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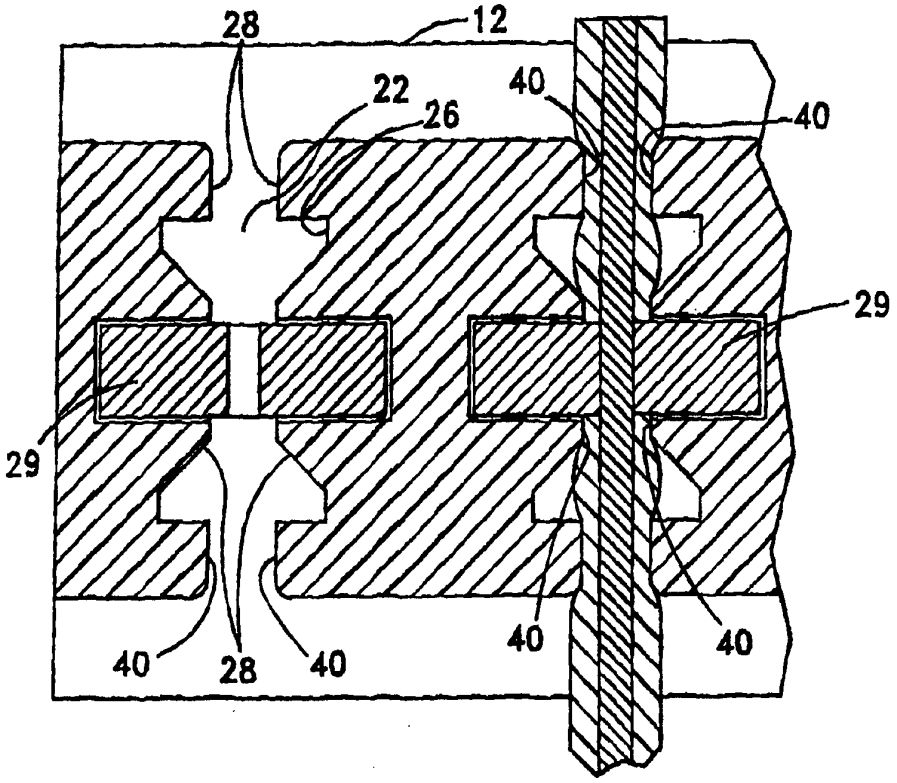
(54) Title: WIRE CONNECTING SYSTEM

(57) Abstract

The invention relates to a cross connect wiring block also known as a (110) connector system. This type of wiring block typically includes slotted beam contacts to electrically interconnect a set of first conductors to an associated set of second conductors. The wiring block essentially comprises an elongated housing (12) containing plural cavities (22) defined by opposing walls (26), where each cavity receives a slotted beam contact (29) longitudinally positioned within the cavity. The improved features of this wiring block are the provision that each first conductor consists of a metal core and an outer layer of insulation, where the diameter of the conductor is a predetermined diameter, and that opposing walls of the cavities include plural pairs of longitudinally directed projections (28), where the distance between the projections of a given pair is less than the predetermined diameter. This ensures greater wire retention of the conductor. Further, the projections are so designed and arranged as to be compatible with conventional hand termination tools.



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WIRE CONNECTING SYSTEM

This invention relates to an improved wire connecting system.

A wire connecting block is known in the prior art as the 110 connector system. Such a wire connecting block is used in the telephone industry to electrically interconnect a set of first conductors to an associated set of second conductors.

An early example of the 110 wire connecting block is taught by U.S. Patent No. 3,611,264. The connector thereof includes an indexing strip and a connecting block, the latter of which carries a plurality of slotted beam contacts. The indexing strip has a plurality of uniform height, spaced-apart teeth along its length. These teeth aid in indexing a first set of conductors. A corresponding plurality of uniform height, spaced-apart teeth carried by the connecting block serve to index a second set of conductors to be cross-connected through the slotted beam contacts to the first set of conductors. The general design and operation of the 110 connector system have remained unchanged over the years to ensure compatibility with a commercially available, manual, wire termination tool, as well as with the existing telephone equipment.

It will be appreciated that a considerable normal force must be applied to the contact to effect termination thereto by the displacing of the conductor insulation, typically polyethylene and the like, and pushing such conductor into the slot between the contact arms. In the wire connecting blocks sold commercially, most experience considerable "play" in the seated contacts.

