United States Patent

Bemben

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[45] **Aug. 22, 1972**

[54] **DRUM**

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[51] **Int. Cl.**.....**G10d 13/02**
[58] **Field of Search**.....84/411, 411.1, 413, 419

[56] **References Cited**

UNITED STATES PATENTS

2,259,268	10/1941	Robison	84/419
2,261,119	11/1941	Ludwig et al.	84/419
2,548,271	4/1951	Percy	84/411

FOREIGN PATENTS OR APPLICATIONS

1,095,169	12/1967	Great Britain	84/411

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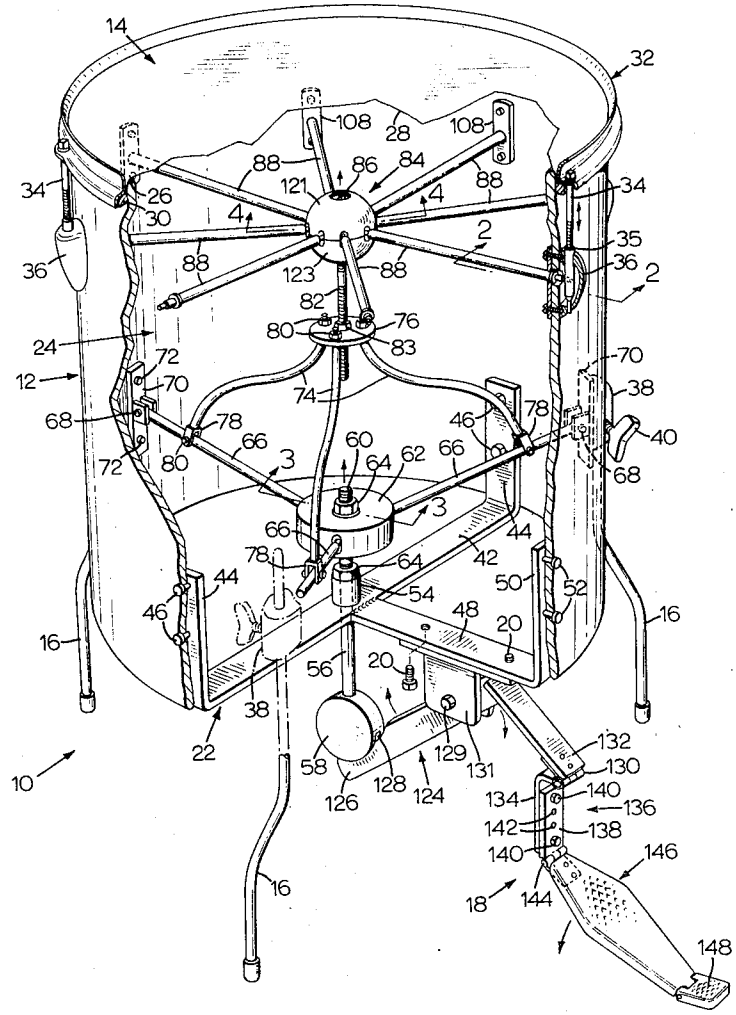
[57] **ABSTRACT**

An adjustable pitch musical drum is provided which includes a tubular cylindrical casing having its axis vertical, and a conventional drum head in tension over another end of the casing. A plurality of legs support the casing off the floor and a foot pedal is provided below the casing for adjusting the tension in the drum head. A tensioning mechanism connects the pedal to the drum head so that a relatively large movement of the pedal results in a small tensioning movement at the drum head to vary the frequency and hence the pitch of the note produced by the drum.

