Jan. 24, 1967 J. A. JOHNSEN 3,300,596

CHARACTER GENERATION MATRIX

Filed April 2, 1965 2 Sheets-Sheet 1

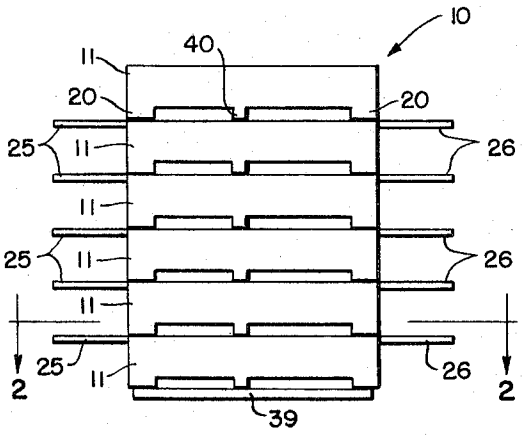
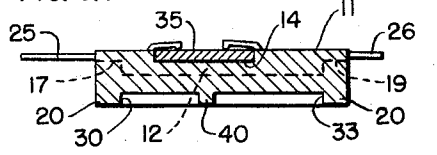


FIG. 1

FIG. 3A



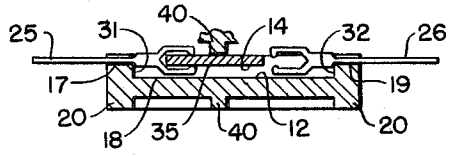


FIG. 3B

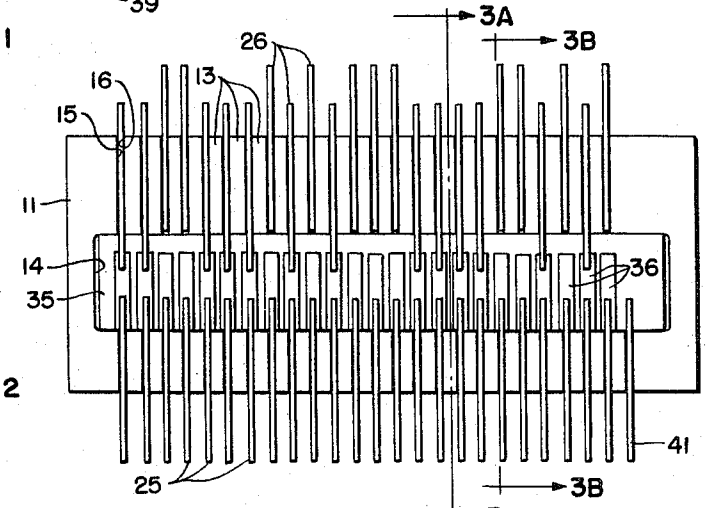


FIG. 2

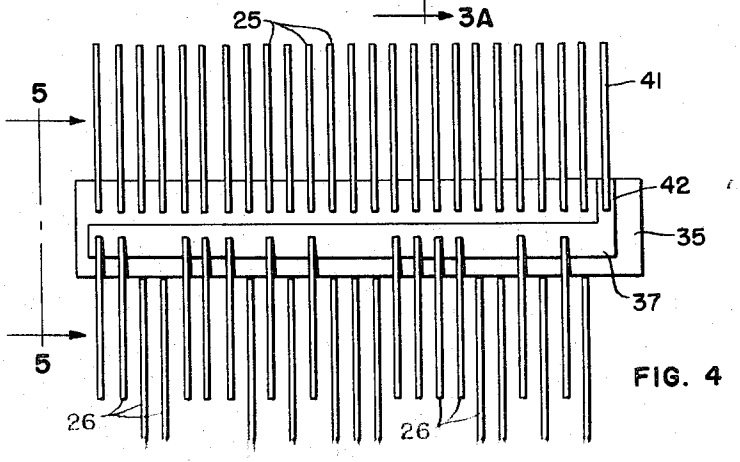
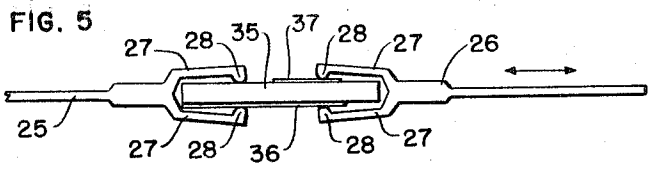


