

UNITED STATES PATENT OFFICE.

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TREMOLO DEVICE FOR MUSICAL INSTRUMENTS.

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To all whom it may concern:

Be it known that I, FREDERICK S. BRASOR, a citizen of the United States, residing in the city of Chicago, in the county of Cook and the State of Illinois, have invented certain new and useful Improvements in Tremolo Devices for Musical Instruments, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof.

The purpose of this invention is to provide means for producing a tremolo effect in the music of a wind instrument by interrupting the free flow of air through the instrument at frequent and regular intervals. It consists in various features and elements of construction hereinafter described and shown in the drawings as indicated by the claims.

In the drawings:—

Figure 1 is a diagrammatic side elevation of a wind instrument of the character of a saxophone with certain parts omitted and broken away to simplify the illustration but showing a tremolo device embodying this invention applied to the instrument.

Figure 2 is a transverse partial section taken as indicated at line 2—2 on Figure 1.

Figure 3 is a detail section taken as indicated at the line 3—3 on Figure 2.

Figure 4 is a detail vertical section taken as indicated at the line 4—4 on Figure 2.

Figure 5 is a partial horizontal section taken as indicated at the line 5—5 on Figure 4.

Figure 6 is a detail section taken as indicated at the line 6—6 on Figure 4.

Figure 7 is a transverse section taken through the air passage of the wind instrument as in Figure 2, but showing the parts in the position which they assume when the driving motor is removed.

For producing a tremolo effect in wind instruments such as the saxophone, I have found it desirable to periodically restrict the air passage but undesirable to completely close the passage at any time. Therefore the means which I have chosen to secure this effect is in the form of a disk valve, 1, whose area is slightly less than the cross-sectional area of the air passage, 2, in which it is mounted and I provide means for con-

tinuously rotating this valve in one direction so that it stands alternately across the passage and in a plane aligned with the axis of the passage and thus alternately restricts and relieves the flow of air for causing periodic pulsations giving the tremolo effect. For rotating the valve disk, 1, I provide a spring motor in a case, 3, secured in any convenient manner to the instrument and serving to operate the valve, 1, without any special attention on the part of the artist who is playing the instrument. This motor, however, is controllable at will by the artist so that if desired the speed of rotation of the valve disk, 1, may be varied, or its motion may be stopped altogether; and I make special provision to insure that the disk shall always stop in a position in which it does not materially obstruct the air passage but stands in the plane of the axis of the passage.

As shown in Figure 6, the spring motor includes the usual spiral spring, 4, arranged on a winding shaft, 5, and connected to drive an initial gear wheel, 6, meshing with the pinion, 7, which is secured fast to a spiral gear, 8, arranged to drive a worm, 9, on the spindle, 10, said spindle being axially aligned with the spindle, 11, of the disk, 1, when the motor casing, 3, is attached to the instrument. The speed of the spindle, 10, is governed in a well understood manner by means of a centrifugal governor, 12, driven through gears, 13 and 14, and including friction brake members, 15, which act upon the friction cone, 16, mounted for adjustment along the axis of the shaft or spindle, 17, of the gear, 14. Such adjustment of the cone, 16, will serve to vary the speed permitted by the governor mechanism and is effected in a manner hereinafter described.

The casing, 3, is removably secured by straps, 18, embracing the tubular portion, 2, of the instrument, A, and is positioned definitely with respect to the valve disk therein by the engagement of a cupped boss, 19, with the projecting bearing boss, 20, which is permanently fitted to the instrument. The upper end of the spindle, 10, is journaled in the bushing, 21, of which the boss, 19, is an integral portion and has a flattened tang or terminal, 22, which engages with the slotted lower end of the

spindle, 11. Thus the rotation of the spindle, 10, is transmitted to the spindle, 11, and valve disk, 1, the worm gear drive insuring quietness of operation. When the parts are thus connected the clamping straps, 18, force the boss, 20, against a packing washer or gasket, 23, lodged in the bottom of the cupped boss, 19, thus sealing the passage, 2, against leakage. Upon removal of the motor casing, 3, a spring, 24, in a pocket or housing, 25, reacts against the upper end of the spindle, 11, to shift the spindle axially so that its shoulder, 26, near its lower end will seat upon a packing washer, 27, lodged in the bushing, 20, and thus keep the passage, 2, sealed against air leakage.