2 Claims, 4 Drawing Figures



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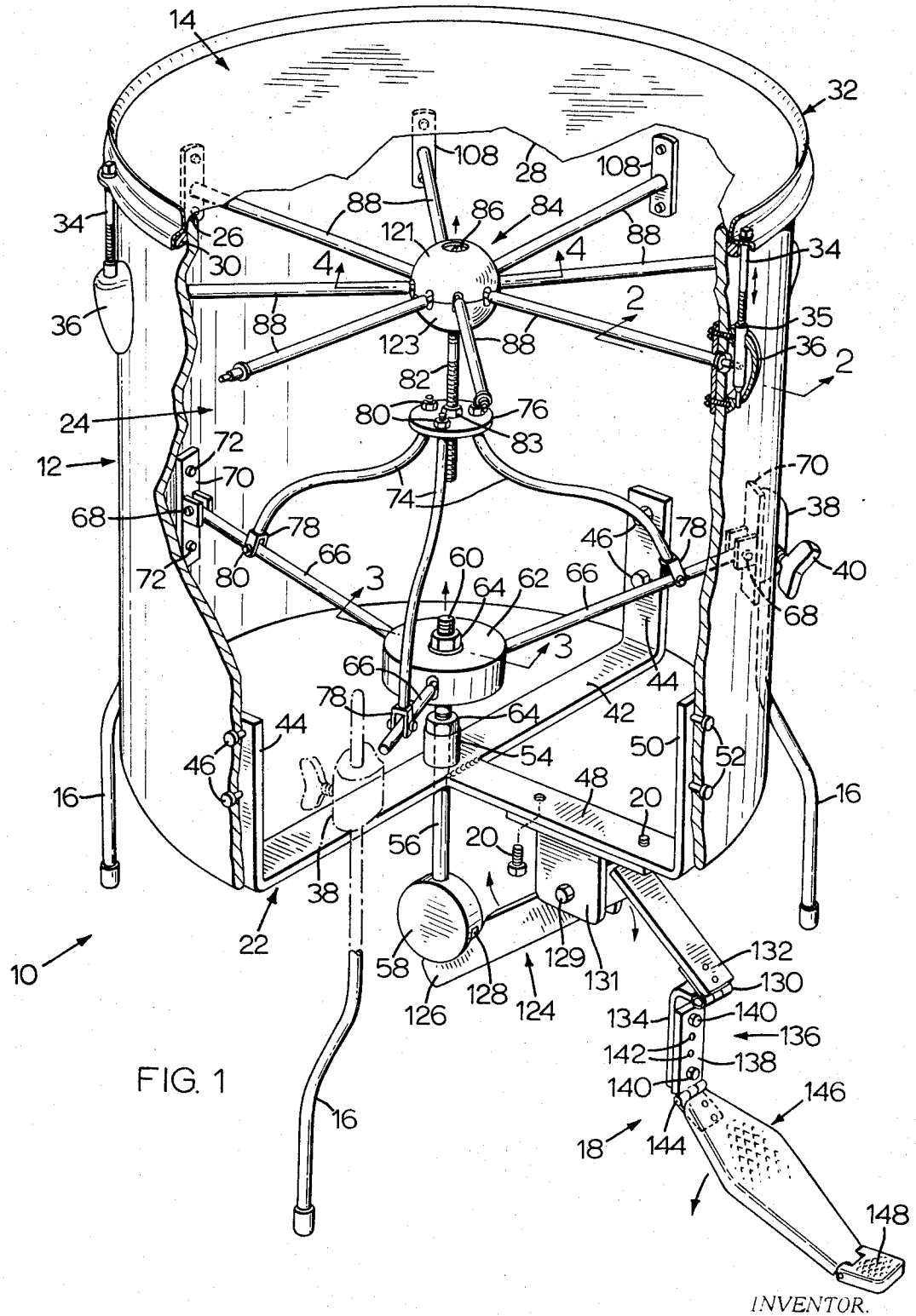

