Sept. 28, 1943. T. W. BEYER 2,330,261

ADJUSTABLE REED

Filed April 18, 1941

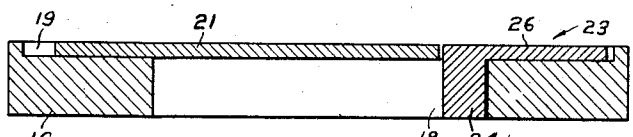



Fig. 1.

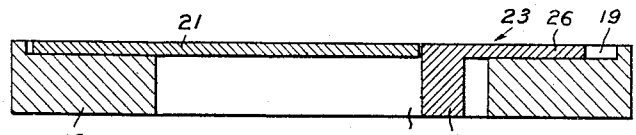



Fig. 2.

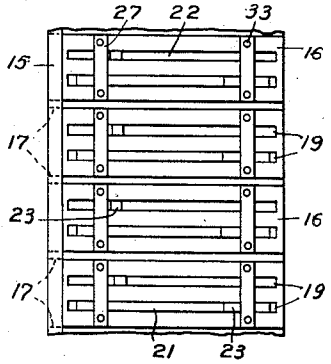



Fig. 3.

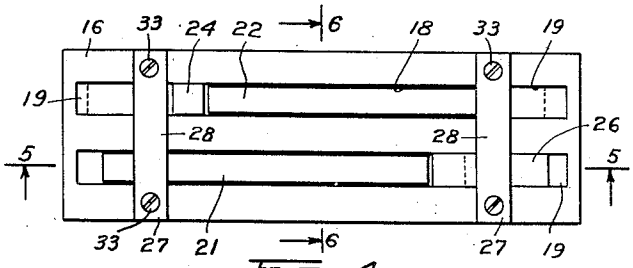



Fig. 4.

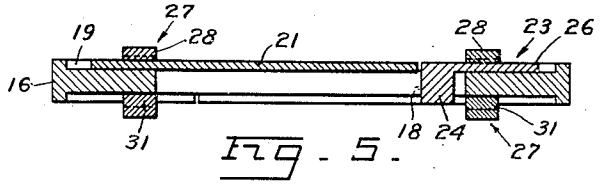



Fig. 5.

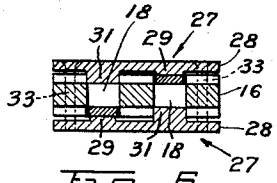



Fig. 6.

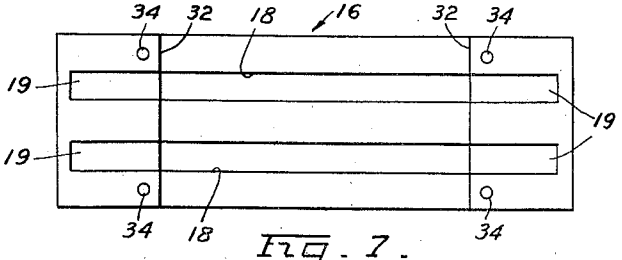



Fig. 7.

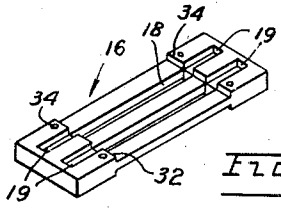



Fig. 8.

INVENTOR.
THOMAS W. BEYER
BY George B. White
ATTORNEY.

Patented Sept. 28, 1943

2,330,261

# UNITED STATES PATENT OFFICE

2,330,261

## ADJUSTABLE REED

Thomas W. Beyer, San Rafael, Calif.

Application April 18, 1941, Serial No. 389,126

6 Claims. (Cl. 84—363)

This invention relates to adjustable reeds.

A reed is a thin elastic tongue of flexible vibrating material supported at one end and held in the path of the current of air in certain musical instruments. The reed is secured to a reed block or other fixture over an opening, as in the reed organ or accordion or the like musical instruments, and it is set in vibration by an air current forced through said opening. A reed is beating or striking when it overlaps the opening, and is termed a free reed when it plays freely within the opening.

The usual reed vibrator in musical instruments is a thin metal tongue fixed at one end. The reed vibrator vibrates freely either in surrounding space, as in the accordion and concertina, or enclosed in a pipe or channel, as in certain reed stops of the organ or in the harmonium. Sound waves are generated by the vibrations of the reed. In some instruments the air current is created by blowing the air directly by the breath of the performer, such as in the harmonica; and in other instruments the wind supply is obtained by mechanical devices, such as the bag of the bag pipe instrument, or the bellows of such keyboard instruments as in the accordion, organ or harmonium.

