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71 Applicant: **MOLEX INCORPORATED**
2222 Wellington Court
Lisle Illinois 60532(US)

72 Inventor: **Brubaker, Weldon L.**
2553 Alta Court
Lisle Illinois(US)

72 Inventor: **Case, Arnold A.**
1633 Tyler Road
St. Charles Illinois(US)

74 Representative: **Slight, Geoffrey Charles et al,**
Graham Watt & Co. Riverhead
Sevenoaks Kent TN13 2BN(GB)

54 **Electrical contact for terminating insulated conductors.**

57 A contact member (14) for forming an electrical connection with insulated conductors of either a solid core, stranded or tinsel ribbon type is formed from a unitary piece of stamped sheet metal and includes both insulation displacement portions (52) and insulation piercing portions (54). Each insulation displacement portion comprises a plate (56) having a slot (58) for establishing contact with a solid core conductor by severing and displacing its insulation. Each insulation piercing portion includes an arm (62) spaced laterally from an adjacent plate (56) having a conductor receiving opening (64) with a barb (66) for piercing through the conductor insulation. The arms (62) are deflectable with respect to the plates (56) upon interaction of the barbs (66) with a solid core conductor terminated to the contact member. The insulation displacement and insulation piercing portions of the contact member may thus co-operate or function alternatively to provide an effective electrical connection with a conductor, regardless of its particular type.

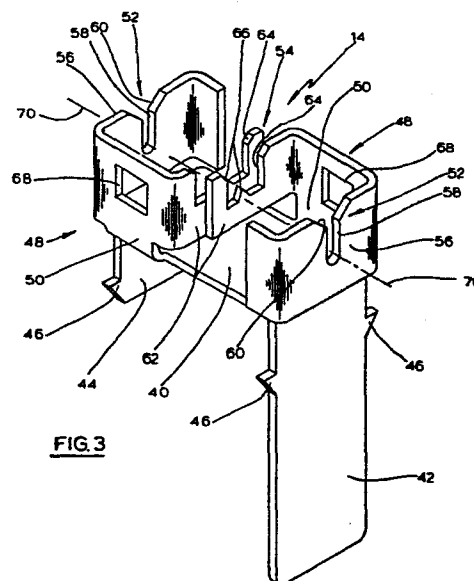


FIG. 3

ELECTRICAL CONTACT FOR TERMINATING INSULATED
CONDUCTORS

This invention relates generally to electrical contact members for terminating insulated conductors, and specifically, to a contact member having the capability of terminating a conductor without prior
5 removal of the conductor's insulative coating.

A wide variety of methods and devices are available for terminating an insulated electrical conductor such that the conductor may provide a reliable electrical connection between circuitry
10 apparatus of diverse type. Because of its inherent economies, a preferred method involves terminating a conductor to a contact member without prior stripping or removal of the insulative coating covering the conductor. Such a method is particularly well suited
15 for use in the telecommunications or data processing industries, wherein electronic equipment is often field-installed or serviced. By eliminating the step of stripping the insulation from the conductor, significant economies are possible in the wiring of
20 electronic or electrical apparatus.

Two such methods have become widely accepted, namely, insulation piercing and insulation displacement. In the former case, an electrical connection is established with the conductor typically through the use of a barbed contact member which has been forced

through the insulative coating of the conductor. An exemplary contact member of this type is disclosed in Hardesty, U.S. Patent No. 4,054,350 issued October 18, 1977, illustrating the termination of a multi-conductor
5 cord through the use of barbed, blade-like terminals. In the case of the latter method, the insulative coating of the conductor is severed by the edges of a slot formed in a contact member permitting the insulative coating to be displaced in the region of the
10 connection. This method is disclosed, for example, in Carre, U.S. Patent No. 4,217,022.

In practice, the selection of termination methods as between insulation piercing and insulation displacement, depends primarily upon the construction of the
15 conductor which is to be terminated. Insulated conductors in wide-spread use may fall in three general categories, namely solid core, stranded wire or tinsel wire.

