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MUSICAL REED TOYS

Filed June 8, 1964 3 Sheets-Sheet 1

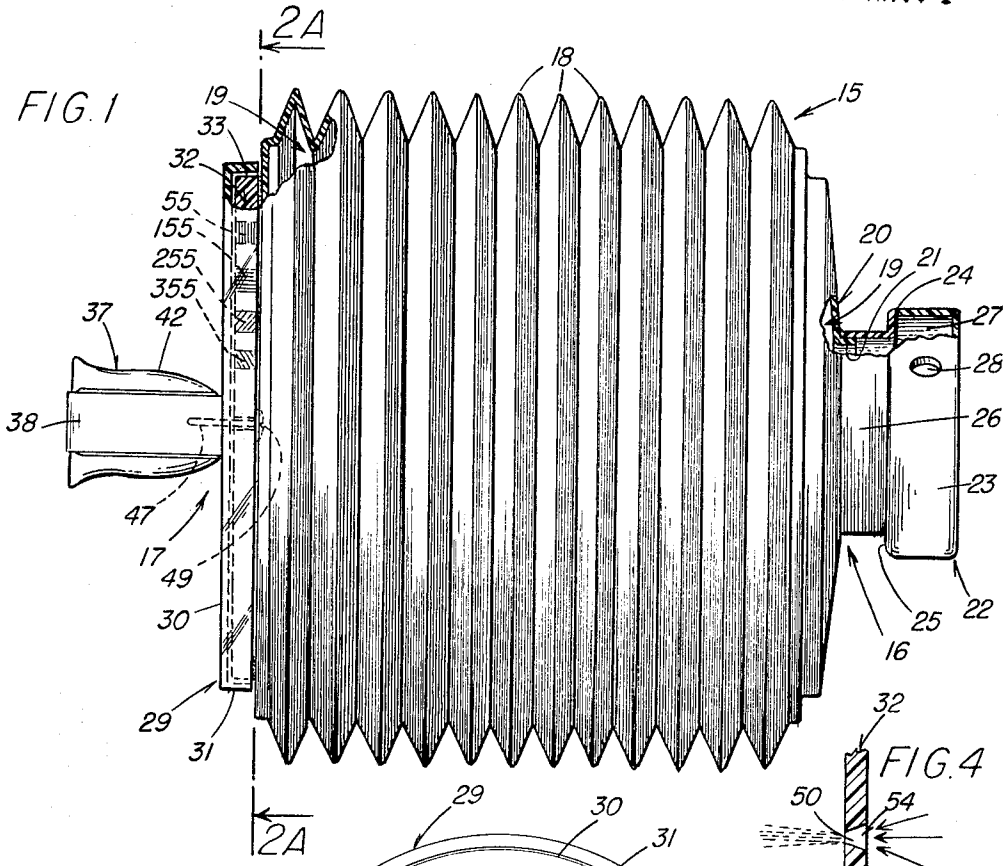


FIG. 1

FIG. 4

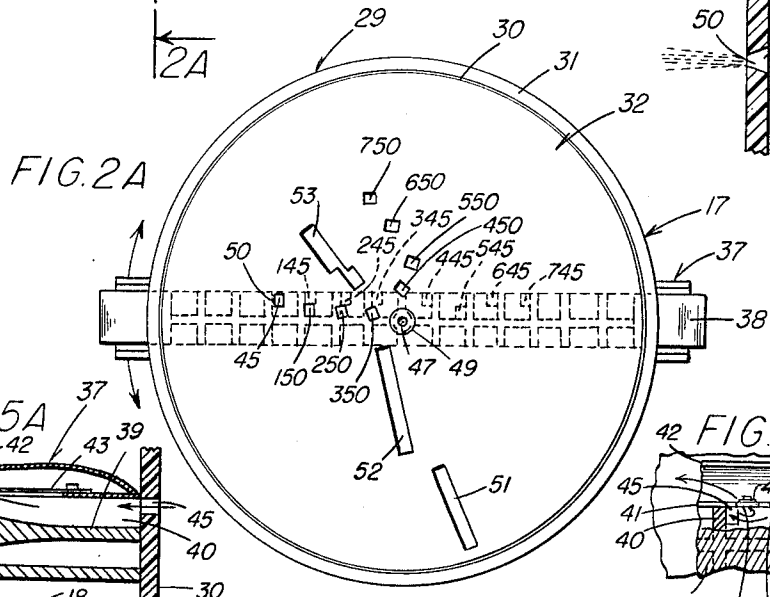


FIG. 2A

FIG. 5A

FIG. 3

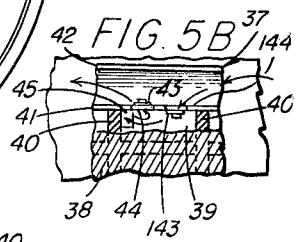


FIG. 5B

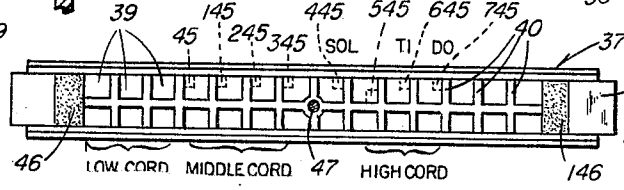


FIG. 2B

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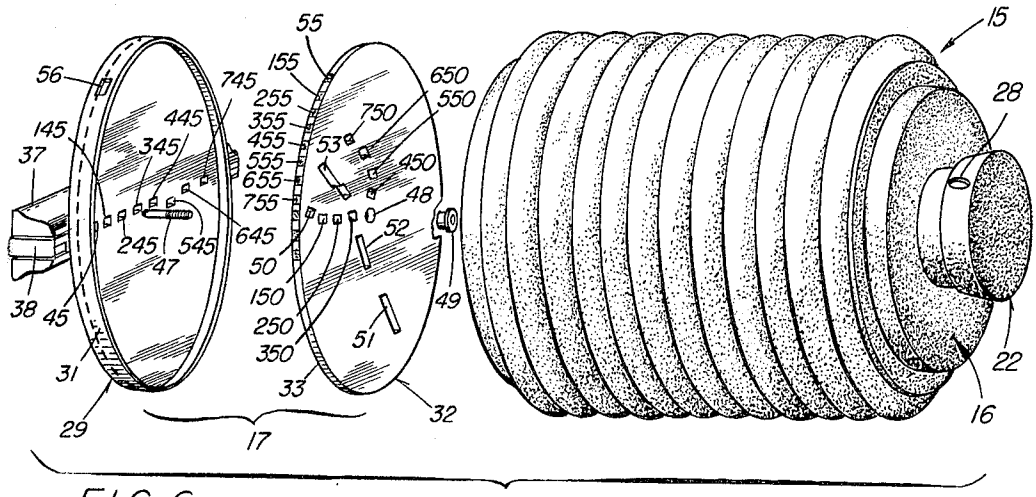