The wind or current of air fed through the openings, for instance from bellows, is broken up into periodic air puffs. At its entrance into the channel or box the air flow is alternately checked or allowed by the vibrator so as to cause alternate pulses of condensation and rarefaction in the air passage thereby to cause the desired sound. On keyboard instruments these passages are usually controlled by valves operated by keys. For instance in the accordion, which is a small portable reed wind instrument with a keyboard, bellows of many folds are provided to which is attached a keyboard with from five to fifty keys. The keys on being depressed while the bellows are being worked open valves admitting wind to the reeds. The pitch of the note is determined by the length and the thickness or stiffness of the reeds. This is especially true in case of free reeds.

The most valuable characteristic of a reed is its power of producing all the delicate gradations of tone between forte and piano by virtue of a law of accoustics governing the vibration of free reeds, whereby increased pressure of wind produces a proportional increase in the volume of tone. The sound produced by the free reed itself is weak and usually requires to be reinforced by means of an additional column or stratum of air.

Free reed instruments are therefore classified according to the nature of the resonant medium provided, namely free reeds vibrating in pipes, as in organs, free reeds vibrating in reed compartments and reinforced air chambers of various shapes and sizes, as in the harmonium and harmonica, and free reeds set in vibration through a valve, but having no reinforcing medium, as in the accordion and concertina.

The quality of tone of reeds is due to the tendency of air set into periodic pulsations to divide into aliquot vibrations or loops, producing the phenomenon known as harmonic overtones or upper partials. It is necessary therefore in tuning such instrument to avoid the weakening or changing of the material or shape of the reed itself.

The herein above description illustrates the conditions under which reeds operate and function in the various reed instruments. A reed or vibrator in general when set in periodic motion by the impact of a current of air, produces corresponding succession of air puffs, the rapidity of which determines the pitch of the musical note. The reed or vibrator, an end of which is fixed over a frame, such as an oblong rectangular frame, swings through the frame or its opening freely backwards and forwards like a pendulum while vibrating. The adjustment of the pitch in tuning the instruments is a complicated task. For instance in tuning an accordion, it is necessary to slightly bend the reed. This creates a change of flexibility so that it has to be compensated for by filing across the fixed end of the reed. Even then the air space at the tip of the reed is altered. The complex conditions in obtaining the true pitch requires lengthly and tedious tuning operations. After a few tunings the reeds lose their resiliency and conditions change so far that the reed has to be replaced. This involves practically the complete disassembly of the entire instrument. Due to the physical changes to which the material of the reed is subjected during such tuning, it was necessary to make reeds out of special expensive materials.

The primary object of this invention is to provide a method for tuning the reeds of musical instruments, by adjusting the length of the reeds relatively to a fulcrum by changing the position of the reed relatively to its support; and another feature of this invention is to substantially simultaneously adjust the frame element adjacent the free end of the reed so as to maintain the same relative position between the free end of the reed and the adjacent end of the opening.

Another object of this invention is to provide a reed arrangement for musical instruments, whereby the reed can be tuned by changing the length of its vibrating end and substantially simultaneously changing the portion of the frame which forms the end of the opening adjacent the free end of the reed so that the spacing at the end of the reed remains the same in all adjustments.

Another feature of this invention is to provide a method and apparatus whereby the length of the reed and the corresponding length of the air opening in which the reed works are adjustable to maintain a constant relation between them at the various adjusted lengths of the reed.

Another object of this invention is to provide a reed block or reed frame with mounting elements to support the reed and also to support the edge of the air passage opening adjacent the vibrating end of the reed, with longitudinal adjustability.

Another object of this invention is to provide a reed mechanism for reed instruments, the tuning or pitch adjusting operation on which does not involve filing or bending the reed in a fixed opening, but allows easy and accurate tuning where the pitch of the reed is tuned by adjusting its length and also adjusting the opening according to the reed adjustment; and wherein the tuning of instruments is greatly facilitated, and the life of the reeds and of the instrument is prolonged. Convenience of arrangement, simple construction, lightness and comparative inexpense of manufacture are further objects which have been borne in mind in the development of the invention.

I am aware that some changes may be made in the general arrangements and combinations of the several devices and parts, as well as in the details of construction thereof without departing from the spirit and scope of the present invention, hence I do not limit my invention to the exact arrangement and combination of the said device and parts as described in this specification, nor do I confine myself to the exact details of the construction of the said parts as illustrated in the accompanying drawing.

With the foregoing and other objects in view, which will be made manifest in the following detailed description and specifically pointed out in the appended claims, reference is had to accompanying drawing for the illustrative embodiments of the invention, wherein:

Fig. 1 is somewhat diagrammatic sectional view of the reed device in on position.

Fig. 2 is the same view as Fig. 1, showing the reed and opening shortened.

Fig. 3 is a fragmental plan view of a reed block, with my reed plates and device in position.

Fig. 4 is a top plane view of a single reed plate and reeds on it constructed in accordance with my invention.

