Nov. 30, 1948. A. O. WILLIAMS 2,455,032

MUSICAL INSTRUMENT

Filed Sept. 17, 1947

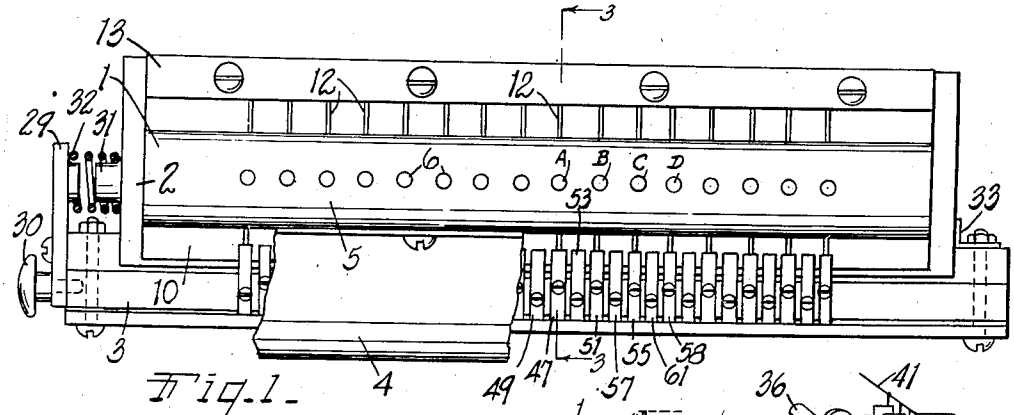


Fig. 1.

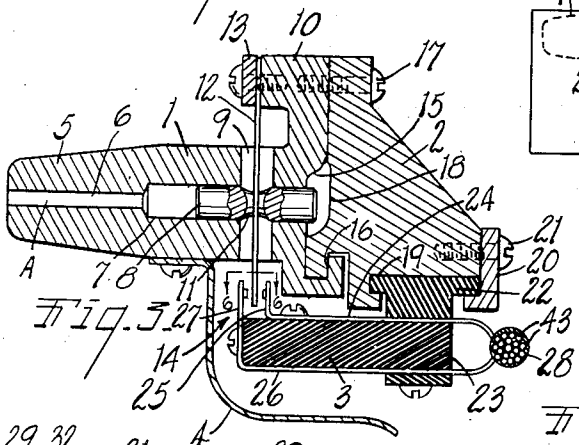


Fig. 3.

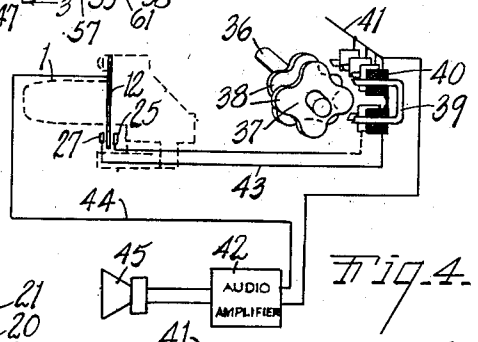


Fig. 4.

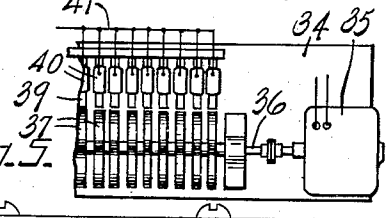


Fig. 5.

