 and 32 there is a clearance formed by the height of flanges 24 and 26. Between 60 and 80 and 90 there is the clearance formed by relieved portions 64 and 66. The clearances operate to maintain an elastic reserve with portions of the blocks in tension created as the various studs are tightened down.

The assembly 10 is shown as being capable of accommodating ten connectors 100. It is to be understood, however, that more or less than ten connectors may be accommodated utilizing a construction similar to that shown in FIGURES 1 and 2.

Turning now to the connector 100 of the invention, FIGURES 3-5 show in various views the preferred construction for a single Y connector adapted to interconnect three coaxial paths. Utilizing the teachings hereinafter described, Y-type connectors having more than three coaxial paths may be constructed. For example, a connector might be provided with ten coaxial paths such as 120 and 130, commoned to a single path such as 132.

As indicated in FIGURE 3, assembly 100 is comprised of a central channel 102 having coaxial barrels 120, 130 and 132 mechanically secured thereto to form a Y-type connector capable of accommodating three coaxial terminals. The external dimensions of channel 102 are such as to fit within one of the channels 44 as heretofore described with respect to the connector block 10 shown in FIGURE 1. As better shown in FIGURE 5, channel 102

4

is comprised of side plates 104 and 108 interconnected by a plate 106 to which barrels 120 and 130 are secured by welding, riveting, cold forging, or by screw threads formed in apertures of the plate 106 cooperating with threads on one end of the barrel. Each of the barrels is comprised of an outer metallic shell such as 121 flared as at 122 at the other end to accommodate the insertion of coaxial cable terminals. Secured within shell 121 and extending about half of the length thereof is a dielectric insert 123 wedged therein, which is preferably of various thermoplastic compounds. Insert 123 includes a central bore mounting a central contact pin member 124, having a pin extension 126 adapted to mate with the coaxial cable terminal. At the other end of 124 is an end portion 125 which is adapted to be electrically joined to a conductive bus bar or plate 128 as by welding, riveting, cold forging, or threading.

Bus 128 is centrally disposed within the cavity defined by the walls 104, 106 and 108 of channel 102 and is insulated therefrom by a number of dielectric members in a manner shown in FIGURES 4 and 5.

The third barrel 132 is identical to barrels 120 and 130 and is secured to a metallic plate member 134 through a central aperture 135 therein by threading or welding. The end portion of the central contact pin 136 is also secured and electrically connected as at 137 to the central bus 128. To complete the outer metallic shell of 102, end plates 138 and 140 are provided.

On each side of bus 128 are dielectric members 142 and 144 of the same planar configuration. Member 142 is apertured to receive pin 136 and member 144 is apertured to receive pins such as 126 for each barrel 120 and 130. The ends of bus 128 are insulated by dielectric plates 146 and 148 fitted interior of plates 138 and 140. Top and bottom dielectric plates 150 and 152 are included to thus complete electrical isolation of the signal paths formed by the bus 128 and pins interconnected therewith and the outer path formed by channel 102 and the shells of barrels 120, 130 and 132. As an important manufacturing consideration, each of the dielectric plates is rectangular to permit economy of production as by die cutting from dielectric sheet material. The use of right angle flat stock also simplifies assembly procedures.

During assembly the channel 102 in the form shown in FIGURE 5 is positioned, and the various insulating pieces 142, 144, 146, 148, 150 and 152, including the conductive bus 128, are assembled and positioned within channel 102. The pin members such as 126 are then rotated and threaded into bus 128 if the embodiment is of the threaded type. Alternatively, if the pin members are welded, riveted, or cold forged to bus 128, the insulating plate 142 is first positioned within channel 110 of 102. The pin members are then inserted through plate 144 with plate 142 inserted over pin 136 and the plates 146, 148, 150 and 152 added. Following this, the metallic end plates 138 and 140 are then forced in slots 114 and 115 provided in the walls 104 and 108 in the direction shown in FIGURE 5. Plate 134 is thereafter worked into intersecting slots 116 and 118 to completely captivate the bus and surrounding dielectric. Finally, the edges of both walls 104 and 108 are forced inwardly as at C to clinch plate 134 within slots 116 and 118 and hold the assembly together. Plate 134 operates to lock plates 140 and 138 and thus the assembly together.

The design of connector 100 greatly facilitates production procedures wherein a coaxial Y-type connector may be produced with broad tolerances. The insulating housing for connector 100 provides a compact and secure means for mounting numbers of connectors.

Changes in construction will occur to those skilled in the art, and various apparently different modifications and embodiments may be made without departing from the scope of the invention. The matter set forth in the foregoing description and accompanying drawings is offered by way of illustration only. The actual scope of the in-

5

vention is intended to be defined in the following claims when viewed in their proper perspective against the prior art.

I claim:

1. An interconnecting assembly comprising in combination, an insulating housing having a base block apertured to receive terminals affixed to the ends of coaxial cables, a further block apertured to receive a barrel portion of a coaxial connector extending therethrough into an aperture of said base block, the said further block including a series of channels transverse to the longitudinal axis of said further block and of a configuration similar to that of connectors to be fitted therein, a cover block adapted to be fitted within said further block over connector members fitted therein, said cover having rows of apertures adapted to receive other barrel portions of connectors extending therethrough, cable block members adapted to be fitted against said cover block, including apertures adapted to receive, in one end, the other barrel portions extending through said cover block and, at the other end, terminals of coaxial cables inserted therein and means intersecting the ends of said blocks for holding said assembly together.

2. The assembly of claim 1 wherein the said base, further, and cover blocks each include at their ends, transverse faces relieved from the thickness of the body of each block, whereby said means for holding said blocks together places the blocks in tension to lock the assembly together.

3. The assembly of claim 1 including connectors, each comprised of a metallic channel member having on an outside wall a number of coaxial connector barrel portions and having side walls including interiorly a series of intersecting slots adapted to receive metal plates inserted therein, one of said plates having secured thereto a further connector barrel portion, a central conductive pin member secured by a surrounding dielectric insert in each barrel portion and a central conductive bus interconnecting electrically the central pin members of each of said connector barrel portion within the cavity defined by the

6

walls of said channel member, dielectric plates substantially surrounding said bus member within said cavity whereby at least three commoned conductive paths are effectively insulated from and shielded by a commoned conductive outer path formed by said channel member, including said coaxial connector barrel portions.

4. The connector of claim 3, wherein each connector barrel includes a central pin member threaded into said bus.

5. The device of claim 3, wherein each connector barrel includes a central pin member welded to said bus.

6. An improved Y-type coaxial connector assembly having at least three coaxial paths, each formed of a conductive metal barrel forming an outer shell, a central dielectric insert secured in each barrel and a central connector pin member supported in each insert, similar ends of said pins commoned to a bus of conductive metal, a rectangular channel of conductive metal surrounding said bus and spaced therefrom by a number of dielectric plates in contact with said bus, the inner surfaces of said channel including a series of intersecting slots adapted to receive conductive plates therein to completely surround the pin contact with the bus, at least two of said barrels secured to said channel and one of said barrels secured to one of said plates in a line parallel to the axis of said two barrels.

7. The connector of claim 6 wherein portions of channel metal adjacent said slots are forced inwardly to hold said plates against relative movement.

References Cited by the Examiner

UNITED STATES PATENTS

2,813,144	11/1957	Valach	339—177 X
2,933,713	4/1960	Jackson et al.	339—92
3,040,289	6/1962	Wicks	339—92
3,054,078	9/1962	Baschkin	339—176 X
3,160,456	12/1964	O'Keefe et al.	339—92

JOSEPH D. SEERS, *Primary Examiner*.