The primary purpose of the spring, 24, and the axial movement of the spindle, 11, which it causes upon removal of the spring motor is to shift the disk, 1, into engagement with the retaining notches, 28, of the bushing, 20, as shown in Figure 7, so as to keep the disk standing in an axial plane of the tube, 2, to permit normal playing of the instrument without the tremolo effect.

The stopping and starting of the spring motor may be controlled by any convenient means but preferably by a lever arm, 30, extending from the casing, 3, on the mouth-piece, 31, of the instrument so as to be operated by a short downward movement of the chin. The lever is fulcrumed in the casing at 32 for actuating a rigid crank arm, 33, at whose upper end there is pivoted a pawl, 34, engaging a ratchet wheel, 35. Fixed to the ratchet wheel is a cam wheel, 36, having depressions, 37, and upraised portions, 38, which alternately engage a follower stud, 39, on a vertically movable member, 40. Said member, 40, carries at its upper end a thrust pin, 41, to engage one or the other of two diametrically opposite holes, 42, in the gear wheel, 13, on spindle, 10. A spring, 43, urges the member, 40, normally upward thus maintaining its follower, 39, in contact with the cam wheel, 36. A guide pin, 44, in a slot, 45, of the member, 40, serves also as a stop for the pawl, 34, by engaging a lug, 46, thereon. A spring, 47, coiled about the fulcrum pin, 32, normally holds the lever, 30, at the upper limit of its stroke.

When said lever, 30, is depressed by the chin movement of the operator the pawl, 34, is drawn to its limiting position shown in Figure 3 thus rotating the wheel, 35, by the amount of one tooth. If this shifts a depression, 37, of the cam, 36, into registration with the follower, 39, the member, 40, is permitted to move upward thrusting its terminal pin, 41, into the next approaching hole, 42, of the gear, 13, and thus arresting the gear and the entire motor train. The two holes, 42, in the gear, 13, are so placed with relation to the coupling tang,

22, of the spindle, 10, and the disk, 1, of the spindle, 11, as to insure that the disk, 1, will thus be arrested in the position shown in Figure 2,—that is, extending along an axial plane of the tube, 2. For restarting the rotation of the disk, 1, the operator again depresses the lever, 30, by a short chin movement and thus shifts the ratchet wheel, 35, by the amount of one tooth bringing a high portion, 38, of the cam wheel into registration with the follower, 39. Each of these upraises, 38, of the cam has a slight depression, 48, to retain the parts in engagement but the radius of the high point, 38, as compared with the depression, 37, is sufficient to insure withdrawal of the stop pin, 41, from the wheel, 13, thus permitting the motor to resume operation. Since the valve disk, 1, requires very little energy for moving it a spring, 4, of reasonable proportions will supply plenty of force for bringing the motor up to full speed promptly and producing the desired pulsation of the musical tone at regular intervals.

To vary the rate of this pulsation if desired, I prefer to mount the operating end of the lever, 30, on a vertical pivot, 50, and to provide the lever with up-turned arms, 51, which may laterally engage the operator's chin to permit of a limited sideways adjustment of the lever, 30, at will. This movement about the pivot, 50, swings an auxiliary arm, 52, through a limited lateral range so as to move a cam member, 53, which it carries and thus cause vertical adjustment of the follower, 54, which engages the inclined working face, 55, of said cam. The follower, 54, projects through an opening, 55, in the casing, 3, being rigidly attached to a vertically slidable member, 56, therein having a shifter fork, 57, at its upper end engaging the grooved collar, 58, of the friction cone, 16. Thus by lateral movement of the lever, 30, said friction cone, 16, is adjusted vertically through a limited range to vary the maximum speed permitted by the governor device and thus to vary the rate of pulsation produced by the rotating valve disk, 1.

In many instances the operator will prefer to merely swing the lever, 30, out of operating position without detaching the motor casing, 3, from his instrument. For this purpose I provide a hinge in said lever at 60 and furnish a clamping nut, 61, which permits the arm, 30, to be adjusted angularly about the axis of the hinge, 60, to fit it accurately within range of the operator's chin. Or by releasing the clamping nut, 61, the lever may be swung into the dotted line position indicated at 62 in Figure 1 and again clamped until wanted for further use.

