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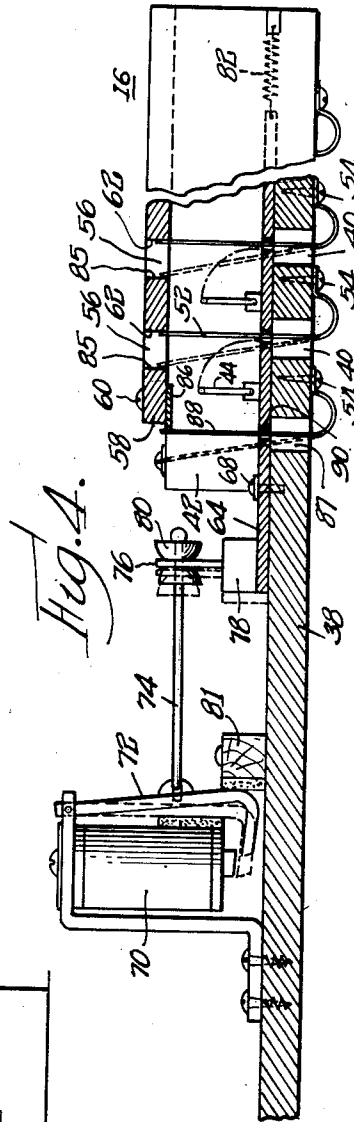
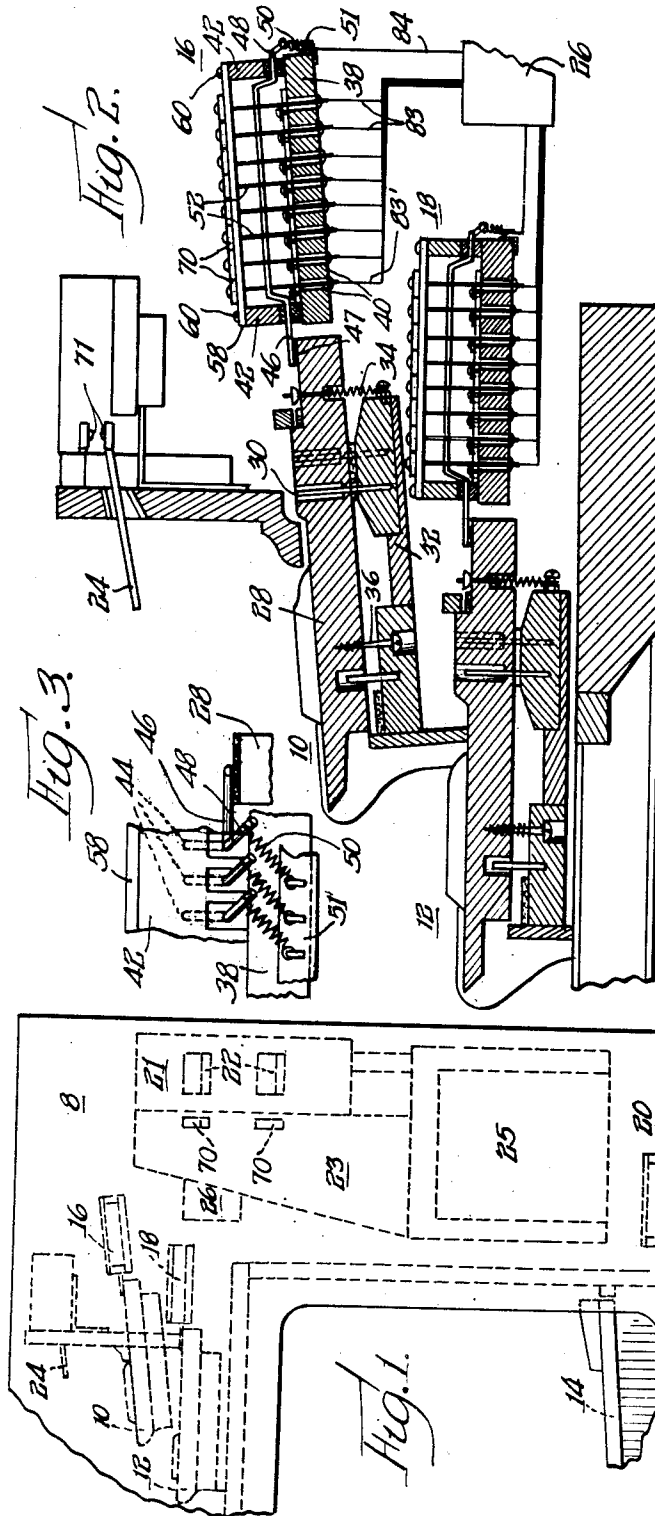
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2,547,918