The problem to be solved by this invention is to improve the wire retention capabilities of a wiring block while at the same time, keep it compatible with existing termination tools.

The problem has been solved by providing a cross connect wiring block of the type for receiving slotted beam contacts to electrically interconnect a set of first conductors to an associated set of second conductors. The wiring block essentially comprises an elongated dielectric housing containing plural cavities defined by opposing walls, where each cavity receives a slotted beam contact longitudinally positioned within the cavity. An improved feature hereof is the provision of each first conductor consisting of a metal core and an outer layer of insulation, where the diameter of the conductor is a predetermined diameter. Further, the opposing walls include plural pairs of longitudinally directed projections, where the distance between the projections of a given pair is less than the predetermined diameter of the insulated conductors.

The preferred embodiment of the invention will now be described by way of reference to the drawings where:

FIGURE 1 is a perspective view of the improved wire connecting system according to this invention;

FIGURE 2 is a partial, enlarged perspective view of the system of Figure 1, illustrating further details of the invention;

FIGURE 3 is a sectional view of the system taken along line 3-3 of Figure 1, but showing a loaded slotted contact within a cavity of such system;

FIGURE 4 is a sectional view taken along line 4-4 of Figure 3, further showing one terminated, insulated wire within a slotted beam contact;

FIGURE 5 is a partial, enlarged top view of the system in accordance with this invention; and

FIGURE 6 is a partial, enlarged sectional view of the system hereof, illustrating the profile of two known terminating tools, and their relationship to the unique features of this invention.

Turning first to Figures 1 to 3, the wire connecting block 10 of this invention comprises a dielectric housing 12, typically formed of plastic, having a pair of side walls 14, a pair of end walls 16, a first mating face 18, and a contact loading face 20. Within the housing 12 are a plurality of cavities 22 for receiving and retaining slotted beam planar contacts, as hereinafter described. The cavities along the mating face 18, include a pair of opposing slots 24 into which the slotted beam contacts are received in a longitudinally arranged manner. Additionally, on each side wall 26 of the cavity 22, spaced from said slots 24, are plural pairs of opposing projections or vertically oriented ribs 28. The function of such projections or ribs will be discussed in greater detail hereinafter.

Before describing further details of the housing 12, it may be helpful to review briefly the construction of a slotted beam contact 29, to illustrate in conjunction with Figure 3, how such contact is retained within the housing. For a detailed discussion of a preferred slotted beam contact, reference may be made to U.S. Patent Number 5,409,404. Briefly, slotted beam contacts are typically stamped from a planar strip of sheet metal, such as phosphor bronze, by an operation which advances the strip incrementally through a plurality of work stations, where stamping and peening steps may be performed on the strip. The resulting contact consists of a mid body portion, and a pair of insulation cutting and conductor receiving slots formed by a pair of arms extending from the mid body portion. The pair of arms are typically bifurcated to form furcations with inner portions forming enlarged elongated openings adjacent the mid body portion, where the terminated conductors seat, and with outer portions closing towards each other to form slots having predetermined width characteristics for receiving

insulated conductors. Further, the outermost ends of the arms are tapered to form a relatively sharp V-shaped entrance to the conductor receiving slots to thereby facilitate displacement of the insulation and termination of the conductor.

Since contact retention and avoidance of "play" are key elements to an effective wire connecting block, the contact may be modified by the provision of an outwardly directed lance. Specifically, as a further operation of the stamping process, a lance 30 is struck from the mid body portion of the contact, where such lance 30 is acutely angled from the mid body portion. In loading the housing 12, the lance 30 is caused to rest against the angled transition section 32, see Figure 3. In other words, such angled section functions as a "stop" to further movement of the contact toward the mating face 18.

Provision must also be made to prevent movement of the contact toward the contact loading face 20. It will be noted from Figures 1 and 3 that a recess 34 has been provided in a side wall 14, where the base 36 (Figure 3) is a relatively thin section. To finally secure the contact, a sharp tool may be caused to enter into the recess 34 where such tool severs three sides of the thin walled section 36 which is then hingedly moved or flexed into the opening created by the lance 30. By this arrangement, the partially severed hinged wall section 36 is flexed into engagement with the lance 30, and thereby positioned to resist movement of the contact in the opposite direction. In other words, "stops" have been created against movement in either of the directions where the forces of conductor termination are significant.