Solid core conductors, which typically comprise
20 a unitary core of conductive material covered with a dielectric coating, are best suited for insulation displacement techniques because of the relative rigidity of the central core. Conversely, piercing methods are generally unreliable for use with a solid
25 core conductor.

Stranded wire usually has a core consisting of a plurality of relatively thin conductive members grouped

together. This type of wire may be terminated by either insulation piercing or insulation displacement, if suitable precautions are taken in the design of the contact member to assure a reliable electrical
5 connection to the terminated wire.

Tinsel conductors typically comprise a plurality of tinsel ribbons wrapped helically about a filamentary core with the resulting assembly enclosed in a textile braid or nylon jacket. This type of
10 conductor is known to be unsuitable for termination by insulation displacement, inasmuch as the filamentary core is too soft to provide for appropriate contact forces between the contact member and the tinsel ribbon.

15 Because all of these conductor types are in widespread use, particularly in the telecommunications field, there is a need to provide a single contact member which has the capability of terminating any one of these conductors as needed.

20 This invention provides a contact member for forming an electrical connection with an insulated conductor, the contact member including a plate having an open slot therein defining a pair of opposed edges for severing and displacing the insulation of a
25 conductor inserted therebetween, the slot having a mouth open to an edge of the plate and leading to a

relatively narrow section for receiving and terminating the conductor to the contact member, and insulation piercing means spaced laterally from said plate in alignment with the slot of the plate for piercing the insulation of the conductor upon its termination to the contact member.

The invention includes a connector assembly including a housing fitted with contact members as defined in the immediately preceding paragraph.

Specific embodiments of the present invention will now be described by way of example, and not by way of limitation, with reference to the accompanying drawings in which :-

FIG. 1 is a perspective view of a connector assembly of this invention fitted with contact members of this invention;

FIG. 2 is a plan view of a blank from which the contact members shown in Fig. 1 may be formed; and

FIG. 3 is an enlarged perspective view of one contact member in its fully formed state.

Referring now to the accompanying drawings, in Fig. 1, the connector assembly is designated generally by the reference numeral 10. The connector assembly 10 is of a type suitable for use in telecommunications applications and comprises a dielectric housing 12 fitted with a plurality of contact members 14 for

forming electrical connections with respective insulated conductors 16.

The housing 12 includes a plurality of internal partitions 18 which define recesses 20 for receiving
5 and electrically isolating the contact members 14. An opening 22 in the housing 12 allows for exit of the terminated conductors 16, and suitable strain relief formations 24 are provided internally of the housing 12 to aid in the prevention of dissociation of the
10 conductors 16 from the contact members 14.

Extending from sidewalls 26 of the housing 12 by means of a plastics living hinge arrangement 28 are a plurality of termination tabs 30 corresponding in number to the number of contact members 14 housed
15 within the assembly 10. The termination tabs 30 carry ram blocks 32 and 34 which are receivable within the recesses 20, for purposes which will be described in greater detail hereinafter. Ramp-like latching projections 35 extend from the sides of the blocks 34.

20 In order to seal the housing 12, the connector assembly 10 includes a suitable cover 36 connected to the housing 12 by means of an integrally formed hinge 38. By a number of well-known latching arrangements, the cover 36 may be adapted to snap fit over
25 the housing after tabs 30 and blocks 32 and 34 are received within their respective recesses 20.

Turning now to Fig. 2, the contact member 14 illustrated in Fig. 1 is shown as it would appear in the form of a stamped, sheet metal blank, designated generally by the reference numeral 14'. The blank 14' is preferably a unitary piece of relatively thin, highly conductive material. The contact member 14 includes a central body portion 40 from which an elongated, blade-like terminal portion 42 extends providing an electrical contact member for connection to other circuitry apparatus (not shown). Extending from the opposite side of the body portion 40 is a retention tab 44. Both the terminal portion 42 and tab 44 have a pair of ears 46 extending laterally therefrom for retaining the contact member 14 in a recess 20 between a pair of the partitions 18 formed in the housing 12 with the body portion 40 and the lower edges of a pair of plates 56, yet to be described, seated on an opposite pair of shoulders 18' formed on the two partitions respectively. The body portion 40 also carries a pair of wings 48 connected to the body portion 40 by support members 50. Each wing 48 is the mirror image of the other and is seen to include an insulation displacement portion 52 adapted to be firmly seated with the body portion 40 and an insulation piercing portion 54 adapted to be flexibly supported relative to the body portion 40.