ELECTRIC ORGAN COUPLER ASSEMBLY

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2 Sheets-Sheet 1



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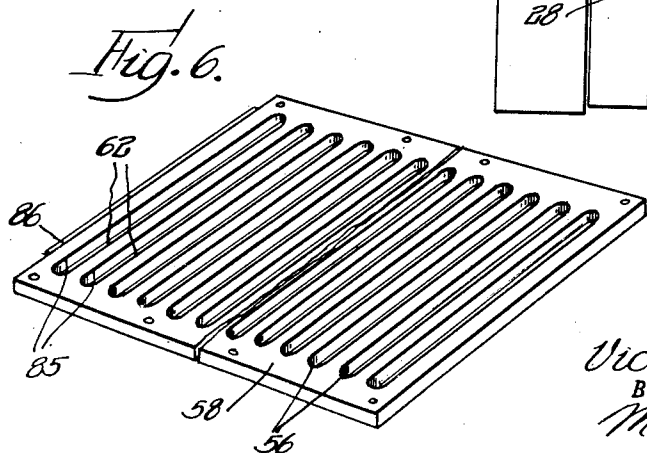
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2 Sheets-Sheet 2



UNITED STATES PATENT OFFICE

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ELECTRIC ORGAN COUPLER ASSEMBLY

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The present invention relates in general to coupler assemblies for electric organs, and, in particular, to an improved switch contact arrangement, and alignment board therefor, for controlling the operation of the organ tone generators.

In general, there are a number of sound sources or generators associated with each key of an organ, and the number of sound sources which are activated in response to the operation of a key is dependent upon which tone control stops have been operated. In electric organs each operated stop prepares an electrical circuit for each of a number of associated keys, which circuits are then completed upon the operation of the selected keys. The switching mechanism which thus prepares and activates the electrical circuits associated with each key in response to the operation of the various stops and keys is termed a "coupler assembly." When several stops are operated concurrently, the operation of a key in the associated keyboard will complete a corresponding group of several circuits. It is essential that all of the circuits in a group be closed by the key at the same instant in order to obtain the desired tonal effect.

It is an object of the present invention to provide an improved coupler assembly, for use in an electric organ, which is arranged to insure simultaneous closing of each of the selected electrical circuits corresponding to a key.

Another object of the invention is to provide an improved form of unitary contact finger abutment or alignment board, for the coupler assembly of an electric organ, which is constructed in such manner as to avoid the contact misalignment difficulties, caused by warpage, which have heretofore been encountered when individual alignment strips were used.

A further object of the invention is to provide an improved contact finger abutment, for an electric organ coupler assembly, which simplifies manufacture of the assembly and minimizes the number of parts required therein, thereby effecting a saving of material and labor.

A still further object of the invention is to provide a coupler assembly, for an electric organ, wherein an improved alignment means is provided which insures accurate location of contact fingers, forming part of the assembly, in both their normal and operated positions.

These and other objects of the invention will best be understood upon a perusal of the following specification taken in conjunction with the accompanying drawings, wherein:

Fig. 1 is a side elevational view of an electric organ constructed in accordance with and embodying the structures of the present invention, illustrating the disposition of the coupler assemblies therein;

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Fig. 2 is an enlarged sectional view of the keyboards and associated coupler assemblies of the organ shown;

Fig. 3 is a partial rear view of one of the coupler assemblies;

Fig. 4 is an enlarged sectional view of a portion of the coupler assembly, taken along the line 4—4 in Fig. 5;

Fig. 5 is a plan view of a portion of the upper keyboard and associated coupler assembly, as seen from the top of Fig. 2;

Fig. 6 is a perspective view of the improved form of contact finger abutment or alignment board; and

Fig. 7 is a sectional view, similar to Fig. 4, showing an alternative form of contact finger for use in the coupler assembly.

The electric organ 8 shown in Fig. 1, and set forth for purposes of illustration of the present invention, includes a swell keyboard 10, a great keyboard 12, and a pedal keyboard 14. These three keyboards have coupler assemblies 16, 18 and 20 individually associated therewith, to which the present invention particularly relates.