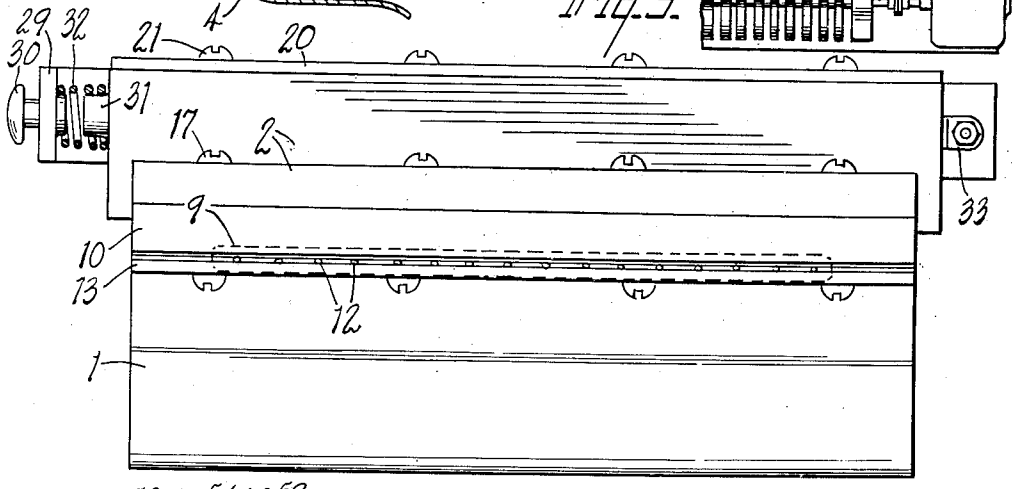


Fig. 2.

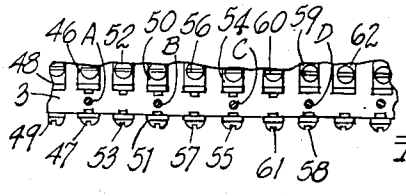


Fig. 6.

INVENTOR.
Alfred O. Williams
BY
ATTORNEY

Patented Nov. 30, 1948

2,455,032

UNITED STATES PATENT OFFICE

2,455,032

MUSICAL INSTRUMENT

Alfred O. Williams, Richland, Mich.

Application September 17, 1947, Serial No. 774,612

15 Claims. (Cl. 84—1.01)

1

This invention relates to improvements in a musical instrument.

The principal objects of this invention are:

First to provide a musical instrument in which a motor driven electro-magnetic sound producing system is selectively actuated to produce music by an instrument manipulated and operated like a harmonica.

Second, to provide a harmonica-like instrument for selectively controlling electrically produced and amplified musical tones.

Third, to provide a musical instrument which may be held in the hands and played like a harmonica to produce musical tones from a remotely located electric amplifier system.

Fourth, to provide a musical instrument having the characteristics described above which may be easily played and economically produced.

Other objects and advantages relating to the details and economies of the invention will be apparent from the following description and claims.

The drawings, of which there is one sheet, illustrate a preferred form of my instrument.

Fig. 1 is a front view of my instrument with a portion of the guard case broken away to illustrate the tone producing contacts.

Fig. 2 is a plan view of the instrument.

Fig. 3 is a cross sectional view along the line 3—3 of Fig. 1.

Fig. 4 is a schematic wiring diagram of the electrical circuit employed in my instrument and illustrates conventionally the tone producing mechanism of the instrument.

Fig. 5 is a conventional fragmentary plan view of the tone producing mechanism employed with my instrument.

Fig. 6 is a fragmentary cross sectional view along the line 6—6 in Fig. 3.

My instrument consists of a tone producing and amplified system which may be positioned remotely from the musician and an operating or playing instrument which is held and played by the musician and which is connected to the tone producing mechanism by a multi-conductor electrical cable. The playing instrument is illustrated in Figs 1, 2, 3 and 6 and consists of a mouthpiece 1, body 2, slide 3 and guard 4. The mouthpiece 1 is provided with a forwardly projecting transversely extending lip engaging portion 5 defining a plurality of equally spaced tone bores 6. The bores 6 are enlarged at their rear end to form cylinders 7 arranged to receive the pistons 8. Each of the cylinders 7 is intersected by a vertically extending transverse slot 9 and

2

the back side of the mouthpiece is provided with a generally vertical flange 10.

Each of the pistons 8 is transversely bored as at 11 (see Fig. 3) to pass a metallic contact member or reed 12. The upper ends of the reeds 12 are secured to the upper portion of the flange 10 and electrically connected together by means of a terminal bar 13 which forms an electrical contact common to all of the reeds. The lower ends of the reeds 12 project downwardly through the bottom of the slot 9 and are positioned between opposed pairs of contacts 14 as will be more particularly described presently.