The insulation displacement portion 52 is further adapted to form an electrical connection with an insulated conductor by severing and displacing the insulative coating of the conductor core. To this
5 end, the plates 56 are provided and each includes a slot 58 having a mouth 60 opening to an upper edge of the plate 56.

The insulation piercing portion 54 is intended to establish an electrical connection with an insulated
10 conductor by the method of piercing the insulative coating, and therefore, is formed with an arm 62 having an opening 64 for guiding the insulated conductor. The opening 64 is generally U-shaped and at its bight portion has an upwardly pointing barb 66. The support
15 members 50 are adapted with latching apertures 68, the operation of which will be described in greater detail hereinafter.

In Fig. 3, the contact member 14 is shown as it would appear in a fully formed state. As seen,
20 therein, the wings 48 are bent upwardly on their support members 50 and each plate 56 is bent through an angle of ninety degrees such that plates 56 are substantially parallel one to another. Similarly, each arm 62 of the insulation piercing portions 54
25 is bent at right angles so as to reside in a plane which is substantially parallel to the planes of the

plates 56. Because of this resulting U-shape forming of the wings 48, the insulation piercing barbs 66 and insulation displacement slots 58 are all aligned along a common axis of termination designated generally by the reference numeral 70.

Referring to Figs .1 and 3, it will be apparent that manual termination of a conductor to the assembly 10 can be readily accomplished by positioning the conductor 16 over the contact member 14 in alignment with the mouths 60 of the insulation displacement slots 58, and correspondingly, in alignment with the U-shape openings 64 of the insulation piercing arms 62. Then, by pivotal movement of the associated tab 30 about its hinge 28, the ram blocks 32 and 34 may be brought in contact with the conductor 16 and further pressed within the contact member 14. The conductor is, thereby, forced into the slots 58 which sever and displace the insulative coating of the conductor 16. Contemporaneously, the insulative coating is pierced by the barbs 66 of the insulation piercing portion 54 of the contact member 14 and the conductor 16 assumes a terminated position along the axis 70. The latching projections 35 thereupon engage the upper edges of the apertures 68 of respective contact members 14, thereby retaining the conductors 16 in seated position against the advent of vibration.

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It can be appreciated from the foregoing description that when a tinsel conductor, for example, is terminated to the contact member 14, the barbs 66 provide for effective termination of the tinsel conductor by piercing its insulative coating and establishing contact with the tinsel ribbon. Correspondingly, when it is desired to terminate either a stranded or solid core conductor, the insulation displacement slots 58 provide for the effective termination of those conductor types as well. As best seen in Fig. 3, the insulation piercing portion of the contact member 14 is spaced above the body portion 40 by appropriate dimensioning of the support member 50. Because the arms 62 are, thereby, cantilevered over the body 40, a solid core conductor can cause the arms 62 to deflect downwardly due to natural resilience of the arm material and the inability of the barbs 66 to penetrate the core of the conductor if this proves necessary. Therefore, the barbs 66 cannot interfere with the action of the insulation displacement slots 58 in providing effective electrical contact between a solid conductor core and the contact member 14.

CLAIMS:

1. A contact member (14) for forming an electrical connection with an insulated conductor (16), the contact member including a plate (56) having an
5 open slot (58) therein defining a pair of opposed edges for severing and displacing the insulation of a conductor (16) inserted therebetween, the slot having a mouth (60) open to an edge of the plate and leading to a relatively narrow section for
10 receiving and terminating the conductor to the contact member characterised by insulation piercing means (54) spaced laterally from said plate (56) in alignment with the slot (58) of the plate for piercing the insulation of the conductor upon its
15 termination to the contact member.
2. The contact member of claim 1 wherein the insulation piercing means comprises a barb (66) pointed generally in the same direction as the slot opening.
- 20 3. The contact member of claim 1 or 2 wherein the insulation piercing means (54) and plate (56) are formed from a single piece of thin conductive sheet metal (14') which is reversely formed into a generally U-shape, the legs of the U defining a
25 pair of substantially parallel planes, the insulation piercing means (54) and plate (56) being

disposed each in a respective one of said planes.

