

UNDERCARPET WIRING SYSTEM INSTALLATION KIT

2052131

1 ~~FIELD OF THE INVENTION:~~

This invention relates generally to the installation of wiring systems and more particularly to a group of interrelated components for use in installing flat multiconductor cable systems for undercarpet use.

5 ~~BACKGROUND OF THE INVENTION:~~

One presently known type of undercarpet cable system includes a flat multiconductor cable which is assembled between a plastic shield and a metallic shield. The cable assembly, comprising the cable and its two protective shields, is installed between a floor and overlying carpeting. The multiconductor cable includes a plurality of flat electrical conductors which are contained in a casing comprised of a thin sheet of electrical insulation. The plastic shield provides a cushion for the multiconductor cable so as to resist the abrasion and possible piercing of the cable insulation by projections extending upwardly from the floor, such projections being especially prevalent if the floor is made of concrete or a similar coarse building material. The metallic shield resists piercing of the cable insulation by an object inserted through the carpet. By electrically grounding the metallic shield, any electrically conductive object which may pierce the metallic shield and contact a "hot", i.e., electrically energized, conductor of the multiconductor cable will be grounded so as to protect a person who contacts the object from electrical hazard.

Inasmuch as the multiconductor cable and the two shields may not be positively attached to each other either before, during or after their installation, there is the possibility that the cable could be installed without the shields or that, once installed, the shields could move relative to the cable, thereby leaving a portion of the cable exposed either aside the metallic shield or the plastic shield. Such exposed cable runs a greater risk of

1 being pierced than a properly covered cable and,
therefore, presents an electrical hazard.

Where the metallic shield is properly posi-
tioned above the cable, there remains the possibility
5 that the metallic shield will not be properly grounded,
for instance, by failure to electrically connect it to
ground. Like a properly grounded shield which is im-
properly installed so as to expose a portion of the
cable, a cable having a nongrounded metallic shield
10 presents a potentially hazardous situation.

Such known undercarpet wiring system includes
a network of cable assemblies, the individual cable
assemblies being electrically connected. In such a
system, the metallic shield of each assembly is grounded
15 by use of connectors for electrical connection of ad-
joining metallic shields. In such arrangement, shield
grounding integrity is dependent on physical continuity
of the shield. Thus, if the shield is interrupted as
by cutting, the free remnant of the shield will not be
20 electrically continuous to ground, with resulting hazard.

In such known system, connections between cables
are made, in tap or splice configuration, by arranging the
cables in mutually abutting relation. For instance, a
tap connection of two five-conductor cables is prepared
25 by arranging the five conductors of a first cable perpen-
dicular to the conductors of a second cable and in abut-
ment with a side margin of the second cable. Insulation-
piercing connectors are now placed beneath each conductor
of the first cable, each connector being of different
30 size from all others so as to extend into registry under
a different conductor of the second cable. The connec-
tors are then crimped into electrical engagement with
each cable. Difficulty attends this practice, particu-
larly in the need for such different size connectors and
35 the fact that all but one of the connectors span plural
conductors of the second cable, giving rise to possible
interphase short circuitry.

The present invention has as its object the provision of interrelated components which will facilitate installation of undercarpet cable systems of nature improved from the foregoing system.

5 In attaining this and other objects, the subject disclosure provides a kit of parts inclusive of flat electrical cable having a plurality of conductors of common width in an electrically insulative casing.

10 In accordance with the present invention there is a kit of parts for use in the installation of a wiring system, comprising:

(a) flat electrical cable having a plurality of elongate conductors disposed in an electrically insulative casing;

15 (b) template means adapted for receiving first and second such cables in overlapping relation and providing for predetermined alignment thereof, the spatial intersections of the overlapping conductors defining a plurality of connection zones, said template means including means defining a first aspect of connection selectivity for limiting connection of conductors between the first and second cables to preselected zones of the plurality of zones available for making connections; and

20 (c) identifying means defining a second aspect of connection selectivity for identifying for connection use zones less in number than the number of said preselected zones.

25 The foregoing and other objects and features of the present disclosure will be further evident from the following detailed discussion and from the drawings wherein like reference numerals identify like parts throughout.