Fig. 5 is a sectional view taken on lines 5—5 of Fig. 4.

Fig. 6 is a sectional view taken on lines 6—6 of Fig. 4.

Fig. 7 is a detail plan view of my reed plate, and

Fig. 8 is a perspective view of my reed plate.

The hereindescribed embodiment of my invention is particularly adapted for use in connection with accordions and harmonicas, but the same arrangement and principle of operation can be adopted for other reed instruments. The reeds are usually mounted on a so called air block 15 by means of reed plates 16. The reed block 15 is made of any suitable material such as composition or wood and is divided into individual compartments 17 open at one end so as to communicate with the air current, such as the air flow caused by the bellows of the accordion. The top of each compartment is covered by a reed plate 16, which is suitably held in place by wax, screws or the like, and sealed at the edges so as to prevent escape of air except through the usual air passages. The reed plates 16 are oblong, rectangular frames. Each reed plate 16 has a pair of substantially parallel openings 18 extended longitudinally intermediate the ends thereof. The openings 18 in the herein illustration are elongated slits each conforming to the width of the reed used.

In order to accommodate oppositely acting reeds on the opposite sides of the plates 16, each reed plate 16 has on the opposite faces thereof longitudinal grooves 19 which are contiguous with the respective ends of the air openings 18. The depth of each groove 19 is preferably the same as the thickness of the reeds used on the plate, so that when a reed is held in either of said grooves 19 the top of the reed is preferably at the level of the top of the recesses formed by the grooves 19. These grooves 19 may extend to the ends of the reed plate 16 or may be stopped short of the ends. In the herein form they are shown short so as to avoid the need for waxing and sealing at the ends of the grooves 19. The intermediate portion of the reed plate 16 is recessed across its entire width and to a length corresponding to the length of the air openings 18 so that the reeds overlying the openings 18 have their lower edges in registry with the top of the recessed plane in the middle of the reed plate faces. Each reed plate 16 is symmetrical so that its faces and positions are interchangeable.

A reed 21 is held in one groove 19 on one face of the reed plate 16. Another reed 22 is held in the groove 19 on the other face of the reed plate 16 diagonally opposite the first reed 21. The reeds 21 and 22 extend over the respective slits or air openings 18 so as to be vibrated by the current of air flowing through said air openings 18. The reeds 21 and 22 are vibrated by air current flowing respectively in opposite directions. The reeds 21 and 22 are made of suitable resiliently flexible material, such as clock spring steel. Each reed is slidable in its groove so as to extend over its air opening 18 to a selected distance. The part of the reed protruding beyond the inner end of its groove is the vibrating part. The inner end of the groove 19 adjacent the recessed middle portion of the face of the reed plate is the fulcrum point where the vibrating portion of the reed begins. The pitch of the sound created by the vibrating reeds depends on the length of the vibrating part of the reed. The length of the vibrating part determines the arc of the swinging of the free end of the reed, its stiffness, and its corresponding rapidity of vibration under the impact of an air current. Therefore in tuning the reed, the length of the reed can be varied, by sliding it in its groove until its vibrating end is of the desired length.

The air opening 18 is also varied to the same length as the adjusted length of the vibrating end of the reed. This is accomplished by a compensator 23 which forms the wall at the end of the

air opening 18 opposite the free end of the reed. This compensator 23 includes a head 24 which slidably fits into the end of the opening 18 and extends the full depth of the opening 18. A stem 26 extends from the compensator head 24 and is slidable in the groove 19 so as to hold the compensator in axial alignment with the opposite reed. As the reed length is adjusted, the compensator is also moved axially so that the compensator head 24 remains adjacent the free end of the reed in all adjusted positions. In other words the end of the opening 18 is moved with the adjustment of the reed so that the relation between the vibrating end of the reed and its air opening is the same in all adjusted positions.

To facilitate tuning operations, the reeds and the compensators are held in their respective grooves 18 by suitable releasable clamps 27. In this illustration adjacent each end of the recessed middle portion of the reed plate is a clamp 27. Each clamp is made of a pair of opposed, spaced clamping bars 28, one on each side of the reed plate 16. A clamping screw 35 extends through each end of the clamp 27 so that the screw extends through the reed plate 16 and screws into the lower clamping bar 28. Each bar 28 has on it a short projection 29 and a long projection 31 of slightly less width than the width of the grooves 19. The difference in length between the projections 29 and 31 corresponds to the thickness of the reed. It is also preferable that the compensator stem 26 be of the same thickness as that of the reeds, so as to render the clamp bars 28 interchangeable. In assembling the device the longer projection 31 of the bar 28 is inserted into the empty groove 19, and the shorter projection 29 bears against the reed 21 or 22 or against the compensator stem 26 respectively and is thus assuming a position substantially parallel with the face of the reed plate. The pair of clamping bars 28 are positioned on the opposite sides of the reed plate 16 in registry with each other and with the edge 32 of the adjacent end of the air opening 18, thereby clamping the reeds firmly at the fulcrum point. In order that the clamp 27 be always aligned, the clamp screws 33 extend through the opposite bars 28 and through holes 34 in the reed plate 16. The screws 33 are threaded into one of the clamping bars 28 so as to draw the bars 28 toward each other and against the reed plate 16 and the respective reeds and compensator stems on the reed plate. The heads of the clamping screws 33 are preferably countersunk into the adjacent clamping bar 28. Thus the screws 33 not only tighten and secure the clamp in place but also locate the clamp in registry with the fulcrum of the reeds for accurate adjustments.