4. The contact member of claim 3 wherein the insulation piercing means (54) comprises an arm member (62) formed integrally with and reversely bent from the plate (56).

5. The contact member of claim 4 wherein the arm (62) is deflectable with respect to the plate (56) upon interaction of the insulation piercing means with a solid core conductor (16) which has been terminated to the contact member.

6. The contact member of claim 5 including a body portion (40) having a support member (50) extending therefrom for supporting the insulation piercing means (54) in suspended disposition over the body portion (40).

7. The contact member of claim 6 including means (42) formed integrally with the body portion (40) for electrical connection of the contact member to a circuit device.

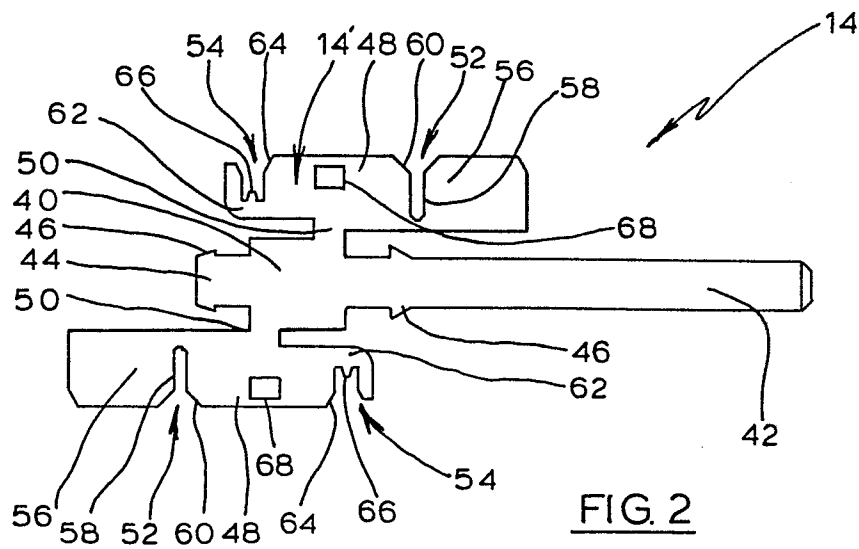
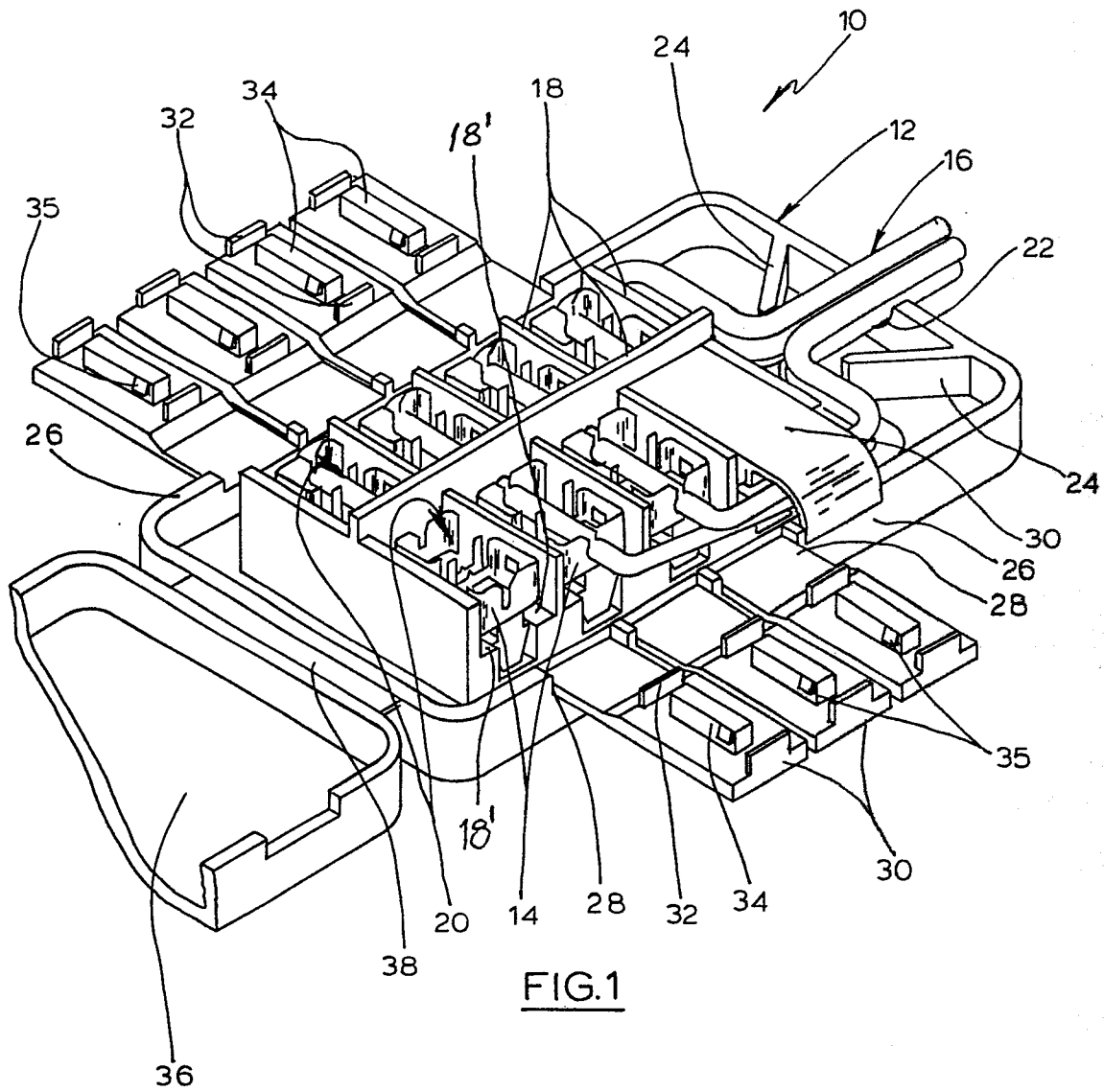
8. The contact member of claim 1 including a second plate (56) having an insulation displacement slot (58) therein spaced apart and generally parallel to the first plate (56), and means (40, 50) for supporting the plates and the insulation piercing means such that the slots (58) of the plates and the insulation piercing means (54) are aligned along a