30 Fig. 1 is a perspective view of an electrical cable assembly of multiconductor type having overlying

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1 shield secured thereto.

Fig. 2 is a perspective view of an alternative embodiment of the Fig. 1 cable assembly wherein the shield is bendable into overlying relation to the cable conductors.

Fig. 3 is a perspective view of a connector for use in joining flat cables.

Fig. 4 is a side elevational view of the Fig. 3 connector.

10 Fig. 5 is a plan view of a pair of flat cables with perforations made therethrough as indicated.

Fig. 6 is a plan view, as in Fig. 5, but with connectors introduced and crimped.

15 Fig. 7 is a plan view of a flat spacer having patterned recesses.

Fig. 8 is a sectional view taken along line VIII - VIII of Fig. 7.

Fig. 9 is a plan view of a perforation guide.

20 Fig. 10 is a perspective view of the Fig. 9 guide in conjunction with a pair of flat cables.

Fig. 11 is a punch for the Fig. 7 guide to provide therewith perforation apparatus.

Fig. 12 is a plan view of a further perforation guide.

25 ~~DESCRIPTION OF PREFERRED EMBODIMENTS.~~

Referring to Fig. 1, flat multiconductor cable assembly 10 to be installed underneath a carpet (not shown) or some other similar type of floor covering, includes a multiconductor cable 12 containing a plurality of flat electrical conductors 16, 18, 20, which are contained within a casing constituted by a thin sheet 22 of electrical insulation. The insulation 22 is preferably made from a laminate of polyester and polyvinylchloride. The polyvinylchloride is about four mils thick and is contiguous with the conductors 16, 18, 20, while the

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polyester is about one and one-half mils thick and forms the outer surface of the cable 12. The conductors 16, 18, 20, which are made from copper or any other good electrically conductive material, extend side-by-side along the entire length of the multiconductor cable 12.

In the embodiment shown in Fig. 1, the conductors 16 and 20, adjacent to the opposite longitudinally extending edges of the multiconductor cable 12, may be employed as hot conductors, the middle conductor 18 serving as a ground conductor. The ground conductor 18 is permanently connected, both mechanically and electrically, to the metallic shield 14 by a plurality of welds 24 which are arranged at intervals along the length of the cable assembly 10. Alternatively, the ground conductor 18 may be electrically and mechanically connected to the metallic shield 14 by a plurality of spaced-apart rivets or any other suitable fasteners. Also, the multiconductor cable 12 and the metallic shield 14 could be electrically and mechanically connected along the entire length of the cable assembly 10, so that the connection is continuous rather than intermittent. Indicia, such as color coded markings 25, may be provided on the insulation 22 above and below the conductors 16, 18, 20 to distinguish them from each other.

The metallic shield 14 is made from a thin sheet of good electrically conductive metal, such as copper. Preferably, the metallic shield 14 and the conductors 16, 18, 20 are made from the same metal to prevent galvanic corrosion between the metallic shield 14 and the ground conductor 18. The metallic shield 14 functions as a protective barrier for resisting piercing of the multiconductor cable 12 by an object inserted through an overlying carpet. Even if a metallic object were to penetrate the metallic shield 14 and contact one

1 of the hot conductors 16 and 20, the hot conductor will
be grounded through the shield 14 and the ground conductor
18.

5 The plastic shield 15 is employed to provide a
cushion for the multiconductor cable 12. As such, the
plastic shield 15 can be made of any suitable flexible
plastic, such as polyester, sufficiently strong to
protect the multiconductor cable 12 from abrasion and
possible piercing as a result of its installation on a
10 floor, especially if the floor is made from concrete.
The plastic shield 15, which may be permanently attached
to the multiconductor cable 12 in any suitable manner,
also inhibits the penetration of the multiconductor cable
12 by any projections extending upwardly from the floor.
15 Preferably, shield 15 is secured to cable 12 insulation
by heat-sealing thereof at locations spaced lengthwise
of the shield.