The rear side of the flange 10 is recessed along the ends of the cylinders 8 as at 15 and is provided with an upwardly opening groove 16 along the lower edge thereof arranged to receive a mating flange formed on the forward side of the body member 2. The top edge of the body member is secured to the flange 10 by the screws 17 and the front surface of the body member is recessed transversely as at 18 opposite the recess in the mouthpiece to form a chamber into which the rear ends of the pistons 8 may project.

The bottom side of the body member 2 is provided with a rearwardly opening groove 19 which cooperates with the flanged plate 20 to form a T slot on the bottom of the body member for slidably supporting the slide member 3. The flange plate 20 is secured to the body member by suitable screws 21.

The slide member 3 consists of an upper bar 22 having a T-shaped cross section slidably supported in the T slot in the body member. The upper bar is secured to and supports the terminal bar 23 along its lower side and the two parts of the slide member are preferably made of insulating material as illustrated in Fig. 3. The upper surface of the terminal bar 23 carries a series of transversely spaced conductors 24, each of which is provided with an upturned contact 25. The underside and front of the terminal bar carries a series of conductors 26 which terminate in contacts 27 positioned opposite to and in longitudinally spaced relationship with the rear contacts 25 to make up the pairs of contacts referred to above. The conductors 24 and 26 extend to the rear of the slide member and are electrically connected to a series of wires formed into a cable 28.

The left end of the slide member as viewed in Figs. 1 and 2 is provided with an upwardly extending stop bar 29 and a finger button 30 by means of which the slide may be moved relative to the body member 2 and mouthpiece 1. The

stop bar 29 coacts with an abutment 31 on the body member 2 and a coil spring 32 is provided for constantly urging the slide member to the left. The right end of the slide member is provided with an upwardly flanged stop member 33 for limiting the movement of the slide toward the left under the influence of the spring 32. The stop 33 and abutment 31 are spaced relative to the stop bar 29 so that the slide 3 may be moved a distance equal to the distance between two adjacent pairs of contacts 14.

It will be noted that there are twice as many pairs of contacts 14 on the slide member 3 as there are tone bores and pistons on the mouthpiece 1. The pairs of contacts 14 are spaced transversely a distance equal to the distance of travel of the slide on the body member so that the reeds 12 will be positioned behind alternate pairs of contacts in one position of the slide and will be moved to the next adjacent contacts when the slide is pressed to the right. The reeds may be moved into electrical contact with the rear contacts 25 on the slide by blowing into the tone bores 6 to move the pistons 8 rearwardly. The reeds may be moved into contact with the forward contacts 27 by sucking or drawing on the tone bores 6.

The tone producing and amplifying mechanism associated with my playing instrument is illustrated conventionally in Figs. 4 and 5 and consists of a base 34 on which is mounted a constant speed electric motor 35. The motor is arranged to rotate the shaft 36 at a predetermined constant speed and the shaft is provided with a series of magnetic disks 37, each disk having a plurality of lobes or projections 38 formed on the outside thereof. The projections 38 are arranged to be rotated by the shaft 36 through the gaps of a series of magnets 39 as illustrated in Fig. 4. It should be understood that Fig. 4 is a conventional illustration by way of example only and that a great many projections are provided on each disk 37. Each of the magnets 39 is provided with a two-part coil 40 which is magnetically coupled with the magnetic field of the magnet. One side of each of the coils 40 is connected to a common conductor 41 extending to one side of the audio-amplifier illustrated conventionally at 42. The opposite side of each of the coils 40 is connected by means of an individual conductor 43 to one of the contacts 25 or 27. The common terminal 13 on the playing instrument is connected by a conductor 44 to the opposite side of the audio-amplifier and the amplifier is arranged to drive a loudspeaker 45.

As the shaft 36 and disks 37 are rotated at a relatively high constant speed, the lobes 38 will alternately open and close the magnetic circuits of the magnets 39 causing a variation of the intensity of the magnetic fields thereof, the rate of variation being determined by the rotational speed of the shaft 36 and the number of the lobes on each of the disks. The number of lobes on each disk and the speed of the shaft 36 is designed so that each magnet and its associated disk will produce a fluctuating magnetic field, the frequency of which corresponds to a note of the musical scale. Preferably I provide a sufficient number of magnets 39 and disks 36 to produce each note of the chromatic scale. The electromagnetic mechanism thus described for producing the musical tones is of the type commonly used in some electric organs at the present time and forms no part of the present invention except in combination with the playing instrument and so has not been described in greater detail.