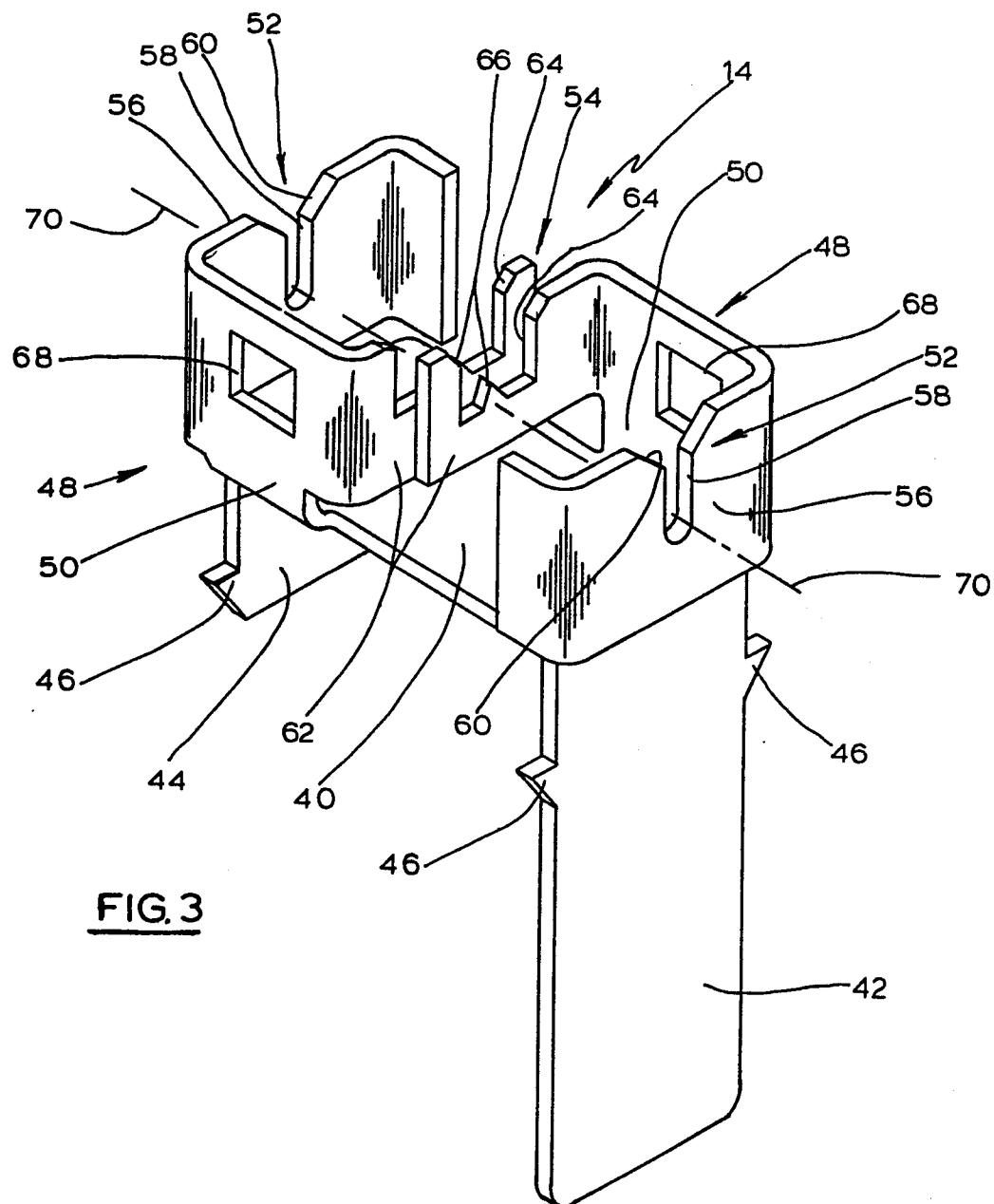
common axis (70) with the insulation piercing means (54) disposed between the plates (56).