FIG. 6

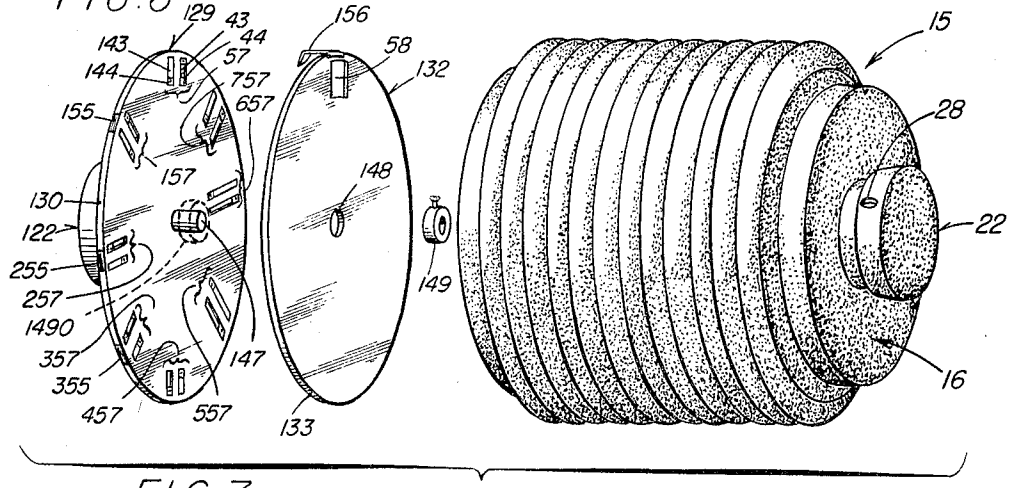


FIG. 7

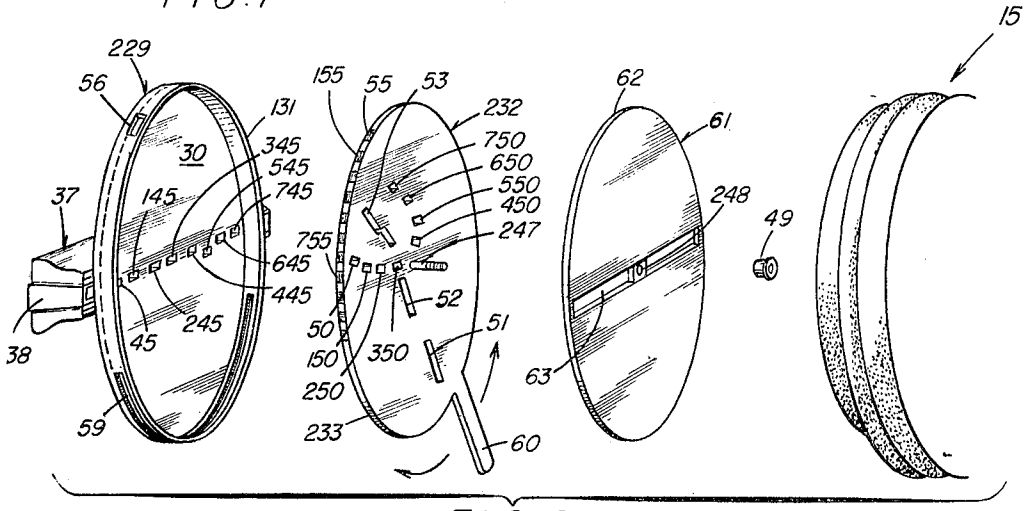


FIG. 8

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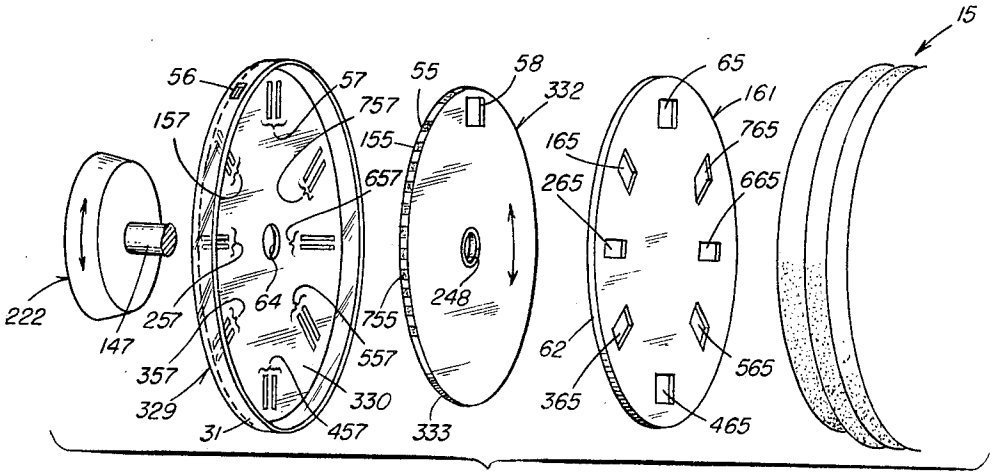


FIG. 9

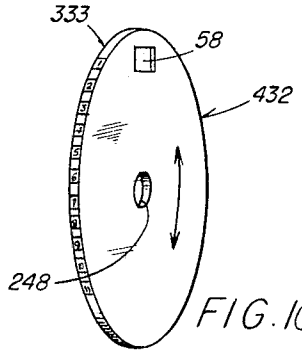


FIG. 10

FIG. 11

COMPRESS

FIG. 12

EXPAND

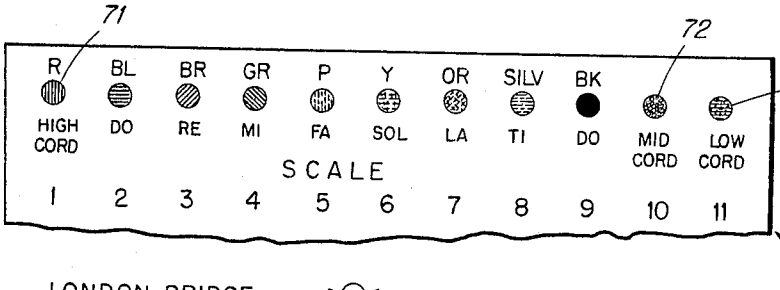


FIG. 13

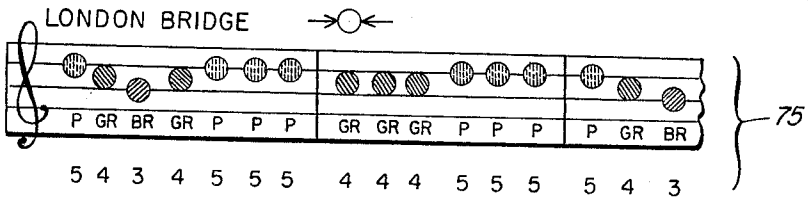


FIG. 14

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Patented Nov. 1, 1966

3,282,144

MUSICAL REED TOYS

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Filed June 8, 1964, Ser. No. 373,478
14 Claims. (Cl. 84—375)

The present invention relates to musical reed toys in which are provided a plurality of different reeds each tuned to sound a particular and different note of a musical scale when vibrated by passage of air forced therepast by means operated by the players.