FIG. 1

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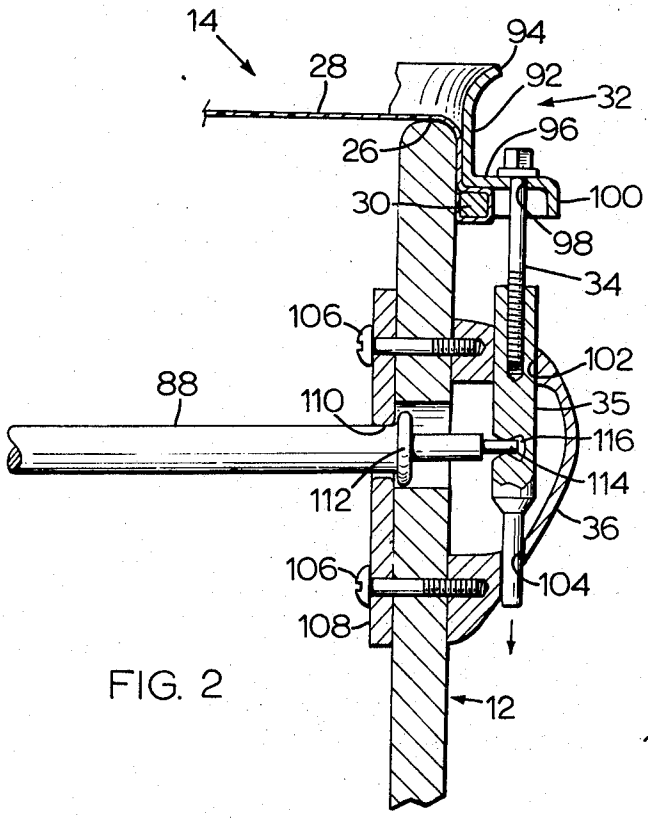

FIG. 2

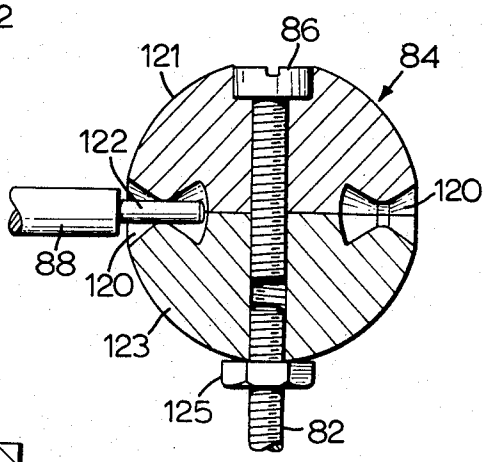

FIG. 4

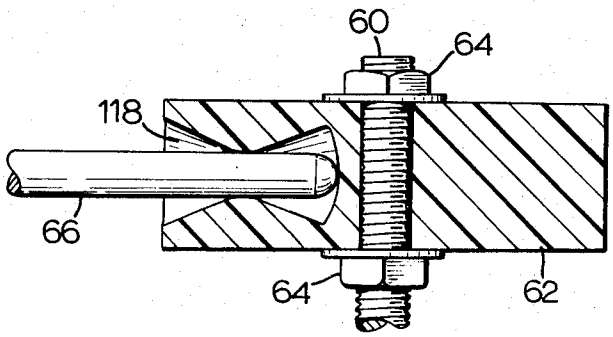

FIG. 3

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DRUM

This invention relates to a musical drum of a type which can be adjusted continuously to vary the frequency of vibration at the drum head to give a range of musical pitch.

A drummer in a dance band, or in a group playing popular music, is often required to play a solo or to play a piece of music with a minimum of accompaniment. With the exception of the expensive and cumbersome timpani, drums are adjusted to a predetermined tension at the head or skin of the drum and the drum remains in this condition while it is being played. The frequency of vibration of the drum head is controlled by the fixed tension in the drum head. However, the drum can be made to make different sounds by hitting it with a variety of blows of different strength. Commonly this is said to change the pitch. For the purposes of the present description however, the word 'pitch' is used to describe results obtained by varying the tension in the drum head rather than changes in the loudness of the note. For a given drum, although the loudness can be varied, the frequency of vibration (and hence the pitch) is fixed for a given head tension.

Commonly a drummer uses a number of different drums to obtain different effects and different notes. It is an object of the present invention to provide a variable pitch drum which a drummer can use to obtain new effects and which may be used in place of one of the drums presently used by a drummer.