When a musician blows or draws on one of the tone bores 6, the corresponding piston is actuated to engage the reed 12 with one or the other of the contacts 25 or 27 associated with that tone bore. Closing the contact with the reed 12 completes an electrical circuit through one of the coils 40 to the audio-amplifier 42 and the varying magnetic field in that magnet produces a fluctuating current in the conductors 41 and 44 which is amplified by the audio-amplifier and causes a corresponding musical tone to be emitted by the speaker 45.

In connecting the pairs of contacts 14 to the tone coils 40 through the cable 23 I prefer to connect the several contacts 25 and 27 to appropriate tone coils so that the alternate pairs of contacts will produce the musical scale when the playing instrument is actuated like a standard harmonica. The other pairs of contacts are connected to tone coils associated with disks 37 which will produce half tones of the basic scales so that by pressing in on the button 30 the musician may obtain half or sharped notes of the basic musical scale. It should be understood that due to the arrangement of the chromatic scale in which the sharped tone of some notes are equal to other whole tones of the basic scale there will be less tone magnets 40 and disks 37 than there are contacts 25 and 27. This variation is compensated for by connecting some of the conductors 43 to the same tone coil 40.

The electrical connections for one octave of the instrument are as follows (see Figs. 1 and 6): Contact 46 associated with bore A is connected to a disk 37 to produce the note "do" of a selected musical scale. Contact 47 associated with bore A is connected with a disk to produce "re." Contact 48 is connected to a disk to produce "do sharp" and contact 49 is connected to produce "re sharp." Contact 50 associated with bore B is connected to a disk to produce note "mi" and contact 51 is connected to produce note "fa." Contact 52 is connected to produce "mi sharp" which on the musical scale is the same as "fa" so contact 52 is connected to the same disk 37 as contact 51 and contact 53 is connected to produce "fa sharp." Contact 54 associated with bore C is connected to produce "sol" and contact 55 is connected to produce "la." Contact 56 is connected to produce "sol sharp" and contact 57 is connected to produce "la sharp." Contact 58 is connected to a disk to produce the tone "ti" and contact 59 is connected to produce the tone "do" one octave above that produced by contact 46. Both contacts 60 and 61 are connected to produce the tone "ti sharp" which is the same as "do" and so are connected to the same disk as contact 59. Contact 62 starts a new octave with the tone "do" the same as contact 59 and 60 and 61.

A musician in playing my musical instrument operates the mouthpiece and slide with his mouth and hands in the same manner as a chromatic harmonica and the tones are produced by the motor driven electro-mgnetic system described. The musician may vary volume or intensity of the music produced by adjusting the audio-amplifier to the desired amount of amplification and by providing various tone control circuits in the audio-amplifier; the tone or quality of the music produced by my instrument may be varied as desired. It will be understood that the instrument may be made to include as many octaves of the musical scale as are desired, the example illustrated being arranged to play four octaves of a musical scale.

I have thus described a highly practical form of my instrument and have not attempted to illustrate various possible modifications thereof as it is felt that such variations and changes as may appear desirable can be made without further description.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A musical instrument comprising a playing member having a mouthpiece defining a plurality of transversely spaced longitudinally extending tone bores, the rear ends of said tone bores being enlarged to form cylinders, said mouthpiece defining a transverse vertical slot intersecting said cylinders, pistons positioned in said cylinders, said pistons being vertically apertured, contact reeds secured to said mouthpiece and extending through said slot and said apertures in said pistons to below said mouthpiece, a common terminal member secured to said mouthpiece and electrically connected to each of said reeds, a body member secured to the back of said mouthpiece and being recessed to form a chamber into which the rear ends of said pistons project, the bottom of said body member defining a slideway, a slide member mounted in said slideway and having a plurality of transversely spaced pairs of contacts secured thereto, the contacts of said pairs of contacts being longitudinally spaced on opposite sides of said reeds whereby variation of pressure in said tone bores by the musician will actuate said pistons to engage said reeds with one or the other of said contacts, conductors electrically connected to said contacts and extending to the tone coils of a motor driven electro-magnetic tone producing and amplifying system, a conductor connecting said common terminal to said amplifying system, there being two pairs of contacts on said slide member associated with each of said bores whereby alternate pairs of contacts register with said reeds in one position of said slide member and intermediate pairs of contacts are brought into registry with said reeds by movement of said slide member on said body member, and a spring urging said slide member in one direction.