A general object of the present invention is to provide embodiments of such toys which are simple in structure and readily and economically constructed and assembled with inclusion of a manually expansible and compressible bellows for creating the effective flow of air selectively past the reeds, through selective plate valving structures.

Another object is the provision in such toys of index means readily to identify to the players the proper relative rotary positions of rotary plate-like means embodied in head end structures of the operating bellows for effecting the sounding of the notes of musical scales in sequences dictated by the players to play desired different tunes.

A further object of the invention is to provide such toys as simple combinations of the bellows sections of concertinas and reed banks similar to those of conventional harmonicas, desirably equipped with simple guiding index means to aid one, such as a child, unskilled in playing musical instruments to play different simple tunes by simple rotary manual adjustments as the bellows is expanded and compressed manually.

Other objects of the invention will in part be obvious and will in part appear hereinafter.

The invention accordingly comprises the features of construction, combinations of elements, and arrangement of parts, which will be exemplified in the constructions hereinafter set forth, and the scope of the invention will be indicated in the claims.

For a fuller understanding of the nature and objects of the invention reference should be had to the following detailed description taken in connection with the accompanying drawings, in which:

FIG. 1 is a side elevational view, with parts broken away and in section, of an embodiment of the musical reed toys of the present invention;

FIG. 2A is a view taken substantially on line 2A—2A of FIG. 1 in the plane of a layer of cement securing the parts of the reed-equipped and valving head structure to the bellows illustrated in FIG. 1;

FIG. 2B is a back end view of the reed bank of the embodiments of FIGS. 1 and 2A, in a preferred form of a conventional harmonica, with omission of the support plate which carries this bank of reeds and the valving disk associated therewith shown in those figures;

FIG. 3 is a sectional detail view, with parts broken away, illustrating the anchorage of the valving disk to the front end of the bellows of FIG. 1;

FIG. 4 is a sectional detail view, with parts broken away, of a portion of the valving disk at an air flow port therein;

FIG. 5A is a sectional detail view to enlarged scale, with parts broken away and omitted, showing interior structural features of the harmonica reed bank with illustration of a port in the support plate communicating with a sound chamber thereof;

FIG. 5B is an enlarged elevational detail, with parts broken away and in section, of a portion of the front edge of the harmonica reed bank shown in FIG. 5A illustrating the employment of a pair of musical reeds in a single sound chamber thereof with one designed to sound its musical note upon outward blowing or expulsion

of air and the other designed to sound its musical note upon inward suction or aspiration of air;

FIG. 6 is an exploded perspective view of the structural parts of the embodiment shown in FIG. 1, with parts broken away;

FIG. 7 is an exploded perspective view, similar to FIG. 6, of a modified form of the musical reed toy;

FIG. 8 is an exploded perspective view, with parts broken away, of another modified form of the musical reed toy;

FIG. 9 is an exploded perspective view, with parts broken away and in section, similar to FIG. 8, showing a further modified form of the present toy;

FIG. 10 is a perspective view of a modified form of the valving disk shown in FIG. 9;

FIG. 11 is an illustration of an indicium which may be employed on printed musical manuscript to dictate operational manipulation of forms of the musical reed toy illustrated in the preceding figures, and particularly with respect to the required expansive action of the bellows;

FIG. 12 is an illustration similar to FIG. 11 showing a different directive indicium requiring compressive action of the bellows;

FIG. 13 is a portion of a directive sheet or chart, with parts broken away, indicating digerent types of indicia which may be employed for identification of different notes and chords; and

FIG. 14 is an illustration of a portion of a musical composition which dictates operation of embodiments of the musical reed toys of the present invention, with parts broken away, demonstrating that which may be provided to direct the production of a simple tune, such as "London Bridge."

Referring to the drawings in which like numerals identify similar parts throughout, and more particularly FIGS. 1 to 6 incl., it will be seen that an embodiment of the present musical reed toy comprises an alternately expansible and compressible bellows including its pleated annular sidewall **15**, a transverse closing back end structure **16** and an opposite head end structure **17**.

The bellows sidewall **15** may be of somewhat conventional construction in the form of a plastic hollow body defined by a plurality of successive collapsible circular V-shaped ribs **18** having interior V-shaped channels and integrally connected together on their inner smallest diameter edges. Such bellows construction permits reduction of the space interiorly thereof by applying opposed forces to the opposite closed ends thereof to collapse the ribs into flat successive folds, and expansion of this space by pulling the closed ends outwardly away from each other to expand the ribs to the form illustrated in FIG. 1. The transverse closing back end structure **16** and the opposite head end structure **17** define with the ribbed sidewall **15** an interior chamber **19** with the capacity of the latter being variable by expansion and compression of the bellows in the conventional manner mentioned.

The back end structure **16** includes a transverse closing plate **20** with its outer edge connected in an air-tight manner to the back end of the ribbed sidewall **15**, such as by being made integral with the inner edge of the rearmost rib. This back wall plate may be centrally provided with an outwardly-projecting hollow neck **21**. The transverse closing back end structure **16** carries a hand grasp **22** which, as will be seen from FIG. 1, may include a cup member **23** having its inner circular edge **24** cemented to a lateral flange **25** of a neck ring **26** suitably telescoped with and cemented to the neck **21**. This structure provides hand grasp **22** in the form of a knob having an enlarged head, which may be of hollow construction to define a compartment **27** therein in communication through the hollow neck **21** with the bellows chamber **19**. A hole

28 may be provided in the side of the enlarged head of the hand grasp 22, and conveniently located so that a finger of one's hand may cover this hole at will and uncover it when desired as other fingers and the thumb of this hand grip the enlarged head to apply alternate push and pull to the back end structure 16 of the bellows. Thus, the hole 28, when provided, may serve as a selectively valvable air inlet and outlet passage, and if this be closed by one's finger at the time push is applied to the hand grasp 22 for moving the back end structure 16 toward the closing head end structure 17 air confined in the bellows chamber 19 may be forced out or expelled through any passage in the head end structure during collapse of the ribbed bellows sidewall 15. If, thereafter, pull is applied to the hand grasp 22 to expand the ribbed sidewall 15 for increasing the capacity of the internal chamber 19 air may be aspirated into the latter through this valvable passage 28 when the closing finger is lifted away therefrom and without causing air to be aspirated through any passage in the head end structure. Other types of valve passage structure may be provided in lieu of the hole 28, such as a conventional spring-biased lever valve having a head pad to cover a hole in the back end plate or wall 20 and provided with a finger-engaging tab which when depressed will pivot the closing pad away from the covered passage to open the latter. The manipulation of such selective valvable air inlet and outlet passage and the reasons therefor will be explained later in connection with the operation of the device.