The selective securement of shield 14 to cable
12 at locations mutually spaced lengthwise of the cable
20 gives rise to successive shield extents which are re-
spectively unsecured and secured to the cable. Thus,
the extent of shield 14 downwardly of weld 24 in Fig. 1
is not secured to the cable. The successive extent of
shield 14, i.e., adjacent weld 24, is secured to the cable.
25 The next successive shield extent, upwardly of weld 24 in
Fig. 1 is again not secured to the cable. This pattern
preferably repeats along the cable length, with uniform
or non-uniform shield extents, giving rise to redundant
electrical connection of shield 14 to cable 12. Elec-
30 trically conductive means are in registry with each
secured shield extent. For example, the body of material
comprising weldment 24, extends through the cable insula-
tive casing, opposed terminal portions of the body having
electrical connection to the shield and to an exclusive
35 one of the cable conductors, respectively.

1 In the Fig. 2 embodiment, cable assembly 10a
includes cable 12a, the leftward conductor 16a of which
travels outboard of insulative casing 22a to provide a
shield 14a for the cable. Such outboard part of con-
5 ductor 16a is bendable about bend line 17 to overlie
cable 12a and may be secured in such overlying disposi-
tion by a suitable mechanical clamp. Thus, both shields
14 and 14a are in removably overlying relation to their
associated cables, whereby the cable may be exposed
10 temporarily for connection to another cable. In both
instances, however, electrical continuity exists as
between each shield and a cable conductor on removal of
the shield from such overlying disposition.

15 In Figures 3 and 4 a self-locking clamp member
26 in accordance with the present disclosure is particular-
ly useful for making electrical contact with the conductors
of flat conductor cable. Figure 3 shows the clamp member
26 as including a bendable member adapted to bend along a
bending line 28 to define first and second arm portions 30,
20 32. In this preferred embodiment, the entire member 26 is
metallic so as to be suitable for conducting electricity
when the clamp member 26 is attached to and makes electrical
contact with a conductor of flat conductor cable.

25 The first arm portion 30, of the self-locking
clamp member is provided with a bendable tab 34, which
extends away from the surface 36 of the first arm portion
30. In the embodiment shown, the tab 34 has been punched
or stamped out of the first arm portion 30, and also is
of a pentagonal shape. The tab 34 has a sharp tip 38 for
30 piercing of a flat conductor cable when the first and
second arm portions 30, 32 are closed, as more fully
described hereinbelow. The tab 34 is shown extending
perpendicular to the bending line 28 of the clamp member
26 which gives it the greatest strength to resist bending
35 of the tab 34 back to its original position, in surface 36

1 upon engagement with opening 40 but does not prevent
proper folding of the tab 34. Tab 34 could also be
positioned perpendicular to the present tab 34 position if
strengthened by ribs, bending, etc. to prevent unwanted
5 folding. The opening 40 would then similarly be turned 90
degrees from the position shown in Figure 3.

The second arm portion 34 is provided with an
opening 40 therethrough which is arranged with respect to
the bending line 28 so as to be adapted to receive the
10 tab 34 when the bendable member 26 is bent along the
bending line 28 to move the first and second arm portions
30, 34 towards one another. As best seen in Figure 3, in
the surface 42 of the second arm portion, the opening 40
is elongated, having a longitudinal dimension substantially
15 corresponding to the width of the tab 34. On the opposite
surface 44 of the second arm portion 32, there is provided
a closing means 46 for bending of the tab 34 when the first
and second arm portions 30, 32 are moved together and the
tab 34 enters and passes through the opening 40.

20 In the embodiment shown, this closing means 46
comprises a hood 48 which has been stamped or punched out
of the second arm portion 32. Hood 48 overlies a portion
of the opening 40 with the hood inner surface being curved
to provide a camming action to cause bending of the tab
25 34 when the two arm portions 30, 32 move together. In
essence, this hood camming surface serves to change the
direction of travel of the tab as the tab enters and passes
between the first and second surfaces 42, 44 of the second
arm portion 32. Initially, the tab enters the opening 40
30 substantially normal to the first surface 42 of the second
arm portion and the hood camming surface causes the tab to
exit at an acute angle with respect to the second surface
44 of the second arm portion 32. Hood 48 also provides a
further important function - namely, it compensates for
35 manufacturing tolerance problems since the tab may not be

made consistently at 90 degrees to the surface 36 but may vary. The hood thus accepts a degree of misalignment that an unhooded slot could not.