Returning now to Figure 2, and the further illustrations of Figures 4 to 6, which show clearly the unique features of this invention, it will be recalled that plural pairs of opposing projections or vertically

oriented ribs 28 have been provided along the cavity walls 26. Each pair consists of projections 28 directed inwardly toward a complementary projection along the opposite cavity wall 26. The spacing between projection ends 40 of a given pair is slightly less than the diameter of the insulated wire to be terminated within the cavity 22, note in particular the terminated wire in Figure 4. By this arrangement multiple gripping fingers are provided to increase wire retention. By way of example, a series of tests were conducted on the wire retention capabilities of a wire connecting system according to this invention, and a prior art version having no cavity projections but rather relying on the retentive capabilities of the slotted beam contact. In this series of tests, the average wire retention force, or the force to remove the wire in pounds per inch, was 1.81 for the present invention, versus 1.27 for the prior art.

While a feature of this invention is the provision of greater wire retention capabilities, such feature is only part of the unique advantage of the product covered by this invention. It will be recalled from the earlier discussion that there are two commercial hand tools that are widely used today to effect termination of a 110 type wiring block. A wire connecting block that is compatible with each offers significant commercial advantages to the manufacturer, as well as some peace of mind to the user. In any case, the respective tools are hand grippable in a pliers-like fashion, where the working heads are configured to be received in the housing cavity 22, and for urging the insulated wire into the slotted beam contact. The cross-sections of the different working heads are illustrated in Figure 6, where the KRONE tool is identified as "K" and the AT&T tool identified as "A". With each tool, the working heads essentially traverse the width of the housing 12

to provide a uniform normal force to the underlying insulated wire that is being terminated.

In the preferred embodiment, as best illustrated in Figures 4 to 6, the respective outer pairs of the axially oriented cavity projections 28 are generally rectangular in cross-section, whereas the inner pairs of projections are triangular in cross-section. By this arrangement, a continuous transverse slot is provided to receive the "A" tool, while at the same time ample space is available to receive the opposing uniquely shaped arrow heads 42 of the "K" tool. Further, to facilitate the entry of the arrow heads 42 into the cavity 22, the top edges of the respective projections 28, at least the inner edges, are tapered or beveled 44, see Figure 5. These beveled edges help to align and direct the arrow heads into the cavity 22.

Claims:

1. A cross connect wiring block (10) of the type for receiving slotted beam contacts to electrically interconnect a set of first conductors each having a predetermined diameter to an associated set of second conductors, where said wiring block comprises an elongated housing (12) containing plural cavities (22) defined by opposing walls (26), each cavity receiving a slotted beam contact (29) longitudinally positioned within said cavity, characterized in that:

said opposing walls (26) include plural pairs of longitudinally directed projections (28), and the distance between ends (40) of a given pair of the projections is less than said predetermined diameter.

2. The cross connect wiring block according to claim 1, wherein there are four pairs of projections per cavity.

3. The cross connect wiring block according to claim 2, wherein the projections include beveled edges (44) to facilitate termination of said first conductors to said slotted beam contacts.

4. The cross connect wiring block according to claim 1, wherein the respective cavities (22) include two outer pairs of axially directed projections (28) having an essentially rectangular cross-section, and two inner pairs of axially directed projections (28) having an essentially triangular cross-section where a side of each inner pair is angled from the wall of said cavity.

5. The cross connect wiring block according to claim 4, wherein the top edge of each angled side is tapered to ensure alignment of a conductor termination tool into said cavity.

6. The cross connect wiring block according to claim 4, wherein the profile of said cavity between adjacent pairs of projections is essentially an arrow head configuration.