The organ further includes a reed frame 21 provided with a plurality of tone generators or reeds, as indicated at 22, which may, for example, be of the type set forth in the patent to Horschke No. 2,015,014, dated September 17, 1935. These reeds are individually disposed in reed cells, and are activated by air admitted to the cells from a wind chest 23, the transmission of the air to the cells being under the control of a series of valves or pallets operated by electro-magnets 24, the detailed functioning of which is set forth in my prior Patent No. 2,343,728, dated March 7, 1944, and indicated by the reference numeral 30 therein.

As more particularly set forth in said Horschke patent the reeds are electrically interconnected with an electronic amplifier as indicated at 25, Fig. 1, so as to produce electrical signals corresponding to the vibrations of the reeds, which signals are converted into acoustic waves by a loud speaker connected to the output of the amplifier.

As will be hereinafter further set forth, each of the coupler assemblies 16, 18 and 20 includes a multiplicity of switch contacts which are selectively closed by the keys of the keyboards, and the stops 24, to select the reed and reed combinations for operation, to thereby effect the tone control. To this end the switch contacts of the coupler assemblies are interconnected with a panel or terminal board 26, Fig. 1, provided with suitable circuit connections, the details of which form no part of the present invention, for selectively energizing the electro-magnets 24 to thereby selectively activate the reeds. The coupler assemblies thus determine which reeds will

be operated in response to the operation of a key.

As all of the keyboards and coupler assemblies in the organ are similar, a description of one keyboard and its associated coupler assembly will suffice to describe the invention. While the coupler assemblies are particularly adapted for use in connection with the organ structure herein described, it will be understood that the switch contacts thereof may be adapted for other uses and control purposes, including the control of organ tone generators of specifically different type and construction.

Referring now particularly to Fig. 2, it will be seen that the swell keyboard 10 includes a plurality of keys 28 which are pivoted on balance pins 30 extending from a key frame 32 through elongated openings in the keys. The keys are biased to pivot in a clockwise direction, as viewed in Fig. 2, by means of key tension spring assemblies 34. Clockwise movement of the keys upon the manual depression thereof, is limited by check screws 36 which pass through counter-bored openings in the key frame 32 into the under sides of the keys 28.

The coupler assembly 16 extends lengthwise of the organ at the rear of the row of keys 28 which comprise the keyboard 10. This coupler assembly comprises a baseboard 38, Figs. 2 and 4, of insulating material and having a plurality of openings 40 disposed in ranks and files, each rank of openings extending lengthwise of the coupler corresponding to a stop, and each file of openings extending transversely of the coupler corresponding to a key included in keyboard 10. A pair of spacer or side bars 42, also of insulating material, extend lengthwise of the baseboard 38 along the front and rear edges thereof.

The lower edges of the spacers 42 are notched to receive journal blocks for a number of switch contact rocker arms 44, each of which corresponds to and is actuated by one of the keys in keyboard 10. Each of the rocker arms 44 includes a key contacting crank arm 46 which extends from the left side of the coupler assembly 16, as viewed in Fig. 2, and is formed at right angles to the switch contact portion of the rocker arm disposed between the spacers 42. The crank arms 46 bear against felt pads 47 secured to the upper sides of the corresponding keys 28 at the rear ends thereof.

Each of the rocker arms 44 also includes a second crank portion 48, Fig. 3, extending from the right side of the coupler assembly 16, as viewed in Fig. 2. Coil springs 50 are anchored, and soldered at one end to hooks formed on a contact strip 51 carried by the baseboard 38, and anchored and soldered to the crank arms 48 at the other end to form electrical contact with and to bias the rocker arms for rotation in a counter-clockwise direction, as viewed in Fig. 4; whereby to normally hold the cranks 46 against the keys with the arms 44 vertically upright, as shown. Upon operation of a key, the rocker arm associated therewith is moved clockwise from the upright position shown in Fig. 4, through an arc of substantially 90°.

As may best be seen in Fig. 4, switch contact fingers 52 which cooperate with the switch arms 44 in the operation of the coupler, extend through each of the openings 40 in the baseboard 38 and are secured to the under side of the baseboard by means of brads or screws 54. The upper ends of the contact fingers 52 extend above the spacers 42 into transverse slots 56 in

a contact finger abutment or alignment board 58, which bridges the spacers 42 and is secured thereto by screws 60.