Accordingly, in a particular preferred embodiment of the invention, an adjustable pitch drum is provided which includes a tubular cylindrical casing having its axis vertical, and a conventional drum head in tension over an upper end of the casing. A plurality of legs support the casing off the floor and a foot pedal is provided below the casing for adjusting the tension in the drum head. A tensioning mechanism connects the pedal to the drum head so that a relatively large movement at the pedal results in a small tensioning movement at the drum head to vary the frequency and hence the pitch of the note produced by the drum.

The invention will be better understood with reference to the drawings, wherein:

FIG. 1 is a partially sectioned perspective view of a drum according to the invention;

FIG. 2 is a side sectional view on lines 2—2 of FIG. 1;

FIG. 3 is a side sectional view on lines 3—3 of FIG. 1; and

FIG. 4 is a side sectional view on lines 4—4 of FIG. 1.

Reference is first made to FIG. 1 which shows a drum **10** having a tubular cylindrical casing or shell **12** and a drum head **14**. Three generally upright legs **16** support the casing **12** and a foot pedal assembly **18** is pivotally attached by screws **20** to a framework **22** which is in turn attached to the casing **12**. Movement of the foot pedal assembly **18** results in moving a tensioning mechanism **24** having a relatively large mechanical advantage for tensioning the drum head **14**. The mechanism **24** is arranged so that a relatively large movement of the foot pedal assembly **18** results in a small tensioning movement at the drum head with relatively small variations in the force required at the foot pedal assembly.

The casing **12** has a rounded upper side **26** for receiving the head **14** such that the head can be

stretched radially over the rounded side **26** without damage to the head. Head **14** consists of a generally circular skin **28** attached at its periphery to a hoop **30** which is adapted to pass over the upper end of the casing **12**. An annular rim **32** is pulled downwardly on the hoop **30** by eight axial bolts **34** to tension the skin **28**. Each of the bolts **34** is threadably engaged in a cylindrical slider **35** which is free to slide axially in a housing **36** in response to movements of the pedal assembly **18**. As the pedal assembly **18** is depressed, the sliders **35** and bolts **34** move downwardly and increase the tension in the skin **28** to increase the pitch of the note produced when the skin **28** is struck. Once the pedal assembly is released, the skin tension draws the mechanism **24** and pedal assembly **18** back to its original position corresponding to the lowest pitch in the drum's musical range.

The legs **16** are adjustably mounted in leg supports **38** on the casing **12** for axial movement to adjust the height of the drum. Locking screws **40** are threadably engaged in respective leg supports **38** to lock the legs in place.

The framework **22** consists of a first member **42** which extends diametrically across the lower open end of the drum **10**, and is attached to the casing **12** by integral upright portions **44** and fasteners **46** which pass through the upright portions **44** and through the casing **12**. A second member **48** is welded to the member **42** and extends horizontally from the center of the first member **42** terminating in a further upright portion **50** which is attached by fasteners **52** to the casing **12**. A journal bearing **54** is attached to an upper side of the first member **42** with the axis of the bearing coincident with the axis of the casing **12**. The bearing slidably receives a lower push rod **56** which is part of the mechanism **24** and which has an enlarged lower end **58** for transmitting motion from the foot pedal assembly **18** to the tensioning mechanism **24**.