FIG. 4

FIG. 5



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CHARACTER GENERATION MATRIX

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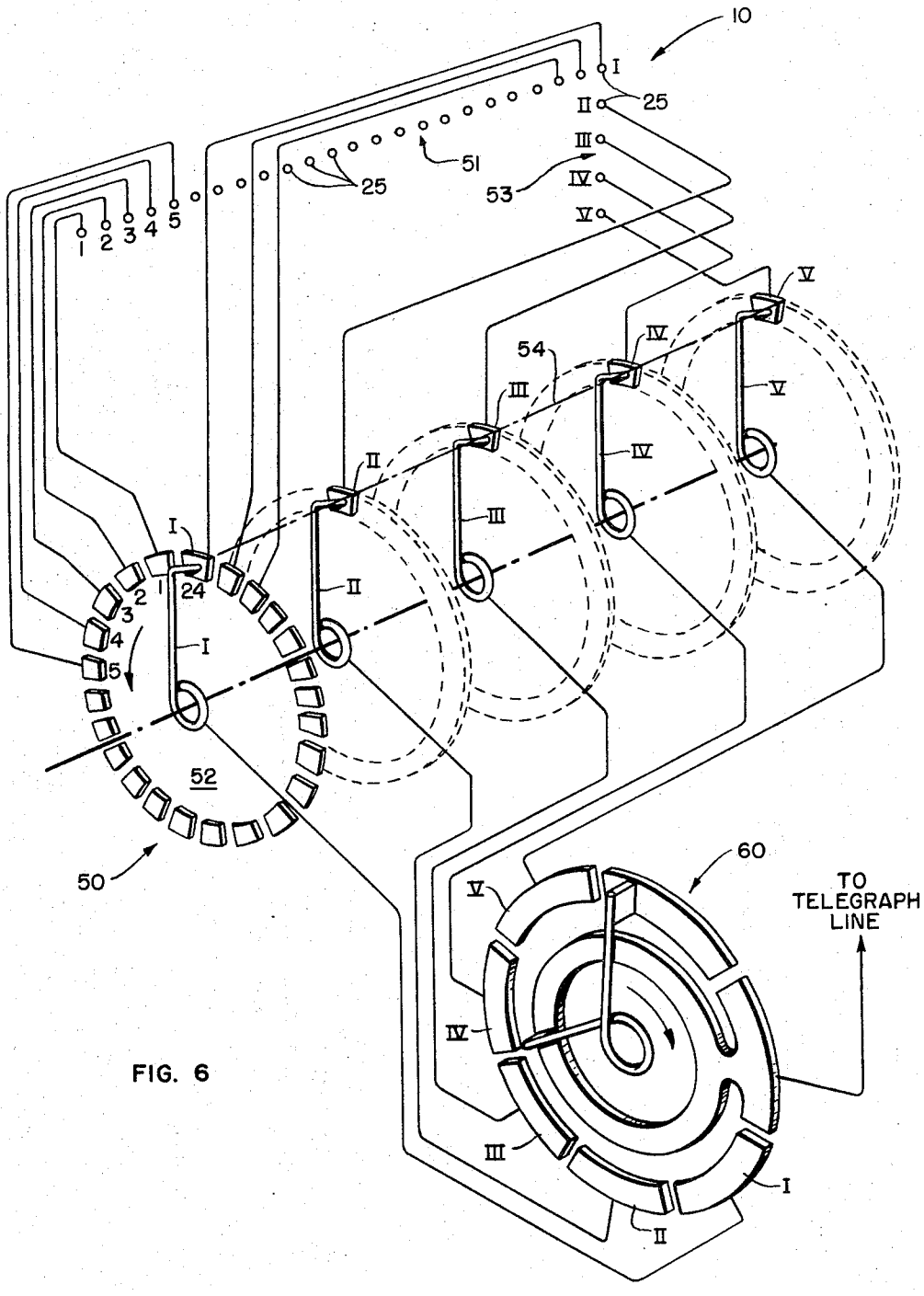


FIG. 6

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3,300,596

CHARACTER GENERATION MATRIX

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6 Claims. (Cl. 200—46)

This invention relates to a character generation matrix and more particularly to a codeable matrix for controlling the generation of telegraph characters.