In the FIGS. 1 to 6 incl. embodiment the head end structure has mounted therein reed support plate means 29 which may include a circular flat plate 30 and a cylindrical rim 31 preferably integral therewith together to define a cylindrical cup structure. The head end structure 17 also includes valving disk means 32 which, as will be understood from FIGS. 1, 4 and 6, may be in the form of a flat plate disk having a circular edge 33 of slightly less diameter than the internal diameter of the cylindrical rim 31 of the reed support plate means 29 for ready nesting and relative rotation within this cylindrical cup structure adjacent the reed support plate 30 thereof. As will be best understood from FIG. 3 the front end of the collapsible ribbed sidewall 15 may be provided with integral transverse plate means having a central hole 34 to define an inwardly-extending annular flange 35. This hole 34 is closed off and covered by valving disk 32 when a marginal circumferential zone of the inside face of the latter is lapped against and cemented by a layer of cement 36 to the annular flange 34. The cylindrical rim 31 of the reed support plate means 29 preferably is of a see-through or transparent character for a purpose to be explained later, and in order to accomplish this in a ready manner, the cup structure comprising plate 30 and this cylindrical rim may be integrally molded from transparent plastic.

A bank of musical reeds is carried by the circular plate 30 of the cylindrical cup structure 29, and it may be conveniently in the form of a conventional harmonica 37, as will be understood from FIGS. 1, 2A, 2B, 5A, 5B and 6. Such a conventional harmonica structure 37 is in the form of elongated bar means which may be conveniently mounted to the front face of the plate 30 to serve as manual engageable means for rotating this plate and as a hand grasp to cooperate with the back end hand grasp 22 for effecting alternate expansion and compression of the bellows 15.

As will be understood from FIGS. 2A, 2B and 5A, the harmonica reed bank structure 37 may include an elongated support body 38 which is rectangular in cross-section and has a plurality of consecutive top sound chambers 39 defined therein by longitudinally-spaced successive kerfs separated by intervening partitions 40 and covered by a top reed-carrying plate 41 over which is superposed a sound-directing shell 42. Let it be assumed that the harmonica reed bank 37 of FIG. 5A has associated with each sound chamber 39 a single musical reed 43 mounted immediately above a reed opening or slot 44, so that when air is forced into the sound chamber it will pass through the reed opening along the side edges of the free portion of the reed and out beneath the sound-directing shell 42 to vibrate the reed and cause it to sound its particular musical note. This will require for a musical scale in the form of a diatonic octave eight of such sound chambers 39 each equipped with such a reed tuned to sound a particular musical note of this scale when air is blown out through or expelled from this sound chamber, such as by collapse or compression of the bellows sidewall 15. Thus in the FIG. 2B arrangement the first three top chambers 39 on the left end may carry such reeds which are so tuned that they may be sounded together to provide a low chord, and the next consecutive eight chambers may successively carry reeds to sound the notes, low do, re, mi, fa, sol, la, ti and high do. The reeds for sounding the notes, low do, re, mi and fa may together constitute the middle chord when sounded simultaneously, and the last three reeds on the right end for individually sounding the notes, la, ti and high do may when vibrated simultaneously provide the high chord.

Thus, to accomplish these ends the valving disk 32 must be provided with portions of flow passages, such as ports, to direct air flow therethrough to other portions of the air passages which may be in the form of ports in the reed support plate 30. One such port for supplying air to the sound chamber 39 for sounding the low do note is shown in full lines at 45 in FIGS. 2A, 5A and 6, and is indicated in dotted lines in FIG. 2B. There is indicated in dotted lines in FIGS. 2A and 2B, and in full lines in FIG. 6, ports leading to the remaining seven sound chambers to cause the reeds mounted in the reed openings therein to sound the remaining notes of the musical scale, i.e., port 145 for note re, port 245 for note mi, port 345 for note fa, port 445 for the note sol, port 545 for the note la, port 645 for the note ti and port 745 for the high do note.

If the conventional harmonica structure employed as the reed support and bank of reeds is of a type wherein the low do note is to be sounded by aspiration rather than blowing, its reed 43 will be mounted within the sound chamber 39 on the bottom side of the cover plate 41, rather than on the top as proposed in FIG. 5A, and the next sound chamber would have its reed for sounding the note re mounted as shown in FIG. 5A. In such an alternating arrangement the notes mi, sol and ti would be mounted like the low do note to be sounded on aspiration while the notes fa, la and high do would be mounted as in FIG. 5A to be sounded on blowing. The latter arrangement of the reeds would require alternate expansion and contraction of the bellows sidewall 15 for successively sounding the notes of this musical scale.

The harmonica bank of reeds 37 conveniently could be fixedly mounted to the front face of the reed support plate 30 by cement which, if desired, could be applied in areas 46 and 146 of the harmonica support body 38, as is indicated in FIG. 2B. A pivot pin 47, shown in dotted lines in FIG. 1, in full lines in FIGS. 2A and 6 and in cross-section in FIG. 2B may be anchored in the harmonica reed support body 38 to extend back through the reed support plate 30 and central hole 48 (FIG. 6) in the valving disk 32 threadably to carry a cap nut 49 behind the rear face of the valving plate for pivotally mounting the reed support plate and the harmonica bank of reeds to the fixed valving disk.

The valving disk 32 is provided with means defining other portions of the air flow passages which are selectively communicable with the air flow passage portions or ports 45 to 745, etc., in the rotary reed support plate 30 for connecting the bellows chamber 19 therethrough to the respective reed openings 44 in which are mounted the musical note reeds 43, etc. These flow passage portions in the valving disk 32 are provided with the sepa-

rate air flow passage portions in the form of ports spaced from each other and arranged in a particular pattern so as to be individually and independently operable in different relative positions of the rotary reed support plate 30 and this valving disk. As will be seen in full lines in FIGS. 2A and 6, port 50 in the valving disk 32 aligns with port 45 in the reed support plate 30 in one relative position so as to supply air from the bellows chamber 19 to the sound chamber 40, for flow through the reed opening 44 to sound the musical note of reed 43 mounted therein, i.e., the low do note. It will be seen from FIG. 2A in this rotary position of the reed support plate 30 relative to the valving disk 32 that the ports 150 to 750 incl. in the latter are out of alignment with the ports 145 to 745 incl. in this plate. Thus air cannot pass through the passages of which these ports constitute portions until the relative rotary positions of this plate 30 and disk 32 are changed by progressive clockwise rotation of the plate relative to the disk as viewed in FIG. 2A, i.e., by progressive rotation of the plate upon turning of the harmonica reed bank 37 to successive new positions.