Insulation-piercing teeth 50 extend outwardly of surfaces 36 and 42 to penetrate the insulative casings of cables to be connected on crimping of the clamp connector of Figs. 3 and 4 and to thereupon electrically engage cable conductors. Further details of this particular connector is set forth in ^{the} pending UK Patent Application (ref T&B 829F) ~~801-7082~~ claiming priority from USSN 06/042441 entitled "Self-Locking Clamp Member", to which incorporating reference is hereby made.

In Fig. 5, two flat cables 52, 54 are shown overlapped and with their shields removed to permit connection. Perforations 56, 58 and 60 are made through both cables, respectively in registry with conductors 52a and 54a, 52b and 54b and 52d and 54c. In Fig. 6 connectors 26 are shown inserted in such perforations and crimped onto the upper insulation of cable 54 and the under insulation of cable 52, thereby electrically connecting the conductors in registry with the perforations.

In Figs. 7 and 8, insulator 62 includes a spacer 64, a thin clear film of electric insulation 66 laminated to one face 68 of the spacer 64, a layer of pressure-sensitive adhesive 70 applied to an opposite face 72 of the spacer 64, and a liner 74 removably attached to the adhesive 70.

The spacer 64 is preferably made from a relatively noncompressible, electric insulating material, such as polyvinylchloride. Spacer 64 is sized and shaped so as to completely cover and overhang overlapping portions of a pair of flat multiconductor cables. Although the spacer is shown as being square in Fig. 7, it can have any other suitable shape depending upon the configuration of the overlapping portions of the cables.

1 A plurality of holes 76 extend through the
spacer 64 between the faces 68, 72 thereof. The holes
76 are sized, shaped, and arranged so as to receive
5 connectors 26 (see Figs. 4, 5 and 6 which electrically
and mechanically connect the overlapping portions of the
cables. Tracking between the connectors 26 is inhibited
by the spacer 64.

10 Each of the holes 76 has an elongated hexagonal
shape which is symmetrical about a line 78 perpendicular
to and bisecting the two opposite parallel sides 80, 82
of the holes so that each of the holes is divided into
two mirror-image portions 84, 86. Each of the portions
84, 86 has a generally pentagonal shape which matches the
15 pentagonal shape of at least one of a pair of arms 30, 32
of a corresponding one of the connectors 26, so that each
of the connectors can be arranged in a corresponding one
of the holes in either of two different orientations as
indicated by dotted lines in Fig. 7 with respect to the
line 78. The size and shape of the holes may be varied
20 depending upon the size and shape of the connectors.

 The film 66 of electric insulation can be made
from any suitable material, such as a laminate of poly-
vinylchloride and polyester adapted for lamination to the
spacer 64. Alternatively, the film 66 can be formed
25 monolithically with the spacer 64.

 In order to prevent the film 66 from being
pierced or punctured by the arms of the connectors 26,
the film is supported a predetermined substantially fixed
distance from the arms of the connectors by the spacer 64.
30 The thickness of the spacer 64 may be varied to vary the
distance between the film and the arms of the connectors
as long as the film is positioned above the arms of the
connectors so as to avoid being cut by the arms of the
connectors.

35 The liner 74 prevents the inadvertent sticking
of the pressure-sensitive adhesive 70 to the cables or

1 other objects. Preferably, the liner is made from a piece of clear plastic.

Further details concerning the insulator-spacer of Figs. 7 and 8 may be had by reference to ^{the} pending UK Patent Application (ref T&B 846F) claiming priority from USSN 06/074428 & 06/042538, entitled "Insulator for Covering Electric Cables", to which incorporating reference is hereby made.

