mass is then plastically deformed at an elevated temperature below the decomposition temperature of the polymer and at a reduction ratio of greater than 8 to 1, so that the polymer particles become aligned elongated filaments which reinforce the metal matrix.

Fibre separator for producing fibre reinforced metallic or resin body
Nakagawa, N. and Ohsora, Y. (UBE Industries, Ltd., Yamaguchi, Japan) *US Pat 5 101 542 (7 April 1992)*
The fibre separator comprises a pair of guide rollers with a composite roller between them and stationary rollers arranged about the composite roller. The fibre bundle runs through the separator under tension and each of the stationary rollers contacts the fibre bundle intermittently at an angle of less than 45°.

Method to manufacture titanium aluminide matrix composites
Smith, P.R., Eylon, D. and Revelos, W.C. (Secretary of the Air Force, Washington, DC, USA) *US Pat 5 104 460 (14 April 1992)*
A β-stabilized Ti_3Al foil and a filamentary material which contains about 30% of the final desired amount of β-stabilizer are layered together to produce a preform. Heat and pressure are applied to consolidate the preform. The filamentary material is silicon carbide, silicon-carbide coated boron, boron-carbide coated boron, titanium-boride coated silicon carbide or silicon-coated silicon carbide.

Method of manufacturing carbon fibre-reinforced carbon elongated structural components
Takahashi, S. (Kanto Yakin Kogyo KK, Japan) *US Pat 5 112 422 (12 May 1992)*
A number of square tubes are prepared by winding carbon fibres round a mandrel such that the fibres frequently cross each other. The tubes are then impregnated with thermo-hardening adhesives. The tubes are then arranged parallel to each other in a block and aramid fibres with a negative linear thermal expansion coefficient are wound snugly round the block. The whole is then heated so that the aramid fibres shrink to fasten the blocks together and the adhesives are carbonized. Finally, the block is cut into pieces of the desired configuration.

Investment casting of metal matrix composites
Cook, A.J. (PCast Equipment Corporation, Pittsburgh, PA, USA) *US Pat 5 113 925 (19 May 1992)*
A mixture comprising a liquid flow medium, binding agent and reinforcement is formed in the desired shape of the composite and is allowed to solidify. The body is disposed within a container and encased in investment material. The whole is then heated such that any water evaporates and the flow medium is removed, after which the remaining reinforcement and binder are sintered to form a solid preform. Molten metal is placed on top of the investment material such that it forms a seal with the container and the metal is then pressurized so that it is forced into the preform. After this the metal is allowed to solidify, thereby forming a metal-matrix composite in the shape of the preform.

Apparatus for preparing thermoplastic composites
Cochran, R.C. and Rosenzweig, E.L. (Secretary of the Navy, Washington, DC, USA) *US Pat 5 116 216 (26 May 1992)*
The apparatus has a base section through which is connected a vacuum source to hold unconsolidated plies of prepreg. Around the plies there is an edge dam which prevents pinching-off of the plies and facilitates volatile removal. In addition, there is a heater which is capable of melting thermoplastic resin. An impervious bag contains the plies, edge dam and heater and is hermetically sealed to the base. Hermetically sealed to the bag is an impervious rigid box which has a second vacuum source connected through it.

Methods of producing ceramic and ceramic composite bodies
Lesher, H.D., Dwivedi, R.K. and Goldberg, P.B. (Lanxide Technology Company, LP, Newark, DE, USA) *US Pat 5 120 580 (9 June 1992)*
At least one mass of filler is floated on a pool of molten parent metal. This metal reacts with an oxidant to form an oxidation reaction product which grows into and at least partially embeds the filler. The reaction temperature is maintained so that the metal is drawn through the filler and reaction product, thereby maintaining an oxidation reaction front within the filler body. The resulting composite is removed from the pool of molten metal before it receives substantial support from the container holding the pool of molten metal.

Process for producing a bicycle frame made of fibre-reinforced plastics
Kubomura, K., Maikuma, H., Tsuji, N., Kimura, H. and Takeda, T. (Nippon Steel Corporation and Nippon Steel Chemical Co., Ltd., both of Tokyo, Japan) *US Pat 5 122 210 (16 June 1992)*
The parts of the frame are formed from fibre-reinforced plastic and are arranged together with metal members in the configuration of a bicycle frame. Uncured fibre-impregnated plastic and foamed plastic are used to form lug portions at the required positions to fix the elements of the frame together. All the lug portions are cured simultaneously to complete assembly of the frame.

Method for forming and consolidating a fibre reinforced resin structure
Principe, F.S. (E.I. Du Pont de Nemours and Company, Wilmington, DE, USA) *US Pat 5 125 993 (30 June 1992)*
Metal alloy cores are covered with a heat curable composite prepreg. The covered cores are placed side by side on a mandrel which has a lower coefficient of thermal expansion than the cores. The free relative movement of the cores and the mandrel is restricted to form a unitary structure and this structure is heated to the curing temperature of the composite prepreg to consolidate and cure the prepreg.

Method for manufacturing composite material
Melton, A.W. (The British Petroleum Company p.l.c., Moorlane, UK) *US Pat 5 126 091 (30 June 1992)*
A reinforcing fibre material is laid up in a mould that includes both needles and a stripper plate with perforations corresponding to the positions of the needles. The mould is assembled with the needles passing through the fibres, but not breaking them, and the stripper plate. The fibres are then impregnated with resin and the resin is cured to produce a perforated fibre-reinforced composite material.

Fibre- and whisker-reinforced injection mouldable resin composition for scroll compressor parts and method of manufacturing scroll compressor parts
Tasaka, T. (Otsuka Kagaku Kabushiki Kaisha, Osaka, Japan) *US Pat 5 131 827 (21 July 1992)*
A fixed scroll, an orbiting scroll, a drive shaft or Oldham coupling is manufactured by injection moulding a resin composition. The composition comprises 40 to 63 parts by weight of at least one thermoplastic resin, 15 to 45 parts by weight of whiskers, 10 to 25 parts by weight of heat-resistant fibres and 5 to 20 parts by weight of finely divided solid lubricant. The thermoplastic resin may be poly(phenylene sulfide), poly(ether ether ketone), poly(ether ketone), all-aromatic polyester, nylon-4,6, nylon–MXD6, polysulfone, poly(aryl sulfone), poly(ether sulfone), poly(ether imide), poly-(amide–imide) or polyimide; the whiskers may be potassium titanate, SiC, graphite, silicon nitride or α-alumina; and the lubricant may be poly(tetrafluoroethylene), ultra-high molecular weight polyethylene, all-aromatic polyamide, microfine phenolic resin, MoS_2, WS_2, $MoSe_2$, WSe_2 or boron nitride.

Process for manufacturing flanged tubular members from fibre composites
Pabsch, A.R.E. and Strehlow, W.E. (Deutsche Forschungsanstalt fur Luft- und Raumfahrt e.V., Linder Hohe, Germany) *US Pat 5 135 596 (4 August 1992)*
Fibres in an uncured matrix are wound onto a core assembly which has both a central portion and spreader elements at either end. The fibres cross each other at an angle and are widened in a cone by the spreader elements. A forming tool is applied to the central region of the winding and pressure applied at its edges to maintain the fibres in a uniform distribution. Fibres and matrix are then assembled in the conical regions to form flange composites, after which the matrix is cured to produce a tubular composite structural member with planar flanges extending radially outwards at either end.