It will be seen from FIG. 2A that an elongated slot 51 is provided in the valving disk 32 for simultaneously communicating ports leading to the three low chord sound chambers 39 on the left with the bellows chamber 19 in a particular rotary position of the reed support plate 30 relative to the valving disk 32 which is different from the positions necessary to sound the eight notes of the scale. The valving disk 32 is also provided with another elongated slot 52 for simultaneously connecting the bellows chamber 19 to the plate ports 45, 145, 245 and 345 in another different relative rotary position of the plate 30 to sound the middle chord of notes low do, re, mi and fa. A third slot 53 is provided in the valving disk 32 for simultaneously communicating the plate ports 545, 645 and 745 to the bellows chamber 19 in still another different rotary position of the plate 30 for sounding the high chord of notes la, ti and high do.

As is indicated in FIG. 4 each of the ports 50 to 750 incl. in the valving disk 32 may be throated to provide each with an enlarged mouth 54 so as to increase the volume of air flowed therethrough when it is forced or expelled from the bellows chamber 19 upon compression of the bellows sidewall 15. This will increase the rate of flow which will assure sounding more sharply the note of the musical reed associated with the sound chamber to which the passage including this port communicates. In the event that the musical reeds for sounding every other note of the musical scale provided in the toy is mounted within its sound chamber to be effectively vibrated by aspiration of air upon expansion of the bellows sidewall 15, the ports in the valving disk 32 leading therefrom may be throated in a similar manner to attain a like increase in the rate of flow in the reverse direction.

When it is desired to introduce into the musical scale half tone notes along with the full tone notes an additional set of reeds may be embodied in the bank of reeds in a manner proposed in FIG. 5B. If it be assumed that reed 43 is supported on the outer side of the mounting plate 41 within the exit of reed opening 44 to vibrate it at a frequency for sounding the low do note, a second reed opening 144 may be provided in this mounting plate within the same sound chamber 39 to have associated therewith within the latter a second musical reed 143 which will vibrate upon aspiration of air into this chamber through this reed opening at a frequency to sound the immediately succeeding higher half tone note. Thus, when the bellows sidewall 15 is compressed to expel air from its chamber 19, with valving disk port 50 aligned with plate port 45 leading to this sound chamber 39, air will be forced through the latter and the reed opening 44 therein to vibrate the full tone note reed 43 while the half tone reed 143 merely is lifted into the other reed opening 144 without vibrating. Alternately, when the bellows sidewall 15 is expanded to enlarge the bellows chamber 19 air is aspirated in through the reed opening 144 to vibrate the half tone reed 143 and the full tone reed 43 is merely depressed into its reed opening 44. It will now be understood that if the bank of reeds carried by the ported plate 30 is to be provided in a limited number so as to permit selective production of only the eight full tone notes of an octave, the proposal in FIG. 5B may be employed so as to associate with each of four sound chambers 39 a pair of full tone reeds with one sounding its note on blowing passage of air from the bellows chamber effected by compression of the bellows sidewall 15 and the other sounding its note on aspiration of air into the bellows chamber with expansion of the bellows sidewall. Thus, the pair of reeds 43 and 143 may be respectively tuned to sound the notes low do and re alternately upon compression and expansion of the bellows. The remaining three sound chambers so equipped with a pair of such reversed reeds for alternate vibration on blow and aspiration may thus provide the remaining six notes of the octave. It is to be understood that in an arrangement of the type last described there will be no need for a selective valvable air inlet and outlet passage in the back end structure 16 communicating to the bellows chamber 19, such as that at 28, since compression of the bellows 15 will blow air selectively out past four of the eight notes and the reverse operation of aspiration by expansion of the bellows will selectively sound the other four notes of the scale. It will thus be apparent that eight such sound chambers 39 may be provided with each equipped with the pair of reeds 43 and 143 in the pair of reed openings 44 and 144, as proposed in FIG. 5B, and with each pair of reeds tuned to sound the same note, one on outward blowing with bellows compression and the other on aspiration with bellows expansion. In the latter case the plurality of pairs of reeds with both reeds of each pair being tuned to sound the same note will permit convenient sounding of any particular note on either outward blowing or inward aspiration. This latter arrangement makes readily possible the playing of a musical composition without the employment of any selectively valvable air inlet and outlet passage in the back end structure of the bellows.

The valving of the passage 28 in the hand grasp knob 22 conveniently permits a variety of types of blowing and aspirating operations of the toy musical reed instrument. If the reed bank is equipped only with reeds which will sound their respective notes upon blowing expulsion of air from the bellows chamber, the passage 28 will be valved by the operator's finger as the expanded bellows is progressively compressed. Upon complete compression of the bellows sidewall 15, the player may recondition it for continuing the playing by uncovering the passage 28, i.e., lifting the tip of his finger away from this hole, and then separating his hands to expand the bellows for aspirating air through this hole without passage of air through any reed openings. In such an arrangement if the player has finished producing the musical composition during the compression of the bellows except for a few of the notes at the end he may quickly condition the bellows to continue until playing of the composition is completed by lifting his finger from the valve hole 28 and applying a short pull to the hand grasp knob 22 for partial expansion of the bellows sidewall 15, and then continue to finish the musical composition by again covering this valve hole with his finger and again compressing the partially expanded bellows. Such selective valving is also useful in practicing the techniques of playing the instrument when equipped with different arrangements of the reeds proposed hereinbefore since aspiration may be selectively accomplished at this valve passage as can expulsion of air from the bellows chamber without causing air to pass through reed openings in communicatively conditioned passages leading to the bank of reeds.

Leakage from between the reed support plate 30 and

the valving disk 32 is minimized not only by the close juxtaposition of the front face of the latter to the back face of the former, but also by the nesting of the edge 33 of the valving disk within the cylindrical rim 31 of the plate and minimization of the intervening space. Such leakage can be further minimized by equipping such opposed surfaces of the reed supporting plate means 29 and the valving disk means 32 with internested annular flanges and annular channels to define therebetween labyrinth paths of flow which minimizes the possible flow therebetween. The cylindrical rim flange 31 of the reed supporting plate means 29 also may serve another useful purpose in providing convenient means to act as index means embodied in the head end structure for dictating to the player the proper positions of the rotary element thereof which will cause the selective sounding of the desired notes.