9. The contact member of claim 8 including a second insulation piercing means (54) disposed with
5 its slot (58) aligned along said common axis (70) between said plates (56).

10. The contact member of claim 9 wherein each insulation piercing means (54) comprises an arm member (62) reversely bent from the adjacent one
10 of said plates (56), the arm members (62) extending in opposite directions and being deflectable with respect to the plates (56) upon interaction of the insulation piercing means with a solid core conductor (16) terminated to the contact member.

15 11. A connector assembly including a housing (12) fitted with contact members (14) as claimed in any preceding claim.







European Patent
Office

EUROPEAN SEARCH REPORT

0112051

Application number

EP 83 30 6991

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 7)
A	DE-A-2 525 221 (HASHIMOTOSEIKI) * Page 7, line 1 - page 8, line 8; figures 1-6, 10, 11 *	1-3, 8, 9, 11	H 01 R 4/24
A	FR-A-2 413 804 (SOURIAU) * Claims 1-4; page 4, line 10 - page 6, line 5; figures 1-3 *	1, 3-5, 8, 11	
A	GB-A-2 037 493 (FERRANTI) * Page 1, line 125 - page 2, line 60; figures 1-5 *	1, 3-5, 7	
			TECHNICAL FIELDS SEARCHED (Int. Cl. 7)
			H 01 R 4/24
The present search report has been drawn up for all claims			
Place of search BERLIN		Date of completion of the search 14-02-1984	Examiner HAHN G
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	