Referring again to Figs. 5 and 6, the five-to-three conductor single-phase tap therein carries neutral (conductors 52a, 54a), ground (conductors 52b, 54b) and phase B (conductors 52d, 54e). Phase A (conductor 52c) and phase C (conductor 52e) are not carried through from cable 52 to cable 54. Perforations 56 and 58 are preferably invariantly made in indicated position, such that neutral may be carried throughout a system as being to the right of the grounding conductor in the running direction and spaced from the hot lines by the grounding conductor. The connection guides of Figs. 9, 10 and 12 are effective for enforcing this discipline, by compelling the use of certain connection zones (fifteen zones are provided in the five-by-three matrix of Figs. 5 and 6) and limiting the probability of erroneous connections.

In Fig. 9, a plate member 176 incorporates slots 160 - 174 in indicated pattern. Registration holes 178 and 180 are provided at ends of plate 176 and the plate includes discriminating indicia 182, in the form of a star, 184, in the form of a triangle, 186, in the form of a square, 188, in the form of a hexagon and 190, in the form of a circle. Conductors of the cable of Fig. 1 bear corresponding indicia. Additionally, plate 176 bears literal indications adjacent various slots. The term "SPlice" encompasses slots 164, 166 and 168 and the slots respectively bear terms "3 WIRE", "4 WIRE" and "5 WIRE". Under the vertical column including slots 164, 170 and 172, the plate bears the legend "TAP 3-4-5 WIRE". The vertical column including slots 166 and 174 bears the

1 legend "TAP 4-5 WIRE". Beneath slot 168 is the legend
 "TAP 5 WIRE". Adjacent hole 180 is the legend "TAP:
 USE ONE PER COLUMN MATCH SYMBOLS ON CABLE".

5 As noted above, cable markings are invariantly
 made through slots 160 and 162. In the case of a splice,
 i.e., connection of two longitudinally aligned and over-
 lapping cables, slots 164 - 168 are used depending upon
 the number of wires in the conductors.

10 In the case of a tap, i.e., connection of
 two cables in overlapping and orthogonal relation, all
 slots may be used. Proper connections and maintenance
 of polarity is assured by simple recognition of the
 indicia. Each indicium is uniquely colored to further
 facilitate proper connections. Table 1 indicates the
 15 various connection possibilities achievable.

TABLE 1

	<u>Slots</u>	<u>Connection(s) Achieved</u>
20	160, 162 and 164	three conductor cable to three conductor cable splice (phase A)
25		three conductor cable to three, four or five conductor cable tap (phase A)
	160, 162, 164 and 166	four conductor cable to four con- ductor cable splice (phases A and B)
30		four conductor cable to four or five conductor cable tap (phases A and B)
	160, 162, 164 166 and 168	five conductor cable to five con- ductor cable splice (three phase)
35		five conductor cable to five con- ductor cable tap (three phase)
40	160, 162 and 170	three conductor cable to four or five conductor cable tap (phase B)
	160, 162, 172	three conductor cable to five conductor cable tap (phase C)

- 1 160, 162, 170 four conductor cable to five con-
 and 174 ductor cable tap (phases B and C)
- 160, 162, 164 four conductor cable to five con-
 and 174 ductor cable tap (phases A and C)

5 In Fig. 10, plate 176 is shown with coopera-
 tive structure providing therewith an installation
 tool. For convenience, the literal legends and
 indicia are omitted, but would be included in the
 device. Base 192 is formed with upwardly extending
10 cable guides 194 and 196, which receive cables 198
 and 200 and place the cables in proper orientation
 with respect to the slot pattern in plate 176. Thus,
 the cables are made mutually orthogonal and slots
 160 - 168 register with a line extending between edge
15 corners 194a and 196a of guides 194 and 196. Guide
 194 has a threaded bore 194b for receipt of pin 202
 having threaded end 202a and shoulder 202b. Pin 204
 may be fixedly secured to guide 196 to serve as a
 pivot for movement of plate 176 into operative posi-
20 tion whereupon pin 202 is threaded into guide 194.

 In the Fig. 10 arrangement, base 192 prefer-
 ably functions as a die and has slots in its upper
 surface in pattern and configuration conforming with
 the slots 160 - 174 of plate 176. To perforate the
25 cables a punch (element 177 in Fig. 11) or punches
 would be inserted in the guide holes in plate 176 in the
 positions which provide the proper perforations for the
 connection to be made. Application of an appropriate
 force or forces to the punch or punches would then create
30 the desired perforation pattern in the cables. Base 192
 preferably includes a removable tray for collection of
 matter thus punched out of the cables. Connectors of
 type shown in Fig. 3 would then be inserted and crimped
 to complete the connection.