This alignment board 58 is shown in detail in Fig. 6, and its preferred detailed structure will be later described.

The contact fingers 52 are normally biased by their own resiliency against the positioning surfaces 62 formed by the slots in the alignment board 58, which are disposed so as normally to position the contact fingers out of the path of movement of the rocker arms 44, which path is indicated by dotted lines in Fig. 4.

The contact fingers 52 may be secured to the baseboard 38 either before or after the alignment board 58 is secured to the strips 42. In either case, the alignment board is adjusted after assembly of the unit by loosening the screws 60 and shifting the alignment board laterally so that there is a desired minimum distance between all of the contact fingers 52 and their associated rocker arms 44 with the former in their normal positions and with the latter in their operated positions. When this adjustment has been made the screws 60 are tightened securely and need not again be disturbed, as one adjustment serves to properly position all of the elements of the assembly simultaneously. The length of time required to adjust the assembly is reduced to a fraction of that required when individual alignment strips are used, partly due to the fact that only a few screws are needed to hold the unitary alignment board in place whereas two screws per row of contacts are required with individual alignment strips.

The minimum distance mentioned above should be sufficient to avoid any chance contact in case one of the contact fingers is set into vibration by sound waves radiated by the loudspeaker of the organ or transmitted through the organ frame. The possibility of the contact fingers being thus excited into vibration is greatly reduced when they are dampened by tensioning their upper ends against abutment surfaces 62 of the alignment board 58, thus permitting a smaller contact gap to be used than when the upper ends of the contact fingers are free.

A number of coupler slides 64, of insulating material, each corresponding to a stop, extend lengthwise of the coupler board 16. The coupler slides 64 are provided with notches 66 along one edge thereof, each of which notches encompasses a corresponding one of the contact fingers 52. The coupler slides 64 are slidably secured to the baseboard 38 by means of screws 68.

At the left end of the baseboard 38, as viewed in Fig. 5, there is provided a group of slide operating electro-magnets 70, each of which corresponds to a stop tablet 24; the electro-magnets being selectively energized through contacts 71, Fig. 2, operated by the stop tablets. The electro-magnets 70 are provided with armatures 72, Fig. 4, which are connected to the corresponding coupler slides 64 by means of connecting rods 74 which are hooked to ears extending from the magnet armatures and pass through eyelets 76 extending from blocks 78 secured to the ends of the coupler slides. Felt or rubber grommets 80 are provided in the eyelets 76 to cushion the coupler slides during operation of the associated electro-magnets.

In Fig. 4 one of the electro-magnets and its associated coupler slide have been shown in their normal positions where the magnet armature 72

rests against a cushioned armature bumper bar 81, towards which it is biased by means of a coil spring 82 secured to the right end of the coupler slide 64. When the electro-magnet 70 is energized by the operation of the corresponding one of the stop tablets 24, the armature 72 pivots in a clockwise direction, as viewed in Fig. 4, to the position indicated by the dotted lines. The coupler slide 64 associated with the energized electro-magnet 70 is thereby shifted to the left, causing the rank of contact fingers 52, which are encompassed by the slots 66 in the operated coupler slide, to be inclined towards the left until their upper ends engage abutment surfaces 85 of the alignment board, as indicated in dotted lines in Fig. 4. When the contact fingers have been thus inclined, they are disposed in the path of movement of the rocker arms 44, so that operation of any of the keys 28 in keyboard 10 will cause the corresponding rocker arms 44 operated thereby to engage the contact fingers 52 in the associated files which have been inclined towards the rocker arms by the operation of the stop magnets. The contact fingers which are engaged by an operated one of the rocker arms are lifted from the associated abutment surface 85 at their upper ends, whereby all of the force produced by the deformation of each inclined contact finger is borne by the operated rocker arm to provide high contact pressure therebetween.

As best shown in Fig. 2, the contact fingers 52 are individually connected with the terminal or panel board 26 by means of wires 83, whereas the terminal strip 51 is connected to the panel by means of wire 84. It will thus be seen that for each finger 52 and rocker arm 44 which are brought into electrical engagement, an individual circuit is established in the panel board to effect the selection of the reeds in accordance with the stop tablets which are operated and the keys which are depressed, as previously described.