In telegraph systems it is frequently necessary to generate a plurality of characters in a given, predetermined pattern for example, address codes. Typically this is done by connecting some type of character storage device, such as a matrix, in which rows in one direction indicate bits, and columns in another direction indicate characters, to a stepping switch and then to a telegraph distributor. The stepping switch connects each character of the matrix to the distributor in sequential fashion and the distributor connects each bit of the character to a telegraph line in serial fashion. In order that the generation of patterns of characters by the matrix method may be made economically feasible, it is necessary that the matrices employed in such generation be inexpensive and of small size when compared with the telegraph apparatus with which they are used.

Accordingly, an object of this invention is to lower the cost of generating patterns of telegraph characters by lowering the cost of the matrices used in such generation.

Another object of this invention is to provide a telegraph character matrix which is comprised of a small number of simple and easily fabricated parts.

A further object of this invention is to provide a telegraph character matrix which is of small size when compared with the telegraph apparatus with which it is employed.

According to the preferred embodiment of the invention these and other objects are achieved by providing a plurality of printed circuit matrix boards each of which have a common bus strip on one of their sides and a plurality of code strips on the other of their sides. Output connector pins each having two arms are mounted with one of the arms on each side of one of the matrix boards and in electrical contact with an individual one of the code strips. Code pins, identical in shape to the connector pins, are slidably mounted on the matrix board so that they may be moved into and out of electrical contact with the common bus strip and an individual one of the code strips. An electric potential is connected to each of the common bus strips so that when one of the code pins is in its actuated position the potential is applied from the common bus strip through code pin and through the associated code strip to one of the connector pins. When the code pin is in its non-actuated position the potential is not connected to the code strip and accordingly, the potential is not connected to the associated connector pin. In this way the connector pins which correspond to actuated code pins may be differentiated from connector pins corresponding to non-actuated code pins. Telegraph characters can be generated by connecting an appropriate group of the connector pins to the segments of a telegraph distributor so that as the brush of the distributor rotates the connector pins will be attached in step-by-step fashion to a telegraph line.

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A further understanding of the invention may be had by referring to the following detailed description when taken in conjunction with the accompanying drawing wherein:

FIG. 1 is an end view of a character generation matrix embodying the present invention;

FIG. 2 is a sectional view taken substantially along the line 2—2 in FIG. 1 in the direction of the arrows;

FIG. 3A is a sectional view of one of the support blocks taken through one of the ribs between the pin receiving slots along the line 3A—3A in FIG. 2 in the direction of the arrows;

FIG. 3B is a sectional view of one of the support blocks taken through one of the pin receiving channels along the line 3B—3B in FIG. 2 in the direction of the arrows;

FIG. 4 is a bottom view of one of the matrix boards showing the common bus strip, the connector pins and the code pins, some of which are in the actuated position;

FIG. 5 is an enlarged end view of one of the matrix boards taken along the line 5—5 in FIG. 4 in the direction of the arrows, and

FIG. 6 is a schematic illustration of a character generation system employing a matrix constructed according to the present invention;

Referring now to the drawings, wherein like reference numerals designate like parts throughout several views, there will be seen a character generation matrix **10** which is comprised of a plurality of support blocks **11**. As shown in FIG. 2 and in FIGS. 3A and 3B each of the support blocks **11** has formed on one of its surfaces a plurality of stepped, tranversely extending connector pin and code pin receiving channels or slots **12** which are separated one from the other by transverse ribs **13** and also has formed in it a longitudinally extending matrix board support slot **14** which forms a locating or supporting surface. Each of the support blocks **11** also has formed on its surface opposite the slots **12** and **14** three longitudinally extending ribs **20** and **40**. As is shown in FIG. 2 the pin receiving channels **13** are partially defined by side walls **15** and **16** of the ribs **13**. As is shown in FIG. 3 the pin receiving channels **12** are further defined by an upper surface **17**, a lower surface **18** and a second upper surface **19** formed on the support blocks **11**.