The lower push rod **56** has an upper threaded portion **60** which projects through an opening in a lower pivot block **62**. A pair of nuts **64** (one of which is shown) are threadably engaged on the upper portion **60**, one above and one below the pivot block **62** to locate the pivot block on the lower push rod **56**. A third nut **64** is also engaged on the portion **60** and serves as a stop for limiting downward movement of the push rod by engaging an upper surface of the journal bearing **54**. Three lower moment arms **66** are mounted in the block **62** such that the arms are free to pivot and slide in the block **62**. The arms **66** are spaced equally about block **62** and extend generally radially from the block **62** and are pivotally connected at their distal or outer ends by pins **68** to pivot support plates **70**. Each of the plates **70** is connected by bolts **72** which project through the casing **12** and are threadably engaged in a corresponding leg support **38**. The arms **66** are connected to a respective one of three curved intermediate moment arms **74** which extend downwardly and radially from a coupling plate **76**. Each intermediate arm terminates at a forked end **78** which is pivotally attached by pins **80** to a corresponding arm **66** adjacent an outer end of the arm **66**. Each of the moment arms **74** is shaped so that at its lower end, the fork **78** is substantially at right angles to the axis of an associated radial arm **66** and the upper end extends axially through the coupling plate **76**. This

facilitates assembly and ensures clearance for pivotal movement of the moment arms **66** in corresponding forked ends **78** when the pedal assembly is moved, (as will be explained). Each of the upper ends of arms **74** is threaded and has two nuts **80** (one of which is shown) arranged one above and one below the plate **76** to attach the arm to the plate.

The plate **76** also has a central opening for receiving a threaded upper push rod **82** which has two nuts **83** (one of which is shown) engaged one above and one below the plate **76** for locking the upper push rod **82** to the plate **76**. Upper push rod **82** is threadably engaged in an upper pivot block **84** and threaded into the block as will be explained. Eight equally spaced upper moment arms **88** are mounted at their inner ends in the block **84** such that the arms **88** are free to pivot in a vertical plane and to slide radially in block **84**. The arms **88** extend radially from the block **84** and their respective outer ends engage in corresponding cylindrical sliders **35**.

Reference is next made to FIG. **2** which shows a moment arm **88** engaged in a cylindrical slider **35** which is free to move axially in the housing **36**. The arrangement shown in FIG. **2** is typical of all eight of the couplings between each of the rods **88** and a corresponding bolt **34**. The rim **32** consists of a generally cylindrical portion **92** which is flared outwardly at its upper end **94** to extend above the skin **28**. The upper end **94** is used for what is commonly called a "rim shot." (This is when the drummer hits the skin **28** and upper portion **94** of rim **32** simultaneously to obtain a distinctive noise). A radially extending flange portion **96** extends outwardly from the lower end of the portion **92** and has openings **98** for receiving eight bolts **34**. The rim terminates in a lip **100** which extends downwardly from the outer edge of the portion **96** to rigidify the rim **32**. The underside of the radial portion **96** engages the hoop **30** of the head **14** so that the skin **28** is stretched when bolts **34** are tightened. Bolt **34** is threadably engaged in the cylindrical slider **35** and the slider **35** is reciprocally engaged in an upper opening **102** in the housing **36** and in a smaller clearance hole **104** at the bottom of the housing **36**. Bolts **106** are engaged through a pivot plate **108** and project through the casing **12** to threadably engage in the housing **36** so that the bolts attach both the plate **108** and the housing **36** to the casing **12**.

The upper radial arm **88** projects through an oversize opening **110** in the plate **108** and is prevented from moving inwardly through the opening **110** by a collar **112** attached to the arm **88**. The outer end **114** of the arm **88** is of reduced diameter and engages in a contoured and slotted recess **116** which permits limited angular motion of the arm **88** relative to the cylindrical slider **35**, and allows the end **114** to reciprocate relative to the slider **35**. This combination of pivotal and sliding movements is necessary because the arm **88** uses the plate **108** as a fulcrum thereby causing the slider **35** to move axially while the end **114** moves in an arc about the fulcrum. This will be better understood after completing the description of the operation of the tensioning mechanism **24** (FIG. **1**).

Reference is next made to FIG. **3** which shows the lower pivot block **62** and one of the lower moment arms **66** engaged in one of three openings **118** in the block **62**. Each of the openings is similar in shape to opening **116** (FIG. **2**) to permit the arm **66** to move angularly in a vertical plane with respect to the pivot block **62** and to slide radially as the block **62** moves axially. The block **62** can be of any suitable metallic material or a rigid plastic. Also, if preferred a dense rubber composition can be used, and this has the advantage that it tends to damp undesirable vibrations in the tensioning mechanism **24**.