If the contact fingers 52 in the same file should be inclined at different angles, they will not be engaged at the same instant by the associated rocker arm 44 when it is operated. The tone source which is connected to the contact finger having the greatest inclination would consequently be brought into operation slightly before the tone sources which are connected to the other inclined contact fingers in the same file. An improper tonal effect would consequently result when a plurality of stops are operated concurrently. It will be noted that the abutment surfaces 85 provided by the slots 56 in the alignment board 58, against which surfaces the upper ends of the contact fingers 52 bear when they are in the inclined position, insure equal inclination of all of the operated contact fingers in a file thereof, thereby avoiding the above difficulty. In Fig. 5, the lowermost stop magnet and coupler slide have been shown in their operated positions to illustrate the manner in which the contact fingers 52 are engaged by the operated contact abutment surfaces of the alignment board 58.

During the playing of an electric organ, the load on the power supply for energizing the various parts should be maintained as uniform as possible. To minimize the extent of the load variations due to differences in the number of stops being played, it is desirable to provide a means of maintaining a load on the power supply for each stop which is not in play, substantially as if the stop were being played. This is accomplished by means of a contact strip 86 attached to one edge of the alignment board 58, 75

as best shown in Figs. 4 and 6. An additional row of openings 87 is provided in the coupler baseboard 38 beneath the contact strip 84. Contact fingers 88 are secured to the under side of the baseboard 38 by means of brads or screws 54 and extend upwardly through the openings 86 to engage the contact strip 84 at their upper ends. These contact fingers 88 are encompassed by additional slots 90 in the coupler slides 64, in a manner similar to the arrangement for contacts 52. The contact finger 88 is interconnected with the panel board 26 by means of a wire 83', Fig. 2, whereas the contact strip 86 is electrically interconnected with the terminal bar 51 and the panel wire 84. By this means when the finger 88 and strip 86 are in engagement a load is applied to the power source to approximate the average load which would be imposed thereon if the stop were operated, upon engagement between the switch contacts 52 and 44. Whenever any of the stop magnets 70 is energized the corresponding contact finger 88 will be inclined to the left, as indicated by dotted lines, Fig. 4, thereby removing the fixed load from the power supply to compensate for the load of the pallet magnets which are brought into play as a consequence of the operation of the keys.

The particular form of contact finger thus far described is given a high degree of flexibility through the provision of the U-shaped portion at the lower end thereof. In particular instances, it may be desired to provide a greater degree of flexibility. This may be accomplished by the alternative construction which has been illustrated in Fig. 7. As there shown, the portions of the contact fingers 52 which are disposed within the openings 40 in the baseboard 38 are coiled into a helix, thereby effectively lengthening the portion of the contact finger which is subjected to the most flexing, and providing a highly resilient structure. It will be noted that this form of construction enables a high degree of flexibility to be obtained, and at the same time effects a saving in space, inasmuch as the contact fingers do not project beneath the lower surface of the coupler baseboard 38.

Particular attention is directed to the character of the alignment board 58, as shown in Fig. 6. The alignment board comprises essentially a unitary structure and may be constructed of laminated wood or plastic. When wood is employed it is preferred that it should be impregnated with a waterproof plastic to render it impervious to dampness and fungi. The use of a one piece structure provided with slots eliminates the misalignment difficulties which occur as a result of warping when narrow strips individual to each file of contact fingers are used as alignment members. In addition the cost of fabrication of the coupler assembly is reduced by the use of a unitary alignment means, in that fewer screws are necessary to attach the slotted alignment board to the spacers 42 than are required to fasten a number of individual alignment strips thereto. This reduces the cost of assembly and also reduces the likelihood of splitting the spacers 42, which entail a considerable amount of labor to replace.

The use of a single alignment board for all of the contact fingers furthermore simplifies assembly in that when the alignment board has been located so as to properly position the contact fingers in any one file thereof, all of the remaining files of contact fingers will automatically be properly located since the abutment and posi-

tioning surfaces in the alignment board are accurately located in the manufacture thereof.