35 In preferred practice, the stencil indicia
 are colored as follows: 182 white; 184 green; 186

1 black; 188 red; and 190 orange. Cable insulation
over conductors is correspondingly colored, e.g., for
a five-conductor cable: neutral - white; ground - green;
phase A - black; phase B - red; and phase C - orange.

5 The arrangement of Fig. 12 includes connec-
tion guide 206 which has a slot pattern modified from
that of Fig. 9 by omission of slot 174 thereof and
by omission of all instructional indicia other than
that adjacent slots 160 and 162. The omitted slot had
10 sole use in a four-to-five tap and such capability re-
mains through slots 170 and 172. Selector plate 208
overlies guide 206 and includes side notches 210 - 218,
notch 216 being shown in registry with detent 220 of guide
206. Plate 208 has openings 222, 224, 226 and 228 there-
15 through for rendering accessible only selective of the
connection guide openings. While shown as transparent,
the plate is desirably opaque.

As in the case of Fig. 9, slots 160 and 162
are used in all connections of cables. In the position
20 shown for plate 208, phase A only is available, use of
slots other than slots 160, 162 and 164 being precluded
since such other slots are not in registry with any of
openings 222 - 228. On the other hand, if plate 208 is
indexed to place notch 218 in engagement with detent 218
25 in engagement with detent 220, with the plate and guide
still in orthogonal relation, slot 170 is now alone
exposed through plate 208. Phase B thus is made available
for a three-conductor tap. The indexing distance, i.e.,
the spacing between peaks of adjacent notches, is the
30 distance d (Fig. 12) established by the slot pattern in
guide 206. The extent and position of openings 222 - 228
is preselected to provide the desired variety of connec-
tions. The following table is further expositive of in-
dexing of plate 208.

TABLE 2

1	<u>INDEXED NOTCH</u>	<u>SLOTS FOR USE</u>
	210	160, 162 and 172
	212	160, 162, 164 and 166
	214	160, 162, 164, 166 and 168
5	216	160, 162 and 164
	218	160, 162 and 170

The connections achieved with the indicated slots are noted above in Table 1.

10 As will be seen, practice wherein neutral and ground connections are in respective singular connection zones of the matrix of connection zones results in repetitive selection of neutral and ground connection zones, i.e., identical geometry in separate connections of a first pair and a second pair of cables, thus carrying polarization throughout an entire installed system. This practice may be restricted to connection of a single pair of conductors to a specific repetitive zone, e.g., an outermost conductor of each cable. While mutual orthogonality of cables is preferred, other alignment is within the purview of the invention. Also, zone selection pattern may be other than a diagonal of the matrix.

20 In the aspect of the foregoing disclosure wherein connection guiding is by stencil or the like, far less than all of the connection zones of the matrix are employable. Connection of at least one pair of conductors is effected by preclusion of use of zones other than a singular zone. In this case, the connection guide has an aperture in registry with such singular zone and continuous surface
30 expanse extending in directions mutually perpendicular from such aperture. Connection of at least one other conductor pair is compelled to less than all zones with which such conductors are in registry. In this case, the connection guide has plural apertures in registry with a
35 common conductor of a cable, i.e., along an axis parallel

to the conductors of one cable and orthogonal to the conductors of the other cable where the guide arranges the cables in mutually orthogonal relation.

Further detail concerning the cable of Fig 1 and perforation guiding and making methods and apparatus is set forth in the copending UK Patent Application 8017081 (ref T & B 834F) claiming priority from USSN 06/042,442, 06/042,369 and 06/042,440. Reference is also made to US Patent Application USSN 06/042,534 entitled "Punch and Crimp Apparatus". The last-noted application discloses tools for both perforating and crimping functions and includes facility, as in the Fig 12 arrangement above, for selection of any one of a plurality of predetermined connection patterns.

