yarns and surrounding fabric deflect, and the two conductors make electrical contact, as in **FIG. 4**(*c*). Increasing applied pressure increases the area of contact, as in **FIG. 2**(*c*). The yarns must exhibit sufficient elasticity to recover from the deflection upon removal of the applied pressure, and thus return to their separated positions, breaking the electrical contact.

[**0044**] Separation Technique—Conductive Cored Yarn Encircled with Displaceable Insulator

[**0045**] Another separation technique involves using a specific composite construction for the conductive yarns. In this composite yarn, a conductive mono-filament or multi-filament core yarn is twisted, braided, spun, plaited, co-moulded, coated, sleeved or otherwise partially encircled by insulating material, as shown in **FIG. 5**(*a*).

[**0046**] When a crossover point between two conductive yarns, at least one of which is of this nature, is not subject to pressure, the insulating material is interposed between the conductors, as in **FIG. 5**(*b*), ensuring physical separation. However, when subjected to pressure normal to the plane of the fabric, the encircling insulating material can twist, compress, move aside or otherwise deflect to allow electrical contact between the core conductor yarns, as **FIG. 5**(*c*) shows. Upon removal of the applied pressure, the insulating material springs back into position and/or shape between the conductors to break (open) the electrical contact.

[**0047**] The geometry of the composite yarn and the compressibility, stiffness and surface textures of its constituent yarns contribute to determining the pressure threshold of a crossover point and can readily be determined by experiment. Composite yarns of this type may be used to construct plain weave crossover points, without the float structures described above.

[**0048**] Separation Technique—Compressible, Insulating Cored Yarn Encircled with Conductor

[**0049**] Another separation technique involves another type of composite construction for the conductive yarns. In this composite yarn, which is a reverse case of the yarn detailed above, an insulating mono-filament or multi-filament core yarn is twisted, spun, braided, plaited, co-extruded, coated, sleeved or otherwise partially encircled by conductive yarns or material.

[**0050**] Additionally or alternatively, a conductive core may be co-extruded with an insulating coating and then subjected to post production processing to selectively expose areas of the conductive core. The conductive yarns are partially embedded into the insulating core yarn, such that the compressible, yielding surface of the core yarn stands proud of the conductive yarns, as shown in **FIG. 6**(*a*). Alternatively, but to the same end, thin conductive yarns may be twisted or spun with larger insulating yarns such that the insulating yarns stand proud of the conductive yarns.

[**0051**] When a crossover point between two conductive yarns, at least one of which is of this nature, is not subject to pressure, the insulating material that stands proud of the conductive yarns ensures physical separation of the conductors, as **FIG. 6**(*b*). However, when subject to pressure normal to the plane of the fabric, the insulating material can compress to allow electrical contact between the embedded conductor yarns, as shown in **FIG. 6**(*c*). Upon removal of the applied pressure, the insulating material springs back into position to hold the conductors apart and break the electrical contact.

[**0052**] The geometry of the composite yarn and the compressibility, stiffness and surface textures of its constituent yarns contribute to determining the pressure threshold of a crossover point and can be readily determined by experiment. Composite yarns of this type may be used to construct plain weave crossover points, without the float structures described above.

[**0053**] Separation Technique—Conductive Cored Yarn Encircled with Displaceable Insulator

[**0054**] Referring to FIGS. **7**(*a*) to **7**(*c*), there are shown various embodiments of yarn with both insulator and conductor. In **FIG. 7**(*a*) there is a core yarn substantially circular in cross-section which can be insulating or conductive as desired. Spun, braided or twisted around the core there are larger diameter insulating yarns and smaller diameter conductive yarns. As can be seen in the Figures, when no pressure is applied to the yarn, the conductive fibres remain spaced from the other conductor(s). However, upon application of a compressing force above the threshold, the insulating yarns are compressed and/or moved to allow contact of the conductive yarns on the conductive base (which may be another composite yarn of this type).

[**0055**] In **FIG. 7**(*b*) there is simply a conductive core having coated thereon or extruded therewith one or more insulating ribs, preferably in a helical arrangement. As can be seen, when no pressure is applied, the conductive core remains spaced from any conductive base upon which the composite is placed (the base may be the another composite structure such as this). However, upon application of a compressive force, there is compression of the insulating rib(s) to allow electrical contact.

[**0056**] In **FIG. 7**(*c*) a deformable conductive core has formed therewith an insulating sleeve from which sections are then removed to leave grooves with conductive troughs. Compression of the structure will cause deformation of the grooves such that a conductive substrate, which may for example be a plate or fibre-like conductor, will make electrical contact with the conductive core. It is not necessary for any part of the conductive core to be removed to create the groove, merely to enough insulator to be removed to allow access to the core.

[**0057**] Separation Technique—Self-Separating Sensory Composite Yarn

[**0058**] In **FIG. 8** there is shown an embodiment of composite yarn having a core around which there is braided a conductive/insulating yarn with floating conductors, which enables the detection of pressure applied at a point along the length of the structure.

[**0059**] Parameters Controlling Actuation Pressure

[**0060**] A number of controllable manufacturing parameters determine the actuation pressure of a crossover point between two conductors in a woven piece of fabric.

[**0061**] a) Relative Diameters of Conductive and Insulating Yarns

[**0062**] As discussed above, if the conductive yarns in the weave are of a smaller diameter or cross-section than the