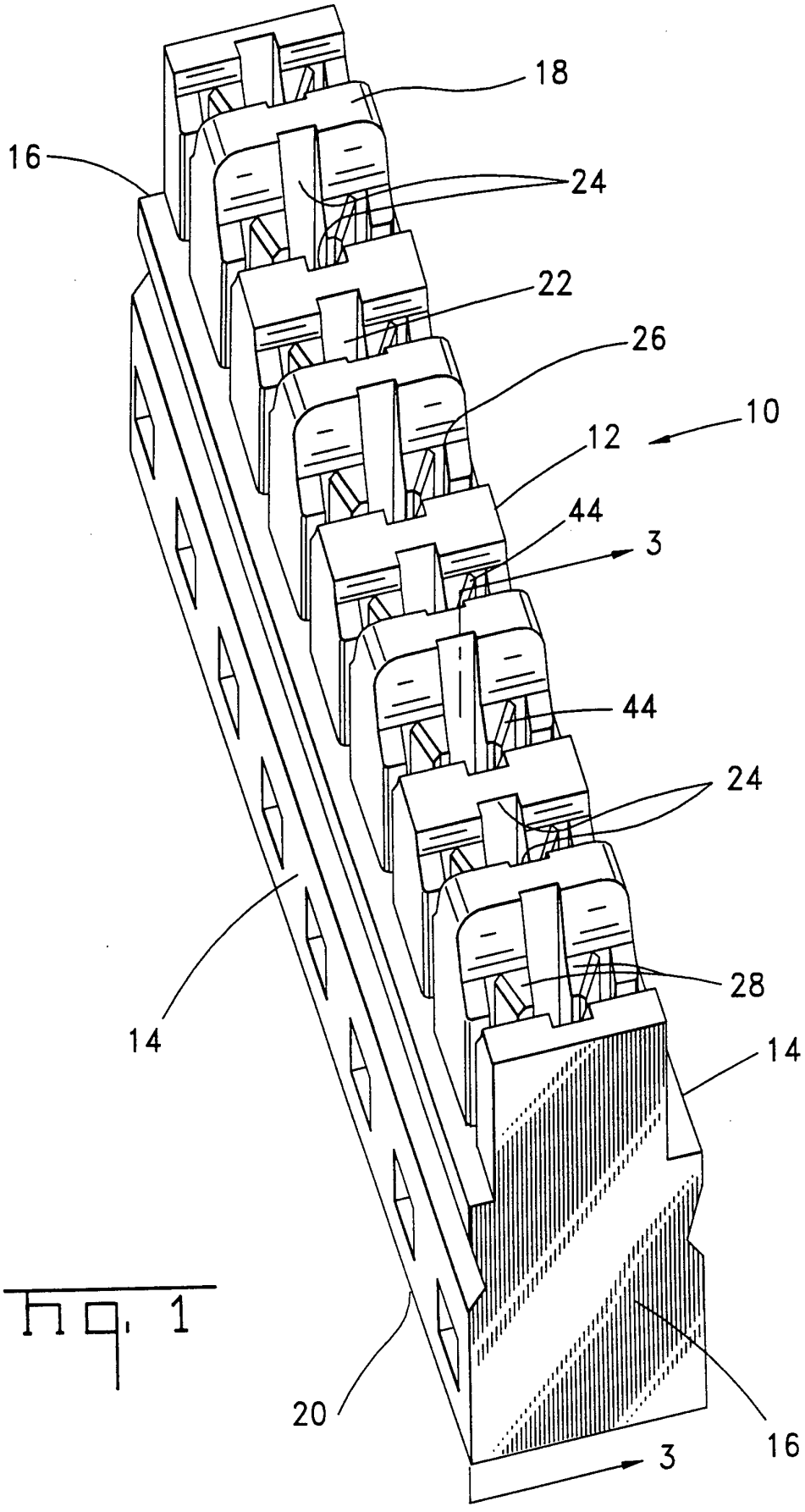


Fig. 1