In providing the foregoing interrelated parts, connectors are selected to have insulation piercing expanse which conforms to the common width of conductors. Thus, by limiting such insulation piercing expanse to an area of no greater than a square of side length equal to the common conductor width, one assures that no connector will span plural conductors of one cable. Where the connector brings insulation piercing means into engagement with outer sides of plural cables, as in the case of the bendable connector of Figs 3 and 4, the insulation piercing expanse is no greater than the above-stated area for each cable side. In such preferred connector, the insulation piercing expanse is defined collectively by the teeth extending from one of the connector arms.

Various changes to the foregoing specifically disclosed embodiments and practices will be evident to those skilled in the art. Accordingly, the foregoing preferred embodiments are intended in an illustrative and not in a limiting sense. The true spirit and scope of the invention is set forth in the following claims:



Claims:

1. A kit of parts for use in the installation of a wiring system, comprising:

(a) flat electrical cable having a plurality of elongate conductors disposed in an electrically insulative casing;

(b) template means adapted for receiving first and second such cables in overlapping relation and providing for predetermined alignment thereof, the spatial intersections of the overlapping conductors defining a plurality of connection zones, said template means including means defining a first aspect of connection selectivity for limiting connection of conductors between the first and second cables to preselected zones of the plurality of zones available for making connections; and

(c) identifying means defining a second aspect of connection selectivity in cooperative association with said cable for identifying for connection use zones less in number than the number of said preselected zones.

2. The invention claimed in claim 1 wherein said template means provide for mutual orthogonal alignment of cables received thereby.

3. The invention claimed in claim 1 wherein said identifying means (c) includes selector means variably settable to provide for connection use of any one of a plurality of predetermined patterns of said preselected zones.

4. The invention claimed in claim 1 wherein said template means include means for making perforations through cable received thereby.

5. The invention claimed in claim 4 wherein said template means includes means for containing material perforated from cable received thereby.

6. The invention claimed in claim 1 wherein said template means comprises stencil means adapted to overlie



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cable received thereby, said stencil means having openings therethrough in predetermined pattern and registering with such preselected zones.

5 7. The invention claimed in claim 6 wherein said identifying means (c) includes apertured means indexible with respect to said stencil means for selectively exposing said stencil means openings.

10 8. The invention claimed in claim 1 wherein said identifying means (c) comprises indicia in said ~~connection~~ ^{template} means including a common indicium for identifying plural of said preselected zones.

9. The invention claimed in claim 8 wherein each said casing includes indicia corresponding to such identifying means (c) indicia.

15 10. A kit of parts for use in the installation of a wiring system substantially as herein described with reference to Figs. 1-11 of the accompanying drawings.

20 11. A kit of parts for use in the installation of a wiring system substantially as herein described with reference to Figs. 1-8 and 10-12 of the accompanying drawings.

25 12. The invention claimed in claim 1 further including an electrically conductive shield overlying said cable and electrically connected to one of said conductors, portions of said shield being displaceable from an outer surface of said cable for permitting overlapping over said cables wherein the insulative casing of said first cable is juxtaposed the insulative casing of the second cable.

30 13. A kit of parts according to claim 1 and including apparatus to perforate cable, connectors for introducing into such perforations and spacers to insulate the connectors.

35 14. A kit of parts for use in the installation of a wiring system comprising:



(a) an electrical cable assembly including a flat electrical cable having a plurality of elongate conductors disposed in an electrically insulative casing and an electrically conductive shield overlying said cable and electrically connected to one of said conductors, portions of said shield being displaceable from an outer surface of said cable for permitting overlapping over said cables wherein the insulative casing of said first cable is juxtaposed the insulative casing of the second cable;

(b) template means adapted for receiving first and second such cable assemblies in overlapping, shield-displaced relation and providing for predetermined mutual alignment thereof, the spatial intersections of the overlapping conductors, defining a plurality of connection zones, said template means including means defining a first aspect of connection selectivity for limiting connection of conductors between the first and second cables to preselected zones of the plurality of zones available for making connections; and

(c) identifying means defining a second aspect of connection selectivity in cooperative association with said cable for identifying for connection use zones less in number than the number of said preselected zones.