For this index purpose, an arcuate zone of the cylindrical cup structure 29 which supports the reed bank structure 37 may be of a see-through character or transparent for observation of an index marking carried by a circumferential portion of the valving disk means 32. Either this portion of the valving disk means or the arcuate cup zone may be provided with a plurality of annularly-spaced indicia markings identifying the different musical notes and with the other being provided with a pointer or target marking for individual and selective alignment with the indicia markings. Alignment of the pointer or target marking with any particular musical note indicia marking will be informative of communicative alignment of a valving disk port with a rotary cup plate port leading to the reed opening in which the reed of that note is mounted. Accordingly, the circumferential edge 33 of the valving disk 32 may be provided with a series of such indicia markings which, as is indicated in FIGS. 1 and 6, may be in the form of separated areas which are distinctively different visually. Such areas 55, 155, 255, 355, 455, 555, 655 and 755, for an eight note scale may be in the form of differently colored or tinted areas to be observed through the see-through or transparent rim 31. A pointer or target area 56 may be marked off or indicated upon the transparent rim 31, so that when any one of the indicia markings 55 to 755 incl. is brought to alignment therewith by rotation of the plate cup structure 29 about the relatively fixed valving disk 32 the desired air passage communication is effected to permit sounding of the note associated with that particular index marking. Thus, the player while holding the instrument of FIGS. 1 to 6 incl. in his hands with, for example, his right hand grasping the knob 22 and his left hand grasping the reed bank bar 37 can assure production of the required note by rotating, if necessary, the reed carrying plate structure 29 with his left hand to bring the indicia (one of 55 to 755 incl.) associated with that particular note to alignment with the target area 56.

In the embodiment of FIG. 7 is illustrated a modified form of the musical reed toy instrument shown in FIGS. 1 to 6 incl., differing chiefly in the manner of mounting of the musical reeds on the support plate means and the structure of the cooperating valving disk to attain the selective communication of air to the reeds. In this embodiment, the reed support plate means is in the form of a circular plate 129 which carries centrally of the outer face thereof a manual rotating knob 122, conveniently fixed upon a shaft 147 extending inwardly through the plate, preferably with a tight fit, for rotation of the latter by the former, to receive on its inner end a collar 149 which may be secured thereto by a suitable set screw approximately in the position indicated in dotted lines at 1490. The head end of the pleated bellows sidewall 15 is equipped with a closing valve disk 132 which may be fixed thereto in a manner similar to that proposed in FIG. 3. The valve disk 132 is provided with a central hole 148 through which the shaft 147 rotatably extends in the completed assembly, to receive within the bellows chamber the stop collar 149. The circumferential edge 130 of the reed support plate 129 is conveniently provided with a series of index indicia 55 to 755 incl., some of which are shown in FIG. 7. The edge 133 of the valving disk 132 is equipped with a forwardly-projecting index pointer 156 to which will be selectively brought to alignment any one of the various index indicia 55 to 755 incl.

The reed support plate 129 of FIG. 7 is provided at each of a plurality of circularly-spaced points or localized areas, such as eight spaced equally at about 45°, with a plurality of pairs of reed openings, each equipped with a musical reed, such as at 57, 157, 257, 357, 457, 557, 657 and 757. As is illustrated at area 57 of the reed support plate 129 each pair of reed openings and musical reeds associated therewith may be in a form similar to that illustrated in FIG. 5B, such as a reed opening or slot 44 provided at its outer exit side with musical reed 43, and an adjacent reed opening or slot 144 equipped on its inner side with musical reed 143. Thus, musical reed 43 will be vibrated to sound its note when air is blown out or expelled forward through reed opening 44 and reed 143 will be vibrated to sound its note when air is aspirated back into reed opening 144. An area of the valving plate 132 which will encompass each pair of reed openings, such as 44 and 144 at 57, is cut out to provide a port for communicating the internal chamber 19 of the bellows with these reed openings.

In operation of the musical reed toy embodiment illustrated in FIG. 7 let it be assumed that reed 43 is tuned to produce the full tone note low do and that similar reeds at locations 157, 257, 357, 457, 557, 657 and 757 are tuned to produce the successive seven full tone notes of the octave, viz., re, mi, fa, sol, la, ti and high do. Let it also be assumed that the reed 143 at location 57 is tuned to produce the half tone note next above low do, and the remaining reeds at the successive locations are tuned to produce the other intervening half tone notes. If a musical composition is to be played with this instrument which begins with low do, the reed support plate 129 will be rotated, if required, to a position where its index indicia is aligned with the pointer 156. With the valved opening 28 closed by the player's finger the hand grasps 22 and 122 will be pushed toward each other to compress the pleated bellows sidewall 15, so as to expel or blow air out of the bellows chamber 19 through the port 58 and the reed opening 44 aligned therewith to vibrate the reed 43 for sounding the low do note. If the next note of the musical composition is the half tone immediately above low do the player will keep the opening 28 closed and retain the setting of the reed support plate 129, pulling on the hand grasps 22 and 122 in opposite directions to expand the pleated bellows sidewall 15 and aspirate air into the reed opening 144 to vibrate the reed 143 for sounding this half tone note. This action is continued with successive rotary setting of the reed support plate 129 as may be dictated by the musical composition and the proper expansion or compression of the bellows as may be required.

In the FIG. 8 embodiment the reed support plate and its bank of musical reeds are similar to those of the FIGS. 1 to 6 incl. embodiment. However, the plate cup member 229 has its cylindrical rim 131 provided with an arcuately-extending slot 59. The valving disk 232 is also similar to the valving disk 32 of the FIGS. 1 to 6 incl. embodiment, but its circular edge 233 is provided with a radially-projecting handle 60 which, in the assembly, extends out through slot 59 with this disk closely nested in the cup structure 229. The head end of the pleated bellows sidewall 15 is provided with a fixed closing disk 61, which may be mounted thereto in the manner proposed in FIG. 3. The closing disk 61 has its circular edge 62 closely fitted within the outer edge of the rim 131 of the reed support cup structure 229 and interposed cement may fix the latter to the former to provide an internal chamber intervening this closing disk and the reed support plate 30 of the cup structure. The valving

disk 232 carries centrally thereof a shaft 247 which projects rearwardly through a central hole 248 in the closing disk 61, to receive inward of the latter a nut sleeve 49 for rotatably supporting the valving disk on the closing disk. A transverse slot 63 in the closing disk 61 has portions flanking opposite sides of the pivot hole 248, to serve with the ports 50 to 750 incl. and 51 to 53 incl. in the valving disk 232 and the ports 45 to 745 incl. in the reed support plate 30, the selective communicating passages leading to the reed openings in the harmonica reed bank 37.

In the FIG. 8 embodiment the circular edge 233 of the valving disk 232 carries the series of index markings or indicia 55 to 755 incl. which are to be selectively and alternatively aligned with the index target 56 by rotation of the valving disk effected by swing of the handle 60. As in the FIGS. 1 to 6 incl. structure the valving disk has three additional index indicia or color spots for guiding the positions of the chord porting slots 51, 52 and 53. When one of the ports in the valving disk 232, such as that at 50, is brought to alignment with one of the ports in the reed support plate 30, such as that at 45, by such rotary manipulation of the valving disk the passage portions defined by these aligned ports will be communicated through the left hand side of slot 63 to the bellows chamber 19, so that manipulation of the latter will cause flow of air through this passage in a direction effective to vibrate the musical reed communicating with the plate port 45. Further operation of the embodiment illustrated in FIG. 8 will be understood from the recital above of the operation of the FIGS. 1 to 6 incl. embodiment.