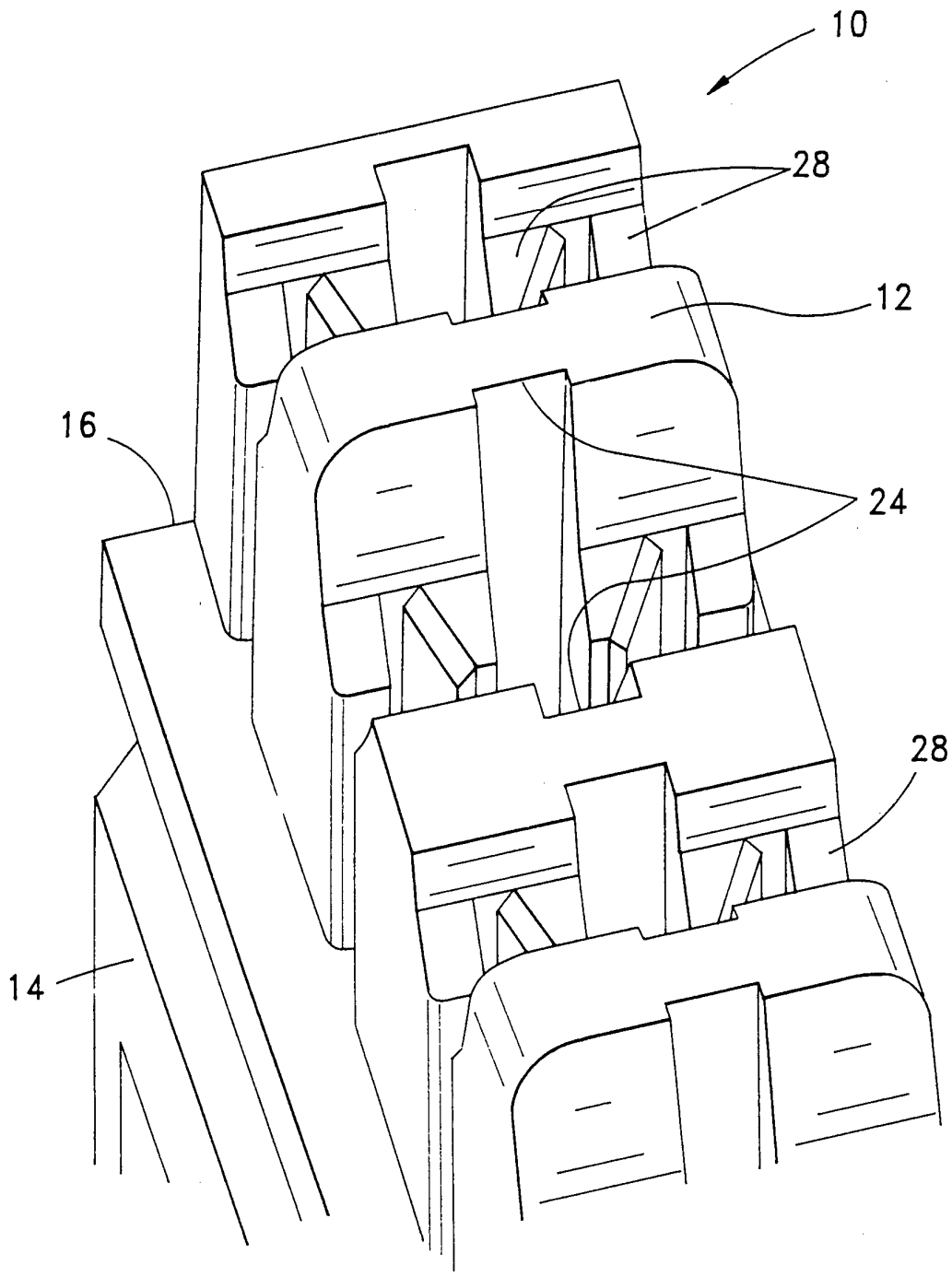


Fig. 2