The novel method of tuning includes the step of adjusting the length of the vibrating portion of the reed relatively to its support or to a fixed fulcrum point. This step involves provision of clamping means or releasable fulcrum for the reed at an end of the air opening, varying the length of the reed extended over the opening by adjusting the reed longitudinally relatively to said end of the air opening. Then the method also involves the step of adjusting the other end of the air opening relatively to the free end of the vibrator or reed in accordance with the length adjustment of the reed. The final step is the clamping of the reed and the adjusted opening in the adjusted positions by a releasable clamp. The adjusting of the air opening to correspond to the reed adjustments maintains constant relative conditions in the air passage so that the operation of the adjusted reed is always normal. The pitch can be more quickly and accurately tuned because the only condition that is changed is the length of the vibrator, all other relative conditions remain approximately constant. There is no change in clearance at the free end of the reed, nor is there any weakening of the reed by bending or filing, or in any way affecting the resiliency or condition of the material of the reed.

The method of tuning reeds by varying the length of the vibrating end of the reeds and correspondingly changing the length of the air opening co-acting with the reed, and the device for providing releasable support at a fulcrum adjacent one end of the air opening, and adjustable wall at the other end of the air opening, permit accurate and true tuning quickly and efficiently, and serve to prolong the life and true resiliency of the reeds in musical instruments.

I claim:

1. In a device of the character described, a reed frame having an air aperture extended therethrough, a reed projecting over said aperture, means to adjustably hold the reed in place, and compensator means extended into said aperture to adjust the aperture wall inside at one end according to the length of the reed adjustments.

2. In a device of the character described, a reed plate adapted to be secured over the air passage of a reed instrument, the reed plate having a substantially oblong aperture therethrough, a reed slidably disposed on the plate so as to extend over said aperture, and releasable means to clamp the reed to the plate at a point opposite an end of the aperture so that a free vibrating portion of the reed projects over said aperture to a selected length, and a compensator element extended into the inside of the aperture for defining the other end of the aperture, said compensator element being adjustable so as to determine the length of the aperture opposite to and adjacent the free end of the reed according to the length of the free portion of the reed.

3. In a device of the character described, a reed plate adapted to be secured to a reed instrument, said plate having a plurality of openings therethrough, a guide slot extending contiguously with each end of each opening and on each side of the plate, a reed positioned in a guide slot adjacent one end of each opening, a compensator element positioned in the other end of each opening and in the adjacent guide slot so as to define the end of the opening opposite the free end of the reed, and releasable clamping means to hold said reeds and said compensator elements in adjusted positions, said clamping means including abutments interchangeably fitting into a vacant guide slot and over a reed and compensator in the other slot on either side of said reed plate.

4. In a device of the character described, a reed plate adapted to be secured to a reed instrument, said plate having a plurality of openings therethrough, a guide slot extending contiguously with each end of each opening and on each side of the plate, a reed positioned in a guide slot adjacent one end of each opening, a compensator element positioned in the other end of each opening and in the adjacent guide slot so as to define the end of the opening opposite the free end of the reed, and releasable clamping means to hold said reeds and said compensator elements in adjusted positions, the positions of said reeds and compensator elements being interchangeable in the guide slots on the opposite sides of the plate.

5. In a reed device for musical instruments, a reed plate having an air passage therethrough, a vibrating reed extended over said passage from an end thereof, a compensator tongue extended into the inside of the other end of said air passage so as to form the end wall of the air passage, and means to adjustably hold said vibrator reed and said compensator tongue on the plate at the opposite ends of said aperture.

6. The combination with a reed plate for musical instruments having an air aperture therethrough and with a longitudinally adjustable vibrator reed on the plate extended over said aperture; of a compensator element in said aperture opposite the free end of said reed comprising, a stem, and a compensator head, said stem being adjustably held on the plate so as to hold said head opposite the free end of the reed, and said head extending into said air passage so as to modify both the opening and the end wall so as to modify both the opening and the end wall of the air passage according to the longitudinal reed adjustment.

THOMAS W. BEYER.