Mounted in the channels **12** thus defined are a plurality of connector pins **25** and a plurality of code pins **26**. The pins **25** and **26** are identical in configuration and are of rectangular cross-section throughout their length. These pins are of the type commonly used to make electrical contacts to the printed circuit boards in that they are constructed from an electrical conductive material and in that they have a pair of arms **27** which have opposed projections **28** for gripping and making electrical connection with a printed circuit board.

The connector pins **25** are mounted in the channels of the support blocks **11** and are surrounded by the walls **15** and **16** of the ribs **13**, the surfaces **17** and **18**, and a rib **20** of the support block **11** which is mounted just above (FIG. 1) the block in which the pins are mounted. As is seen in FIGS. 3A and 3B, leftward movement of the connector pins **25** is prevented by a pair of shoulders **30** and **31** on the support blocks **11**. The code pins **26** are mounted in the support blocks **11** in a manner similar to the mounting of the connector pins **25**. The mounting is somewhat different, however, in that a pair of shoulders **32** and **33** on the support blocks **11** are mounted far enough

to the right (FIG. 3B) to allow sliding movement of the code pins **26**. Rotational movement of the pins **25** and **26** is prevented by the walls **15** and **16** which cooperate with the arms **27** to hold the pins upright.

Mounted in the matrix board support slots **14** of the support blocks **11** are matrix boards or cards **35**. As is shown in FIGS. 2 and 4 the matrix boards have on one of their sides a plurality of code strips **36** and have on the other of their sides a common bus strip **37**. The matrix boards are constructed from an insulating material such as the materials commonly used in the construction of printed circuit boards. The code strips **36** and the common bus strips **37** are constructed from an electrical conductive material and may be formed on the matrix boards **35** by any of the common techniques for applying conductive material to printed circuit boards.

As is shown in FIG. 2, an individual one of the code strips **36** is in line with each of the channels **12** in the support blocks **11** as defined by the walls **15** and **16**. Accordingly, when the matrix boards are positioned in the matrix board support slots **14** and the connector pins are mounted in the channels **12** defined by the walls **15** and **16**, the surfaces **17** and **18** and the ribs **20**, the arms **27** of each of the connector pins **25** are located on the opposite sides of one of the matrix boards **35** and one of the projections **28** on the arms **27** of each of the pins **25** is in electrical contact with an individual one of the code strips **36**. The connector pins **25** are not, however, in electrical contact with the common bus strip **37** since, as is shown in FIG. 4, the common bus strip **37** is positioned so that the arms **27** cannot extend across the matrix board **35** far enough to bring the projections **28** into contact with the bus strip **37**.

The code pins **26** are similarly aligned with an individual one of the code strips **36** by the walls **15** and **16** of the ribs **13**. Since the code pins **26** are mounted for lateral movement they may individually be brought into electrical contact with their respective code strips **36** or may be kept out of electrical contact with their respective code strips according to the desired character to be generated by the character generation matrix **10**.

As shown in FIG. 5 when a code pin **26** is moved to its leftmost position the projections **28** of its arms **27** are in electrical contact with the code strip **36** individual to it and with the common bus strip **37**. Accordingly, since the connector pins **25** and the code pins **26** are formed from an electrical conductive material, whatever electrical potential is present on the common bus strips **37** will be applied to the connector pins **25** through the code pins **26** and the code strips **36**. As is shown in FIG. 3A when a code pin **26** is moved to the right, it is taken out of contact with the matrix board **35** and accordingly, is not in electrical contact with either its respective code strip **36** or the common bus strip **37**. Therefore, the electrical potential which is present on the common bus strip **37** will not be applied to the connector pin **25** which is associated with a code pin **26** which is moved to the right (FIG. 3A).

In use a plurality of support blocks **11**, equal in number to the level of the code to be generated plus one, are vertically stacked and are secured by suitable fasteners which bear against an end plate **39**. Between each of the support blocks **11** a matrix board is mounted in the matrix board support slot **14**. The matrix board is secured in the slot **14** by a rib **40** on the support block **11** which is just above the support block **11** in which the matrix board is positioned. Connector pins **25** and code pins **26** are mounted in the channels **12** defined by the walls **15** and **16** and the surfaces **17**, **18** and **19** and are secured therein by the ribs **20** of the support block **11** which is just above the support block in which the pins are positioned. Each of the matrix boards represents one level of the code to be generated, for example, the uppermost matrix board in FIG. 1 might represent the first level of a code to be generated, the matrix board just below the uppermost board the second level, etc. Vertical columns of connector pins **25** and code pins **26** are each representative of a different character to be generated. Each vertical column, therefore, contains one character pin and one code pin of each level of the code to be generated and accordingly, contains one set of pins for each bit in the character.