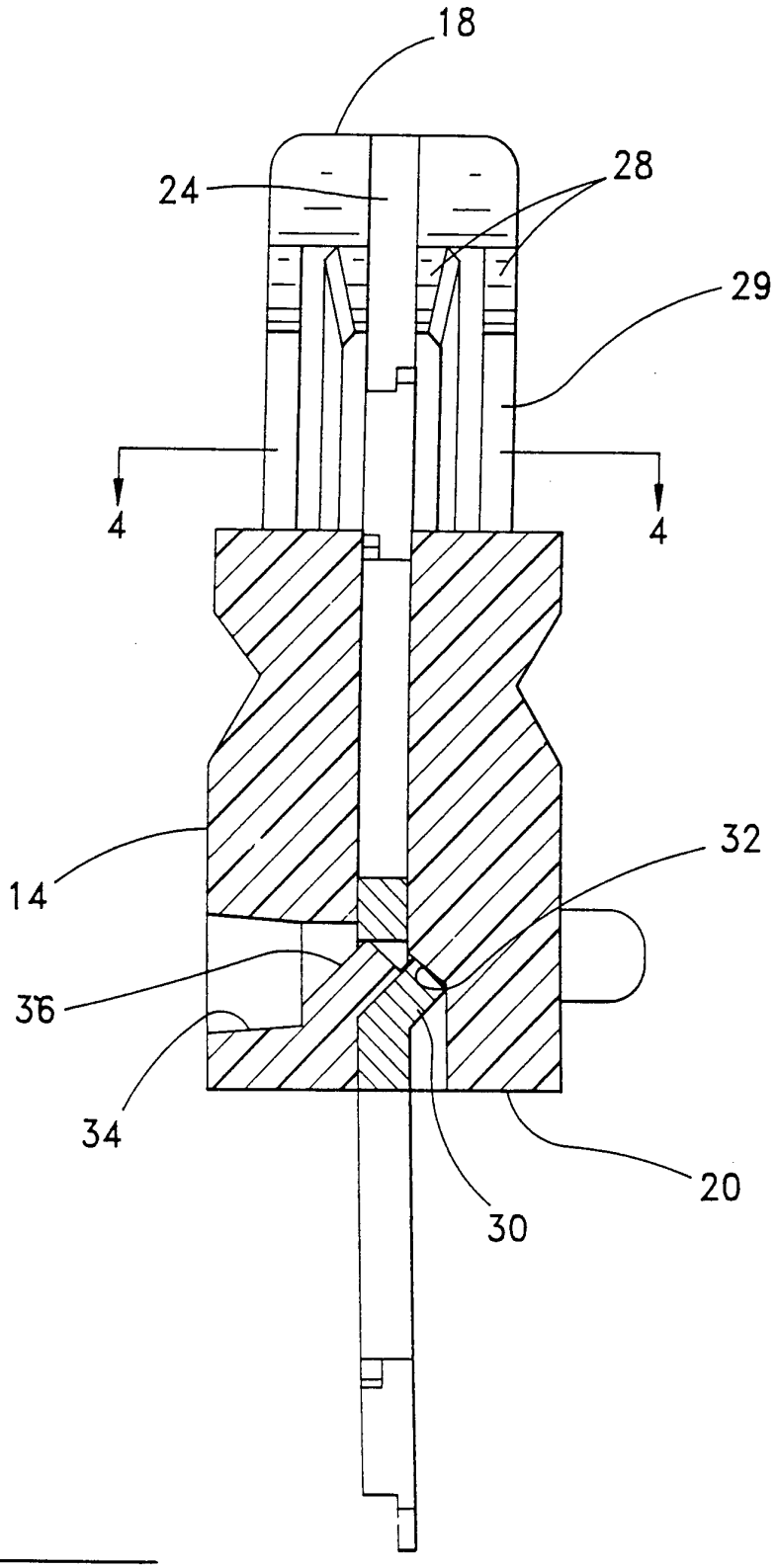


Fig. 3

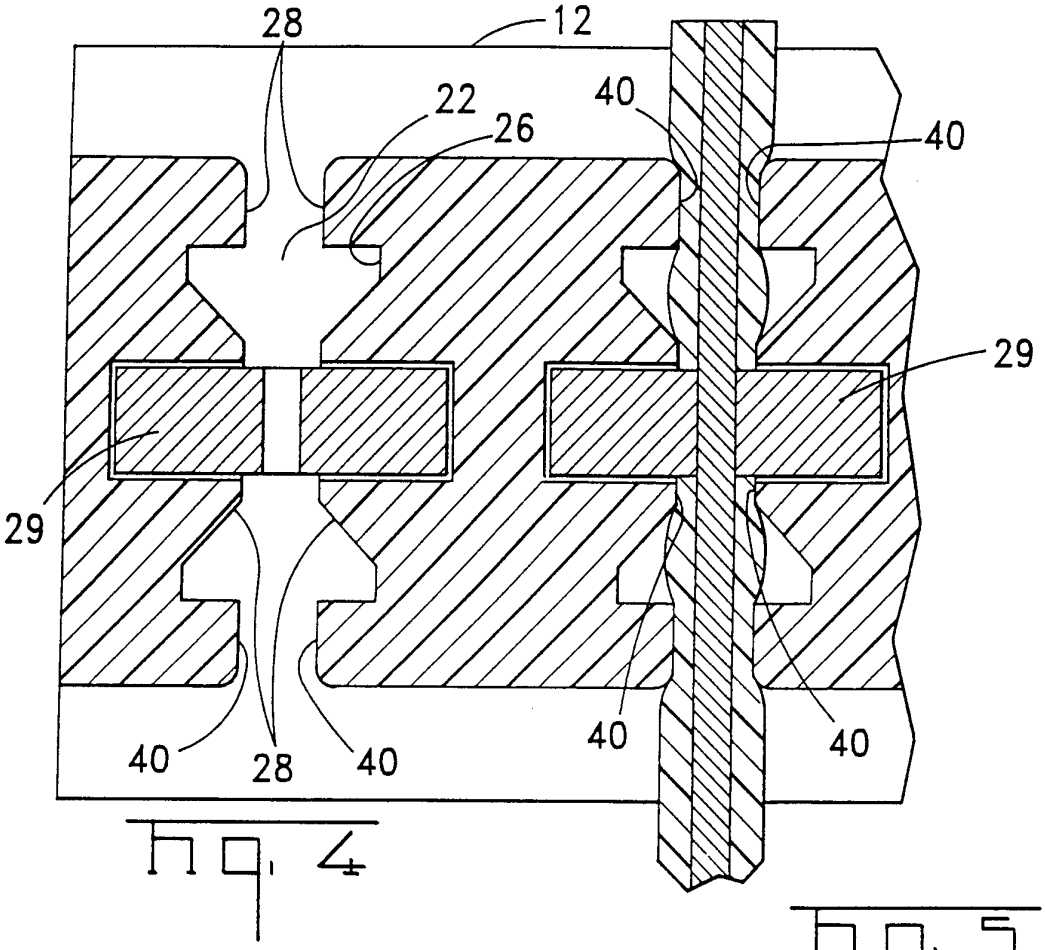