The FIG. 9 embodiment illustrates a variation of the FIG. 7 structure which permits the incorporation therein of a closing head wall or disk 161 to define with plate cup structure 329 an internal chamber in which a valving disk 332, similar in many respects to valving disk 132 of FIG. 7, is rotatable supported and is manually rotatable by a head end or front knob 222. In this embodiment the circular plate 330 is provided as the bottom of the cup structure 329, with its circular edge circumscribed by the transparent cylindrical flange 31, and it carries groups of pairs of reeds in similar fashion, such as at 57, 157, 257, 357, 457, 557, 657 and 757. The grasping knob 222 is not fixed to the front face of the reed support plate 330, but is carried fixedly upon a shaft 147 extending through and freely rotatable in a central hole 64 in the latter. Valving disk 232 is rotatably nested within the plate cup structure 329 and has a central hole 248 into which the inner end of the shaft 147 is fixed, for rotation by the knob 222. Valving disk 332 is equipped with port 58. The closing disk 161 is fixedly mounted to the front end of the pleated bellows sidewall 15, such as in the manner of FIG. 3, and it is provided with a plurality of ports 65, 165, 265, 365, 465, 565, 665 and 765, equal in number to the groups of pairs of reeds 57 to 757 inclusive and spaced apart at similar radial angles of about 45° for respective alignment therewith. The circumferential edge 62 of the closing disk 161 is tightly nested within the outer edge of the rim 31 and fixed thereto by intervening cement, so that the rotary valving disk 332 is confined within the resulting chamber intervening this closing disk and the reed support plate 330. The circumferential edge 333 of the valving disk 332 is conveniently provided with a series of index indicia or markings such as are employed with the valving disk 232 of the FIG. 8 embodiment, comprising the distinctively different markings 55 to 755 inclusive, each adapted alternatively to be aligned with the index target 56 on the see-through or transparent rim 31.

In operation of the embodiment of FIG. 9 let it be assumed that one of the reeds of the pair at 57 is to sound its note. The knob 222 will be rotated, if necessary, to rotate the valving disk 332 for alignment of the index marking carried by the edge of the latter with the index target 56, so as to align port 58 with the pair of reeds at 57. In this position, the port 58 communicates the port 65 of the closing disk 161 with the reed openings at 57, so that proper manipulation of the bellows will cause air to flow in an effective direction past the reed in the location at 57 which will sound the required note. If the reed which is to vibrate for sounding the next note of the musical composition is at one of the other locations on the reed support plate 330 the knob 222 will be turned to rotate the valving disk 332 to a new position wherein its port 58 will communicate one of the other ports of the closing disk 161 with the opposed pair of reeds for producing the next required tone. This manipulation continues step-by-step throughout the reproduction of the musical composition.

In FIG. 10 is illustrated at 432 a modified form of the valving disk 332 of FIG. 9, differing chiefly in the type of index indicia provided upon the circumferential edge 333 thereof. While the distinctly different index indicia provided in the preceding embodiments may be in the nature of color spots that are distinct in hue, FIG. 10 illustrates that these indicia may be in the form of delineated areas distinguished from each other by arithmetical series of numerals. For example, numeral "1," when brought to alignment with the index target 56 may indicate that the valving disk port 58 is suitably aligned between closing disk port 65 and the reeds at the location 57 so that upon compression of the pleated bellows sidewall 15 air will be forced out past the low do reed to sound its note. When the valving disk 432 is again rotated to bring its index numeral "2" to alignment with the index target 56 this will apprise the player of the fact that valving disk port 58 has been rotated to a new position to align closing disk port 165 with the reed location 157 so that air passing therethrough will sound the second note re of the octave, and so on.

In FIGS. 11 and 12 are illustrated musical note designations which are easily read by an untutored player to inform him of how to set the rotary element of an embodiment of the present musical reed toy and how the bellows thereof should be manipulated to sound each note. It is indicated in FIG. 11 by the symbol for the color "blue" that the note low do associated with this color is to be produced as a full tone by compressing the bellows (as is indicated by the arrowheads directed inward to opposite sides of the symbol area). In FIG. 12 it is indicated that the half tone note immediately above low do is to be sounded since the symbol is also lined for the color "blue" and the arrows extending away from opposite sides of the symbol area show that the bellows is to be expanded to sound this note.

In FIG. 13 is shown a portion of a chart 70 indicating how different types of symbols may be employed to identify different notes of a musical scale and various chords. It is therein indicated that a symbol area 71 may be that of a note which by its color "red," or alternatively numeral "1," dictates use of production of the high chord. The chart continues to indicate that the symbol area which are respectively "blue," "brown," "green," "purple," "yellow," "orange," "silver" and "black," or the numerals "2," "3," "4," "5," "6," "7," "8" and "9," respectively dictate production of the notes low do, re, mi, fa, sol, la, ti and high do. The symbol area 72 which is made up of a plurality of distributed small circles, or the numeral "10," indicates that the middle chord is required. The symbol area 73 which is crosshatched and stippled, or the numeral "11," indicates that the low chord is to be produced.

FIG. 14 is a portion 75 of a reproduction of a musical composition which employs only full tone notes, utilizing the symbolic showings in the chart of FIG. 13. The tune laid out thereon is the familiar "London Bridge" and it is symbolically indicated that all of the notes are to be produced by compressive action of the bellows. If an embodiment of the musical reed toy of the present invention employs as index indicia the symbols for the various colors, the symbols for the colors are employed

on the staff to indicate the settings of the index for production of each particular note printed thereon. In order that this written musical composition will also be useful in the playing of embodiments which employ numerals as the index indicia these have been laid out below the staff for similar use and direction.

It will thus be seen that the objects set forth above, among those made apparent from the preceding description, are efficiently attained by the structural proposals shown in the drawings and those described herein. Since certain changes may be made in the above constructions without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

It is also to be understood that the following claims are intended to cover all of the generic and specific features of the invention herein described, and all statements of the scope of the invention which, as a matter of language, might be said to fall therebetween.

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

1. A musical reed toy comprising, in combination,

(a) a source of compressed air in the form of an alternately expansible and compressible bellows having

(b) a transverse closing back end structure carrying a hand grasp to be held in one hand of a player and an opposite head end structure to be engaged by the other hand with an interior air chamber defined between said end structures, the capacity of said air chamber being variable by expansion and compression of said bellows,

(c) reed support plate means mounted in said head end structure of said bellows provided with portions of a plurality of air flow passages extending therethrough each including at least one reed opening communicable to the bellows chamber through the passage which includes the latter,

(d) a bank of reeds carried by said plate means comprising a group tuned to sound notes of a musical scale with each mounted in one of the reed openings to sound the note thereof when air passes in an effective direction in the passage connected to the reed opening in which this reed is mounted,

(e) valving disk means mounted in said head end structure adjacent said plate means with one of said plate and disk means being rotatable relative to the other to constitute a rotary element,

(f) said valving disk means being provided with means defining other portions of the air flow passages selectively communicable with the air flow passage portions in said plate means one at a time in different relative rotary positions of the rotary element of said plate and disk means to connect said bellows chamber therethrough to the reed opening included in the particular passage communicatively conditioned by the particular relative rotary position of the rotary element,

(g) manually engageable means embodied in said head end structure to rotate by the other hand of the player the rotary element of said plate and disk means relative to the other selectively to effect this communication for sounding the notes selectively, and

(h) index means embodied in said head end structure to dictate to the player the proper position of the rotary element for attaining the sounding of the desired notes.