While the invention has been illustrated by the disclosure of a particular embodiment thereof, it should be apparent that various modifications may be made, and therefore it is the aim in the appended claims to include all such modifications as fall within the true spirit and scope of the invention.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent is:

1. In a coupler assembly for an electric organ, a base, a plurality of resilient movable contact fingers extending from said base, said contact fingers being disposed in ranks and files, a plurality of movable contact members each associated with a file of said contact fingers, means for selectively operating said contact fingers by ranks, means for selectively operating said contact members into electrical contact with the contact fingers associated therewith, an alignment board fixedly secured to and spaced from said base, said alignment board having a row of slots therein which are spaced in accordance with the spacing of the files of contact fingers to form contact abutment surfaces, the free ends of the contact fingers in each file thereof being biased to engage a corresponding one of the abutment surfaces of said alignment board, whereby said contact fingers are positioned at equal distances from their associated contact members.

2. In a coupler board for an electric organ, a base, a plurality of resilient movable contact fingers extending from said base, said contact fingers being disposed in ranks and files, a plurality of movable contact members each associated with a file of said contact fingers, means for selectively operating said contact fingers by ranks, means for selectively operating said contact members into electrical contact with the contact fingers associated therewith, an alignment board fixedly secured to and spaced from said base, said alignment board having parallel abutment surfaces thereon which are spaced in accordance with the spacing of the files of contact fingers to form contact positioning surfaces, the free ends of the contact fingers in each file thereof engaging a corresponding one of the positioning surfaces of said alignment board, whereby the contact fingers in a file thereof are positioned at equal distances from the contact member with which they are associated.

3. In a coupler board for an electric organ, a base, a plurality of resilient movable contact fingers extending from said base, said contact fingers being disposed in ranks and files, a plurality of movable contact members each associated with a file of said contact fingers, means for selectively operating said contact fingers by ranks, means for selectively operating said contact members into electrical contact with all of the operated contact fingers associated therewith, an alignment board fixedly secured to and spaced from said base, said alignment board having a row of slots therein which are spaced in accordance with the spacing of the files of contact fingers to form operated and normal contact abutment surfaces, the free ends of the contact fingers in each file thereof being biased normally to engage a corresponding one of the normal abutment surfaces of said alignment board and engaging a corresponding one of the operated abutment surfaces of said alignment board when operated, whereby all of said contact

fingers are normally positioned at equal distances from their associated contact members and all of the operated contact fingers in a file thereof are positioned at equal distances from the contact member associated therewith.

4. In a coupler assembly for an electric organ, a base, a plurality of resilient movable contact fingers extending from said base, said contact fingers being disposed in ranks and files, a plurality of movable contact members, each of said contact members being associated with a corresponding file of said contact fingers, means for selectively operating said contact fingers by ranks, means for selectively operating said contact members into electrical contact with all of the operated contact fingers associated therewith, an alignment board fixedly secured to said base in spaced relation therewith, said alignment board having rows of contact abutment surfaces formed therein which are spaced in accordance with the spacing of the files of contact fingers, the free ends of the contact fingers in each file thereof being biased when operated to engage a corresponding one of the abutment surfaces of said alignment board, whereby all of said operated contact fingers are positioned at equal distances from their associated contact member.

5. In a coupler assembly for an electric organ, a base member, a pair of parallel spacing members secured to and extending lengthwise of said base member, a plurality of resilient movable contact fingers extending from said base member between said spacing members, said contact fingers being disposed in ranks and files, a plurality of movable contact members extending between said spacing members, each of said contact members being associated with a corresponding file of said contact fingers, means for selectively operating said contact fingers by ranks, means for selectively operating said contact members into electrical contact with the contact fingers associated therewith, an alignment board fixedly secured to and bridging said spacing members, said alignment board having rows of contact abutment surfaces formed therein which are spaced in accordance with the spacing of the files of contact fingers, the free ends of the contact fingers in each file thereof engaging a corresponding one of the abutment surfaces of said alignment board, whereby the contact fingers in a file thereof are positioned at equal distances from the contact member associated therewith.

6. In a coupler assembly for an electric organ, a base member, a pair of parallel spacing members secured to and extending lengthwise of said base member, a plurality of resilient movable contact fingers extending from said base member between said spacing members, said contact fingers being disposed in ranks and files, a plurality of movable contact members extending between said spacing members, each of said contact members being associated with a corresponding file of said contact fingers, means for selectively operating said contact fingers by ranks, means for selectively operating said contact members into electrical contact with all of the operated contact fingers associated therewith, an alignment board fixedly secured to and bridging said spacing members, said alignment board having rows of operated and normal contact abutment surfaces formed therein which are spaced in accordance with the spacing of the files of contact fingers, the free ends of the contact fingers

in each file thereof being biased normally to engage a corresponding one of the normal abutment surfaces of said alignment board and engaging a corresponding one of the operated abutment surfaces of said alignment board when operated, whereby all of said contact fingers are normally positioned at equal distances from their associated contact members and all of the operated contact fingers in a file thereof are positioned at equal distances from the contact member associated therewith.