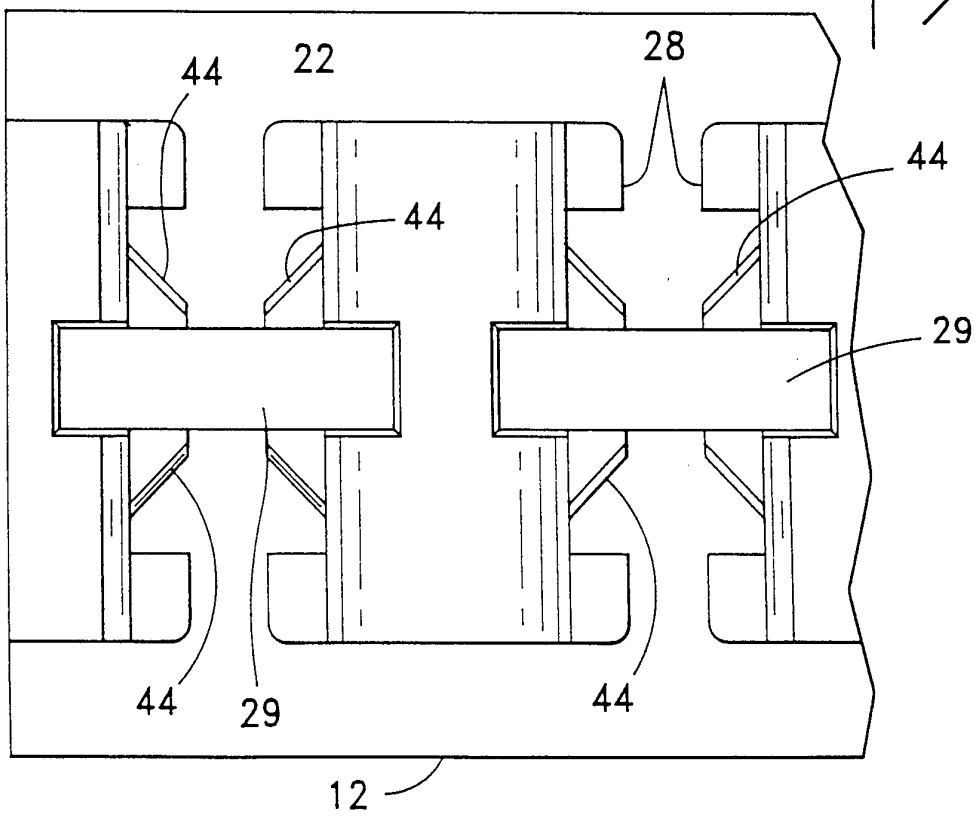