2. The musical reed toy as defined in claim 1 in which said reed carrying plate means comprises a circular plate rotatably mounted in said head end structure with said valving disk means being fixedly carried by said bellows.

3. The musical reed toy as defined in claim 2 in which said valving disk means is in the form of a disk closing off the front end of said bellows and having a pattern of ports therein each constituting the valving portion of a separate one of each of the air flow passages.

4. The musical reed toy as defined in claim 3 in which said rotary circular plate is mounted forward of said valving disk and contains its passage portions as separate ports with at least some thereof being individually and alternatively alignable with the ports in said valving disk one at a time, said reeds being carried in separate sound chambers of a harmonica structure fixed on the front face of said rotary plate with the sound chambers being individually communicated to the ports in said plate.

5. The musical reed toy as defined in claim 4 in which said harmonica structure is in the form of a transverse elongated bar means projecting from the front face of said rotary plate and serving as the manually engageable means to rotate said plate and a hand grasp to cooperate with the hand grasp of the back end structure for effecting alternate expansion and compression of said bellows.

6. The musical reed toy as defined in claim 5 in which said rotary circular plate is provided with a cylindrical rim to define with the plate a cylindrical cup structure in which said valving disk is rotatably nested.

7. The musical reed toy as defined in claim 6 in which said index means comprises an arcuate zone of said cylindrical cup structure of see-through character for observation of an index marking carried by a circumferential portion of said valving disk, one of said valving disk portion and said arcuate cup zone being provided with a plurality of annularly spaced indicia markings identifying the different musical notes and the other being provided with a pointer marking for individual and selectively alternate alignment with the indicia markings, alignment of the pointer marking with any particular musical note indicia marking being informative of communicative alignment of a port in said valving disk with the port in said rotary cup plate leading to the reed opening in which the reed of that note is mounted.

8. The musical reed toy as defined in claim 1 in which said reed carrying plate means comprises a circular plate fixedly mounted in said head end structure and said valving disk means is rotatably mounted in said head end structure between the bellows chamber and said plate.

9. The musical reed toy as defined in claim 1 in which said reed carrying plate means comprises a circular plate provided at each of a plurality of circularly-spaced points with one of a plurality of reed openings each having one of the musical reeds associated therewith for sounding its note upon effective passage of air through this reed opening, said valving disk means being ported selectively to direct air flow initiated by bellows action through one of the reed openings upon relative rotation of said plate and valving disk means.

10. The musical reed toy as defined in claim 9 in which said valving disk means is a flat disk fixed to the head end of said bellows with said circular plate being rotatably mounted thereto coaxially thereof, the plurality of reed openings in said plate being arranged in a circular zone of certain mean radius and said valving disk having a single port located radially of the disk center the mean radius distance to be selectively aligned with any one of the reed openings in selected rotary positions of said plate.

11. The musical reed toy as defined in claim 9 in which a pair of the reed openings is provided in said plate at each circularly-spaced point with the reed associated with one of the pair being adapted to sound its note upon outward passage of air blown through this reed opening and the reed associated with the other of the pair being alternately adapted to sound its note upon inward passage of air aspirated through the latter opening.

12. The musical reed toy as defined in claim 1 in which each air flow passage includes a pair of said reed openings and with each equipped with one of said musical reeds, the reed associated with one of said pair of reed openings being adapted to sound its note upon outward passage of

air blown through the passage leading thereto from the bellows chamber upon compression of the latter and the reed associated with the other of said pair of reed openings being adapted to sound its note upon inward passage of air aspirated through this passage upon expansion of the bellows chamber.

13. The musical reed toy as defined in claim 1 in which means are provided in said back end structure defining a selectively valvable air inlet and outlet passage communicating the bellows interior air chamber with the surrounding atmosphere.

14. A musical reed toy comprising, in combination,

(a) a source of compressed air in the form of an alternately expansible and compressible bellows having

(b) a transverse closing back end structure carrying a hand grasp to be held in one hand of a player and an opposite head end structure to be engaged by the other hand with an interior air chamber defined between said end structures, the capacity of said air chamber being variable by expansion and compression of said bellows,

(c) means defining in said back end structure a selectively valvable air inlet and outlet passage,

(d) reed support plate means mounted in said head end structure of said bellows provided with portions of a plurality of separate air flow passages extending therethrough each including a pair of reed openings, communicable to the bellows chamber through the passage which includes the latter,

(e) a bank of reeds carried by said plate means arranged in two groups with those of one group tuned to sound the full tone notes and those of the other group tuned to sound the half tone notes of a musical scale, the reeds of both groups being paired with each pair mounted respectively in the reed openings of a particular pair of the latter and with one of each pair

of these reeds being adapted to sound its musical note when air is blown out therepast through its associated reed opening and the other reed of this pair being adapted to sound its musical note when air is aspirated inward therepast through the reed opening associated with the latter reed,

(f) valving disk means mounted in said head end structure adjacent said plate means with one of said plate means with one of esaid plate and disk means being rotatable relative to the other to constitute a rotary element of this means,

(g) said valving disk means being provided with means defining other portions of the air flow passages selectively communicable with the air flow passage portions in said plate means one at a time in different relative rotary positions of the rotary element of said plate and disk means to connect said bellows chamber therethrough to the pair of reed openings included in the particular passage communicatively conditioned by the particular relative rotary position of the rotary element,

(h) manually engageable means embodied in said head end structure to rotate by the other hand of the player the rotary element selectively to effect this communication for sounding the notes selectively upon expansion and compression of said bellows, and

(i) index means to dictate to the player the proper position of the rotary element for attaining the sounding of each particular note.

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RICHARD B. WILKINSON, *Primary Examiner.*

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,282,144

November 1, 1966

Philip H. Knott

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 2, line 26, for "digerent" read -- different --; column 3, line 20, for "valve" read -- valved --; column 9, line 37, for "rotatable" read -- rotatably --; line 45, for "flxedly" read -- fixedly --; column 10, line 55, for "of", first occurrence, read -- or --; line 56, for "area" read -- areas --; column 14, lines 8 and 9, for "plate means with one of esaid plate and" read -- plate and --.

Signed and sealed this 5th day of September 1967.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

EDWARD J. BRENNER
Commissioner of Patents