7. In a coupler assembly for an electric organ, a rectangular baseboard having a plurality of openings therein disposed in ranks and files, a plurality of resilient contact fingers each secured at one end to said baseboard on one side thereof and extending through and beyond an adjacent one of the openings therein, a plurality of operating members extending lengthwise of and slidably secured to said baseboard on the other side thereof, each of said operating members engaging a corresponding rank of said contact fingers, a row of contact members rotatably secured to and extending transversely of said baseboard, each of said contact members being disposed adjacent a corresponding file of said contact fingers, means for selectively actuating said operating members to operate the contact fingers in the corresponding rank toward their associated contact members, means for selectively actuating said contact members into electrical engagement with all of the operated contact fingers in the corresponding file, and an alignment board extending parallel to and spaced from said baseboard, said alignment board having contact abutment surfaces formed therein which engage the free ends of said contact fingers to insure that all operated contact fingers in a file thereof are engaged simultaneously during operation of the contact member associated therewith.

8. An alignment board for an electric organ coupler assembly of the type having a plurality of stop controlled contact fingers cooperable with key controlled switch contactors, said board comprising a moisture-proofed, non-conducting generally rectangular panel having parallel transverse slots therein forming contact finger abutment surfaces, and a contact strip secured to the alignment board and extending along the side thereof parallel to said slots.

9. In an electric organ comprising a keyboard having a plurality of keys, and a plurality of stop tablets, the combination of a coupler assembly cooperable therewith, said coupler assembly comprising a base, a plurality of resilient contact fingers secured to said base arranged in longitudinal and transversely extending rows, a plurality of contact members disposed in parallel spaced relation and extending along said rows in one direction, said contact members being selectively operable by the keys, a plurality of contact finger control slides disposed in parallel spaced relation and extending along said rows in the opposite direction, said slides being selectively operable by the stop tablets and being arranged by their operation to cause the operative engagement of said contact fingers and contact members on the operation of the latter, and an alignment plate structure engageable with the contact fingers for determining the position thereof, said plate having a plurality of parallel spaced abutment surfaces engageable by the contact fingers and extending parallel to the contact members.

10. In an electric organ comprising a keyboard having a plurality of keys, a plurality of stop tablets, a plurality of reeds, and a plurality of electro-magnetically operated valve pallets for controlling the selective operation of the reeds, the combination of a coupler assembly for operatively interconnecting the keys, stop tablets, and pallets, said coupler assembly comprising a base, a plurality of resilient contact fingers secured to said base arranged in longitudinal and transversely extending rows, a plurality of contact members disposed in parallel spaced relation and extending along said rows in one direction, said contact members being selectively operable by the keys, a plurality of contact finger control slides disposed in parallel spaced relation and extending along said rows in the opposite direction, said slides being selectively operable by the stop tablets and being arranged by their operation to cause the operative engagement of said contact fingers and contact members on the operation of the latter to actuate said valve pallets, and an alignment plate structure engageable with the contact fingers for determining the position thereof, said plate having a plurality of parallel spaced abutment surfaces engageable by the contact fingers and extending parallel to the contact members.

11. An electric organ as defined in claim 9, wherein said contact fingers comprise U-shaped members having bight portions below the base and leg portions extending through aligned openings provided in said base.

12. An electric organ as defined in claim 9, wherein said contact fingers comprise U-shaped members having leg portions extending through aligned openings in the base, each of said leg portions including a resilient helical twisted portion at a predetermined position along the length thereof.

13. A coupler board for electric organs, said coupler board comprising a base, said base having a plurality of aligned openings therein, a plurality of resilient contact fingers secured to the base on one side thereof and extending through said openings, organ stop controlled members engageable with said contact fingers for controlling the positioning thereof, stop means limiting the positioning of said contact fingers, and key actuated switch contacts selectively engageable with the contact fingers in accordance with the positioning thereof.

14. A coupler board as defined in claim 13, wherein the contact fingers are provided with resilient helical twisted portions intermediate the length thereof to impart a predetermined resiliency thereto.

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