Fig. 4

Fig. 5



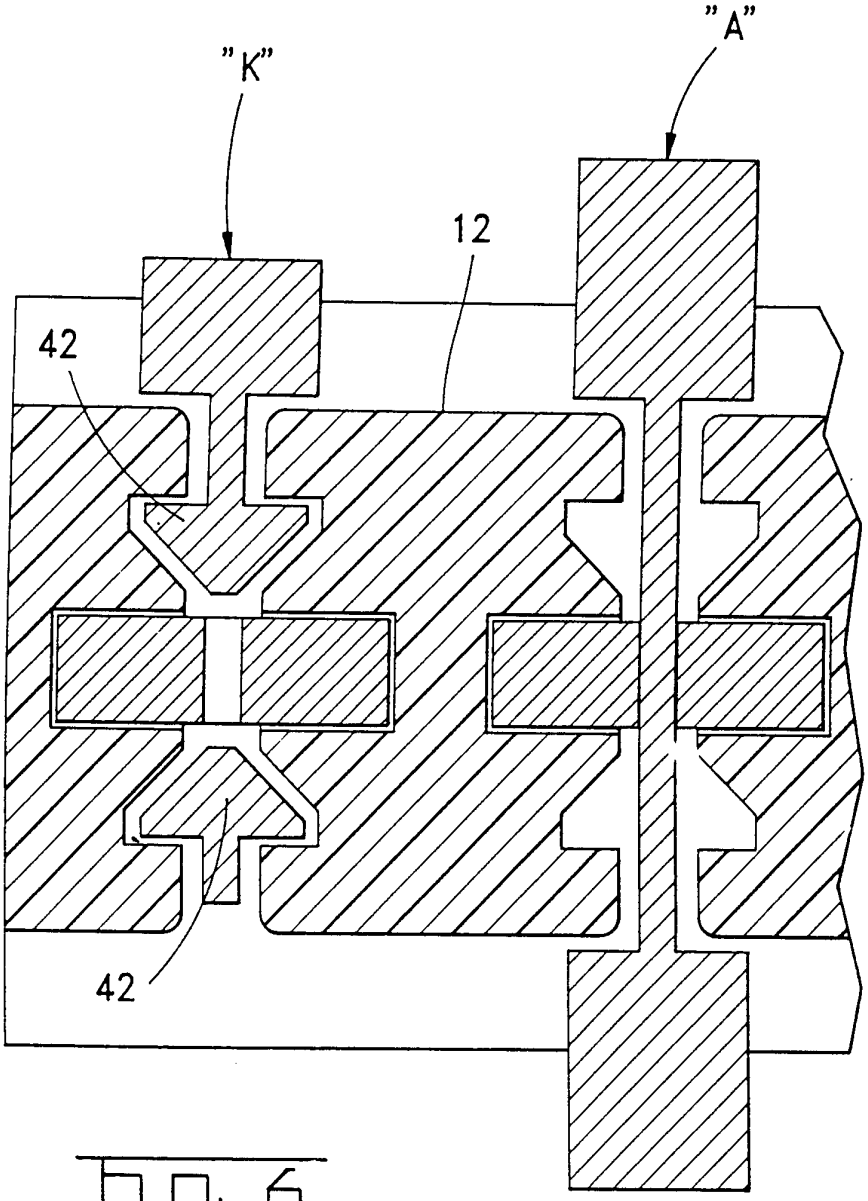


Fig. 6

INTERNATIONAL SEARCH REPORT

Inte· ›nal Application No
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A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 H01R4/24

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 H01R

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	US,A,3 708 779 (MILLER D ET AL) 2 January 1973 see column 8, line 32 - column 9, line 15; figures 17-20	1,2 3-6

Y A	US,A,4 118 095 (BERGLUND RICHARD NEWMAN ET AL) 3 October 1978 see column 3, line 42 - line 60 see column 5, line 56 - column 6, line 10; figures 1-3	3,5 1

Y	FR,A,2 414 261 (HUBBELL INC HARVEY) 3 August 1979 see page 17, line 21 - page 18, line 17; figure 21	4-6

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[X] Further documents are listed in the continuation of box C.

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Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE,U,93 18 473 (QUANTE AG) 24 February 1994 see page 9, line 28 - page 10, line 12; figure 2 -----	1-6

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Information on patent family members

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