2. A musical instrument comprising a playing member having a mouthpiece defining a plurality of transversely spaced longitudinally extending tone bores, the rear ends of said tone bores being enlarged to form cylinders, said mouthpiece defining a transverse vertical slot intersecting said cylinders, pistons positioned in said cylinders, said pistons being vertically apertured, contact reeds secured to said mouthpiece and extending through said slot and said apertures in said pistons to below said mouthpiece, a common terminal member secured to said mouthpiece and electrically connected to each of said reeds, a body member secured to the back of said mouthpiece and being recessed to form a chamber into which the rear ends of said pistons project, the bottom of said body member defining a slideway, a slide member mounted in said slideway and having a plurality of transversely spaced pairs of contacts secured thereto, the contacts of said pairs of contacts being longitudinally spaced on opposite sides of said reeds whereby variation of pressure in said tone bores by the musician will actuate said pistons to engage said reeds with one or the other of said contacts, conductors electrically connected to said contacts and extending to the tone coils of a motor driven electro-magnetic tone producing and amplifying system, and a conductor connecting said common terminal to said amplifying system, there being two pairs of contacts on said slide member associated with each of said bores whereby alternate pairs of contacts register with said reeds in one position of said slide member and intermediate pairs of contacts are brought into registry with said reeds by movement of said slide member on said body member.

3. A musical instrument comprising a playing member having a mouthpiece defining a plurality of tone bores, the rear ends of said tone bores being enlarged to form cylinders, said mouthpiece defining a transverse slot intersecting said cylinders, pistons positioned in said cylinders, said pistons being vertically apertured, contact reeds secured to said mouthpiece and extending through said slot and said apertures in said pistons to below said mouthpiece, a common terminal member secured to said mouthpiece and electrically connected to each of said reeds, a body member secured to the back of said mouthpiece and being recessed to form a chamber into which the rear ends of said pistons project, the bottom of said body member defining a slideway, a slide member mounted in said slideway and having a plurality of transversely spaced pairs of contacts secured thereto, the contacts of said pairs of contacts being longitudinally spaced on opposite sides of said reeds whereby variation of pressure in said tone bores by the musician will engage said reeds with one or the other of said contacts, and conductors electrically connected to said contacts and extending to the tone coils of a motor driven electro-magnetic tone producing and amplifying system.

4. A musical instrument comprising a playing member having a mouthpiece defining a plurality of tone bores, the rear ends of said tone bores being enlarged to form cylinders, said mouthpiece defining a transverse slot intersecting said cylinders, pistons positioned in said cylinders, said pistons being vertically apertured, contact reeds secured to said mouthpiece and extending through said slot and said apertures in said pistons to below said mouthpiece, a common electrical connection for each of said reeds, a body member secured to said mouthpiece, the bottom of said body member defining a slideway, a slide member mounted in said slideway and having a plurality of transversely spaced pairs of contacts secured thereto, the contacts of said pairs of contacts being longitudinally spaced on opposite sides of said reeds whereby variation of pressure in said tone bores by the musician will engage said reeds with one or the other of said contacts, and conductors electrically connected to said contacts and extending to the tone coils of a motor driven electro-magnetic tone producing and amplifying system.

5. A musical instrument comprising a playing member defining a plurality of tone bores, the rear ends of said tone bores being enlarged to form cylinders, said member defining a transverse slot intersecting said cylinders, pistons positioned in said cylinders, said pistons being vertically apertured, contact reeds secured to said member and extending through said slot and said apertures in said pistons to below said member, a common electrical connection for each of said reeds, the bottom of said member defining a slideway, a slide member mounted in said slideway and having a plurality of transversely spaced pairs of contacts secured thereto, the contacts of said pairs of contacts being longitudinally spaced on opposite sides of said reeds whereby variation of pressure in said tone bores by the musician will

engage said reeds with one or the other of said contacts, and conductors electrically connected to said contacts and extending to the tone coils of a motor driven electro-magnetic tone producing and amplifying system.