I claim:

1. In combination with a wind instru-

ment comprising a tubular portion forming an air passage, a valve member rotatably mounted in said air passage and means for causing said member to rotate continuously in one direction for intermittently restricting the passage.

2. In the combination defined in claim 1, said valve being a disk whose area approximates the cross section of the passage.

3. In the combination defined in claim 1, said valve being a disk mounted in the passage with limited clearance to avoid total closure of the passage at any time.

4. In the combination defined in claim 1, said valve being a disk mounted to rotate about an axis substantially at the middle of the passage.

5. In the combination defined in claim 1, means for arresting rotation of the valve member at will.

6. In combination with a wind instrument comprising a tubular portion forming an air passage, a valve member mounted for complete rotation in said air passage, a motor connected to rotate said valve member and means for starting and stopping said motor at will.

7. In the combination defined in claim 6, said starting and stopping means including a control device extending adjacent the mouthpiece of the instrument for actuation by movement of the chin of the operator.

8. In the combination defined in claim 6, means adapted for varying the speed of said motor at will during operation thereof.

9. In the combination defined in claim 6, a governor for said motor and speed-varying means including a control member extending adjacent the mouthpiece of the instrument for actuation by movement of the chin of the operator.

10. In the combination defined in claim 6, means adapted for varying the speed of said motor at will during operation thereof, and a control member extending adjacent the mouthpiece of the instrument for engaging the chin of the operator, said control member being connected for starting and stopping the motor by vertical movement, and for adjusting the speed-varying means by lateral movement.

11. In combination with a wind instrument comprising a tubular portion forming an air passage, a valve member rotatively mounted in the air passage thereof, with its spindle substantially at the middle of the passage with one end exposed for driving engagement with a motor shaft, a motor detachably secured to the wind instrument in operative relation to the valve member, and means for starting and stopping said motor at will.

12. In the combination defined in claim 11, said valve member being in the form of a substantially flat disc, and said stopping

and starting means being arranged always to arrest the valve in the position in which it lies in a plane extending longitudinally of the air passage so that it least obstructs the air passage.

13. In combination with a wind instrument comprising a tubular portion forming an air passage, a valve member mounted in the air passage thereof with a spindle for actuating the valve extending through the wall of the passage and packing for sealing the passage against air leakage adjacent said spindle.

14. In a wind instrument comprising a tubular portion forming an air passage, a valve member mounted in the air passage thereof with an actuating spindle having portions extending through the walls of the air passage at opposite sides respectively; a motor for actuating the valve operatively connected to one of said portions of the spindle; a cap closing the opening through which the other portion of said spindle extends and packing associated with the spindle adjacent the motor connection to prevent leakage of the air passage.

15. In a wind instrument comprising a tubular portion forming an air passage, a valve member rotatively mounted in the air passage thereof, a motor externally attached to the instrument and having a drive shaft for actuating the valve; a spindle for the valve and a journaling bushing for said spindle secured in the wall of the air passage and projecting externally therefrom; a bushing providing a journal bearing for the drive shaft of the motor and having a recess formed to receive the projecting bushing on the instrument; a packing member interposed between the projecting bushing and the bottom of the recess, and means for drawing the parts together to compress the packing to prevent air leakage of the passage.

16. In the combination defined in claim 15, the valve spindle having a range of longitudinal movement in its bearing and being formed with a shoulder within said bearing; packing lodged in the bearing bushing surrounding the spindle, and yielding means tending to move the shoulder against said packing, the motor drive shaft being dimensioned to hold said shoulder away from the packing when the motor is operatively attached to the instrument.

17. In the combination defined in claim 11, said stopping and starting means being arranged always to arrest the valve in the position in which it least obstructs the air passage, and means for retaining the valve in said position when the motor is detached from the instrument.

18. In the combination defined in claim 6, a control device for said motor extending adjacent the mouthpiece of the instrument

for actuation by movement of the chin of the operator, said control device being adjustable toward and from the mouthpiece.

19. In the combination defined in claim
5 6, said motor being supported on the instrument adjacent the mouthpiece with a control member extending under said mouthpiece for actuation by movement of

the chin of the operator, said control member being hinged for folding away from the 10 mouthpiece when out of use.

In testimony whereof, I have hereunto set my hand at Chicago, Illinois, this 13th day of October, 1922.

FREDERICK S. BRASOR