By means of a plurality of power supply pins **41** and an L-shaped projection **42** on each of the bus strips **37** a predetermined electrical potential may be applied to the bus strips. Each of the characters may then be programmed by simply moving the code pins in the character into electrical contact with their respective code strips to represent a marking bit and by moving the pins out of electrical contact with their respective code strips to represent a spacing bit. Thus, any pin moved to the left (FIGS. 3A and 3B and 5) will connect the common bus strip **37** to an associated connector pin **25** and will thereby apply the pre-determined voltage to the character pins. Any code pin which is moved to the right (FIGS. 3A and 3B and 5) will not connect the bus strip to its pin and thus will leave its associated connector pin at zero volts. By this manner the individual characters as represented by vertical rows of code pins may have their individual bits made marking or spacing and may thus be programmed according to any of the well known telegraph codes.

Referring now to FIG. 6 there will be seen a schematic illustration of the device which may be used in conjunction with above-described matrix to generate telepgraph characters. In that figure parts associated with an individual character are designated by an Arabic numeral representative of the character whereas parts associated with an individual bit of each of the characters are designated with a Roman numeral representative of the bit. The connector pins **25** of the matrix **10** each have their outputs connected to one station of a multiple bank stepping switch **50**. All of the connector pins **25** in any given horizontal row, for example, the row **51**, are individually connected to different stations around one bank of the stepper switch, for example, the bank **52**. The connector pins **25** in any given vertical column, such as the column **53**, are connected to stations along an axial row, such as the row **54**, on the various banks of the stepper switch **50**. Thus, when the wipers of the stepper switch are located at any given station all of the connector pins in a given vertical row are individually connected to one of the wipers of the switch.

The wipers of the stepper switch are individually connected to the segments of a telegraph distributor **60**. Thus, when the stepper switch is at any given station the connector pins **26** in a given vertical row will each be individually connected through the wipers of the switch **50** to one segment of the distributor and, as the brush of the distributor rotates about its axis, the connector pins **25** of the given row are connected to the telegraph line in serial fashion.

The stepper switch **50** may be stepped from station to station by any of the well known stepping motors, such as the motor described and shown in the copending application of J. L. De Boo and G. B. Lutz, filed December 29, 1964, Serial No. 421,887. When this is done the individual vertical rows of the character generation matrix **10** will be connected in sequential fashion to the individual wipers of the stepper switch and the individual connector pins **25** in any given vertical row will be serially connected to the telegraph line by the distributor **60**. Thus, any of the pins **25** which are associated with a code pin **26** which has been moved to the left (FIGS. 3 and 5) will be electrically connected to a common bus strip and thus will apply the potential of the bus strip to the distributor segments and to the telegraph line as the distributor brush connect the segments to the line. Any of the connector pins **25** which are associated with a code pin **26** which has been moved to the right (FIGS.

3 and 5) will not be connected to the bus strip and accordingly, will not apply the potential of the bus strips to the respective distributor segment. In this manner each of the pins **25** may be used to connect either a marking or a spacing bit to its respective segment of the distributor and accordingly, characters having the various permutation combinations of marking and spacing bits may be generated by the matrix.

Although only one embodiment of the invention is shown in the drawings and described in the foregoing specification, it will be understood that invention is not limited to the specific embodiment described, but is capable of modification and rearrangement and substitution of parts and elements without departing from the spirit of the invention.

What is claimed is:

1. A character generation device including:

a plurality of electrical connectors each forming an output for an individual bit in the characters to be generated;

at least one matrix card having a common bus strip and a plurality of code strips each individual to a particular bit in the characters to be generated, each of the connectors being in electrical contact with one of the code strips and being out of electrical contact with the common bus strip;

a plurality of means for connecting selected ones of the code strips to the common bus strip thereby connecting the bus strip to the connectors which are in contact with the selected code strips and changing the bits individual to the connected code strips from one state to another; and

means for positioning each of the connecting means in individual association with one of the code strips and for enabling each of the connecting means for individual movement into and out of electrical connection with its associated code strip so that each of the bits in the character to be generated can be changed from one state to another.