6. A musical instrument comprising a playing member defining a plurality of tone bores, the rear ends of said tone bores being enlarged to form cylinders, said member defining a transverse slot intersecting said cylinders, pistons positioned in said cylinders, contact reeds secured to said member and extending through said slot and arranged to be actuated by said pistons, a common electrical connection for each of said reeds, the bottom of said member defining a slideway, a slide member mounted in said slideway and having a plurality of transversely spaced pairs of contacts secured thereto, the contacts of said pairs of contacts being longitudinally spaced on opposite sides of said reeds whereby variation of pressure in said tone bores by the musician will engage said reed with one or the other of said contacts, and conductors electrically connected to said contacts and extending to the tone coils of a motor driven electro-magnetic tone producing and amplifying system.

7. A musical instrument comprising a playing member defining a plurality of tone bores, the rear ends of said tone bores being enlarged to form cylinders, said member defining a transverse slot intersecting said cylinders, pistons positioned in said cylinders, contact reeds secured to said member and extending through said slot and arranged to be actuated by said pistons, a common electrical connection for each of said reeds, a plurality of transversely spaced pairs of contacts secured to said member, the contacts of said pairs of contacts being longitudinally spaced on opposite sides of said reeds whereby variation of pressure in said tone bores by the musician will engage said reds with one or the other of said contacts, and conductors electrically connected to said contacts and extending to the tone coils of a motor driven electro-magnetic tone producing and amplifying system.

8. A musical instrument comprising a playing member defining a plurality of tone bores, said member defining a transverse slot intersecting said bores, pistons positioned in said bores, contact reeds secured to said member and extending through said slot and arranged to be actuated by said pistons, a common electrical connection for each of said reeds, a plurality of transversely spaced pairs of contacts secured to said member, the contacts of said pairs of contacts being longitudinally spaced on opposite sides of said reeds whereby variation of pressure in said tone bores by the musician will engage said reeds with one or the other of said contacts, and conductors electrically connected to said contacts and extending to the tone coils of a motor driven electro-magnetic tone producing and amplifying system.

9. A harmonica-like playing member for actuating a motor driven electro-magnetic tone producing and amplifying system comprising a body member, a mouthpiece secured to said body member and having a plurality of forwardly opening tone bores therethrough, the rear ends of said tone bores being enlarged to form cylinders, a slot extending through said mouthpiece and intersecting said cylinders, pistons disposed in said cylinders, a plurality of contact reeds secured to said mouthpiece and extending through said slot, said reeds being engageable

with said pistons for movement thereby and extending below said mouthpiece, a slide member slidably secured to the bottom of said body member and spring urged in one direction, pairs of electrical contacts carried by said slide member and spaced to the front and rear of said reeds, intermediate pairs of contacts on said slide member arranged to be brought into registry with said reeds by movement of said slide member, a common conductor extending from said reeds on said mouthpiece to said tone producing system, and a plurality of conductors extending from said contacts to the elements of said tone producing system, said plurality of conductors being arranged to actuate said tone producing system to produce the chromatic musical scale upon manipulation of said playing member like a harmonica.

10. A harmonica-like playing member for actuating a motor driven electro-magnetic tone producing and amplifying system comprising a body member, a mouthpiece secured to said body member and having a plurality of forwardly opening tone bores therethrough, the rear ends of said tone bores being enlarged to form cylinders, a slot extending through said mouthpiece and intersecting said cylinders, pistons disposed in said cylinders, a plurality of contact reeds secured to said mouthpiece and extending through said slot, said reeds being engageable with said pistons for movement thereby and extending below said mouthpiece, pairs of electrical contacts carried by said member and spaced to the front and rear of said reeds, a common conductor extending from said reeds on said mouthpiece to said tone producing system, and a plurality of conductors extending from said contacts to the elements of said tone producing system, said plurality of conductors being arranged to actuate said tone producing system to produce the musical scale upon manipulation of said playing member like a harmonica.