2. A character generation device including:

a plurality of electrical connectors forming an output array for the device;

at least one matrix card having common bus strip and a plurality of code strips, each of the connectors being in electrical contact with an individual one of the code strips;

a plurality of means for permutatively connecting selected ones of the code strips to the common bus strip thereby connecting the bus strip to the connectors which are in contact with the selected code strips;

a first guide block having a surface for supporting the matrix card, having a first plurality of slots for guiding and positioning the connecting means so that they may be moved into and out of contact with the code strips and having a second plurality of slots for supporting the connectors; and

a second guide block having a first rib for cooperation with the surface on the first guide block to support the matrix cards, having a second rib for cooperation with the first plurality of slots in the first guide block to guide and position the connecting means and having a third rib for cooperation with the second plurality of slots in the first guide block to support the connectors.

3. A device for generating a plurality of different characters each of which is comprised of a given number of bits including:

a plurality of matrix boards each individual to the same bit in each character to be generated;

a plurality of connector strips mounted on the circuit boards and grouped in sets, all the strips on each set being individual to one bit of one of the characters and each strip in a given set being mounted on a different matrix board;

at least one common bus strip having a predetermined electrical potential applied to it; and

means for bridging between selected individual strips in each set and the common bus to cause the bridged strips to be at the predetermined potential thereby representing bits of one state and to cause the unbridged strips to be at a different potential thereby representing bits of the opposite state.

4. A signal generation matrix comprising:

a plurality of support blocks each having on one of its sides a first plurality of spaced, parallel slots extending in a given direction, a second plurality of spaced, parallel slots extending in the given direction and a locating surface, the first and the second pluralities of slots in the support blocks being in substantial, respective alignment with each other, each support block having on another of its sides, a plurality of ribs extending in a direction perpendicular to the direction of both pluralities of slots;

a plurality of matrix boards supported by two adjacent support blocks and each held in contact with the locating surface of one support block by at least one rib of another support block;

a plurality of bifurcated connector pins, each having a pair of arms and each extending through one of the slots of the first plurality of slots of one support block and held therein by at least one rib of another support block, the arms of each of the pins being on opposite sides of one of the matrix boards;

a plurality of encoding strips mounted on the matrix boards and each in electrical contact with an individual one of the connector pins;

a plurality of code pins each having a pair of arms and each slidably extending through one of the slots in the second plurality of slots of one support block for movement into and out of electrical contact with an individual one of the encoding strips, the arms of each of the pins being on opposite sides of one of the matrix boards, and

means for connecting a source of electrical potential of a predetermined magnitude to each of the code pins whenever they are in electrical contact with their respective encoding strips so that the electrical potential will be applied through the code pins and through the individual encoding strips to the connector pin which is in contact with the encoding strip and so that the electrical potential will not be applied to those connector pins whose respective encoding strips are not in contact with a code pin.

5. A selectively variable connector assembly comprising:

a plurality of identically shaped support blocks superposed one upon the other, each of said blocks having a longitudinally extending card supporting channel formed in it and a plurality of connector pin and selector pin slots extending transversely of it, said longitudinally extending channel being formed on one side of each block and said pin receiving channels being formed on the same side of each block;

a circuit card nested in said longitudinally extending channel and having a common connector element on one of its surfaces and a plurality of individual connector elements on its opposite surface;

a connector pin in fixed relation to said individual connector elements; and

code pins mounted in the pin slots of the support blocks for slidable movement to selectively interconnect the common connector element on a card to the individual connector elements on the opposite surface of the card.

6. A connector block assembly including:

a plurality of connector supporting cards each having two sides;

a plurality of electrically conductive strips mounted on one side of each of the cards;

at least one electrically conductive common strip mounted on the other side of at least one of said cards; and

a plurality of bifurcated pins each individually slidably movable with respect to the cards and each having one of its arms engageable with one side of one of the cards and having the other of its arms engageable with the other side of the same card, said pins mounted for individual slidable movement with respect to the cards to bring an individual one of the strips into electrical connection with the common strip.

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