11. A harmonica-like playing instrument for actuating a motor driven electro-magnetic tone producing and amplifying system comprising a body member having a plurality of forwardly opening tone bores, the rear ends of said tone bores being enlarged to form cylinders, a slot extending through said member and intersecting said cylinders, pistons disposed in said cylinders, a plurality of contact reeds secured to said member and extending through said slot, said reeds being engageable with said pistons for movement thereby and extending below said member, a slide member slidably secured to the bottom of said body member and spring urged in one direction, pairs of electrical contacts carried by said slide member and spaced to the front and rear of said reeds, intermediate pairs of contacts on said slide member arranged to be brought into registry with said reeds by movement of said slide member, a common conductor extending from said reeds to said tone forming mechanism, and a plurality of conductors extending from said contacts to the elements of said tone forming mechanism.

12. A harmonica-like playing instrument for actuating an electric tone producing system comprising a body member having a plurality of forwardly opening tone bores, a slot extending through said member and intersecting said bores, pistons disposed in said bores, a plurality of contact reeds secured to said member and extending through said slot, said reeds being engageable with said piston for movement thereby and ex-

tending below said member, a slide member slidably secured to the bottom of said body member and spring urged in one direction, pairs of electrical contacts carried by said slide member and spaced to the front and rear of said reeds, intermediate pairs of contacts on said slide member arranged to be brought into registry with said reeds by movement of said slide member, a common conductor extending from said reeds to said tone forming mechanism, and a plurality of conductors extending from said contacts to the elements of said tone forming mechanism.

13. A harmonica-like playing instrument for actuating an electric tone producing system comprising a body member having a plurality of forwardly opening tone bores, pistons disposed in said bores, a plurality of contact reeds secured to said body, said reeds being engageable with said pistons for movement thereby, a slide member slideably secured to said body member and spring urged in one direction, pairs of electrical contacts carried by said slide member and spaced to the front and rear of said reeds, a common conductor extending from said reeds on said body to said tone forming mechanism, and a plurality of conductors extending from said contacts to the elements of said tone forming mechanism.

14. A musical instrument for actuating an electro-magnetic tone producing system comprising a body member defining a plurality of bores, a plurality of flexible contact members secured to said body member and extending through said bores to be flexed by variation of pressure in said bores, a common electrical conductor connecting said contact members to said tone producing system, a slide member slidably mounted on said body member, a plurality of pairs of fixed contacts carried on said slide member, the contacts of said pairs of contacts being positioned on opposite sides of said flexible contacts and arranged to be engaged therewith by flexing of said flexible contacts, a plurality of conductors connecting the contacts of said pairs of contacts to said tone producing system, and a spring urging said slide member in one direction, there being twice as many pairs of contacts on said slide member as there are bores in said body member whereby alternate pairs of contacts are in register with said flexible contacts in one position of said slide and whereby intermediate pairs of contacts on said slide are brought into registry with said flexible contacts upon movement of said slide.

15. A musical instrument for actuating an electric tone producing system comprising a body member defining a plurality of bores, a plurality of flexible contact members secured to said body member and extending through said bores to be flexed by variation of pressure in said bores, a common electrical conductor connecting said contact members to said tone producing system, a slide member slidably mounted on said body member, a plurality of pairs of fixed contacts carried on said slide member, the contact of said pairs of contacts being positioned on opposite sides of said flexible contacts and arranged to be engaged therewith by flexing of said flexible contacts, a plurality of conductors connecting the contacts of said pairs of contacts to said tone producing system, and a spring urging said slide member in one direction, there being twice as many pairs of contacts on said slide member as there are flexible contacts on said body member whereby alternate pairs of contacts are in register with said flexible contacts in one position of said slide and whereby intermediate pairs of contacts on said slide are brought into registry with said flexible contacts upon movement of said slide.

ALFRED O. WILLIAMS.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
780,862	Cameron	Jan. 24, 1905
1,956,350	Hammond	Apr. 24, 1934
2,301,184	Arnold	Nov. 10, 1942