FIG. **4** illustrates the upper pivot block **84** which has eight openings **120** which are also similar in shape to openings **116** (FIG. **2**) in the slider **35**. However, the block **84** is made of respective upper and lower halves **121**, **123** to facilitate assembly. The upper push rod **82** is threadably engaged in the lower half **123** and locked in place by a nut **125**. A bolt **86** extends through upper half **121** and threadably engages in lower half **123** to hold the halves in engagement. Each opening **120** receives a corresponding inner end **122** of an upper moment arm **88** to permit the end **122** to pivot in a vertical plane and to move radially as the pivot block **84** moves axially. The inner end **122** is of reduced diameter to limit the size of openings **120** and hence to limit the size of the block **84**. The block **84** is of similar material to the block **62** or any other suitable material can be used.

Returning now to FIG. **1**, the pedal assembly **18** consists of a bell-crank lever **124** having an inner end **126** to engage in a slot **128** in the enlarged lower end **58** of the push rod **56**. The bell-crank lever **124** is free to rotate about a fitted bolt **129** in a U-shaped bracket **131** attached by screws **20** to member **48**, and has a hinge **130** attached to its outer end **132**. The hinge **130** is also attached to an upper end of a first member **134** of an adjustable link **136**. A second member **138** is releasably connected by screws **140** to the first member **134** and has a plurality of holes **142** to permit the screws to be repositioned to adjust the length of the link **136**. A second hinge **144** is attached to the lower end of the second member **138** and to the upper end of an inclined foot plate **146**. The foot plate **146** terminates at its lower end in a pivotal connection to a base plate **148** which normally rests on the floor.

In operation, when a drummer places his foot on the inclined foot plate **146** with his heel on the base plate **148** he can pivot the plate **146** about the base plate **148** to rotate the bell crank lever **124** about the pivot bolt **129**. This results in an upward force on the lower push rod **56** to slide the rod **56** upwardly through the journal bearing **54**. This upward motion of the rod **56** and consequently of the pivot block **62** rotates the lower moment arms **66** about pivot pins **68** in support plates **70**. Because the intermediate moment arm **74** is connected to the lower moment arm **66** adjacent the pivot pins **68**, there is a mechanical advantage created such that the upward force in the arms **74** is greater than the upward force in the push rod **56**.

Further mechanical advantage is obtained when the plate **76** and pivot block **84** are moved upwardly by the force in the moment arms **74**. The pivot block transfers the force to the upper moment arms **88** which are pivoted adjacent their outer ends in pivot plates **108** to draw the cylindrical sliders **35** downwardly. There is a relatively large mechanical advantage in the moment arms **88** so that this combined with the mechanical ad-

vantage in the other parts of the mechanism **24** results in a very small downward movement of the rim **32** for a corresponding large movement of the inclined foot plate **146**. Consequently the drummer is able to tension the skin **28** of the drum head **14** with relatively little effort.

One of the features of the adjustable drum is that the moment arms **66**, and **88** are inclined downwardly from the horizontal with the drum in the position shown in FIG. 1 by a predetermined angle such that when the foot plate is fully depressed, the arms **66** and **88** are inclined upwardly from the horizontal by the same predetermined angle. This eliminates the need for expensive pivotal connections at the cylindrical slider **35**, and pivot blocks **62** and **84** and gives a substantially constant mechanical advantage for all positions of the foot plate **146**.

The pedal assembly **18** can be removed from the drum for transporting the drum by removing the screws **20**. Also the legs **16** can be removed from supports **38** by first loosening screws **40** and sliding legs **16** out of the supports **38**. The drum is then more suitable for carrying.

If preferred, the lower push rod **56** can be made in two parts so that the part which projects downwardly beyond the frame **22** can be unscrewed from the rest of the rod **56** so that the drum will then fit into a conventional drum cover.

The lower end of the casing **12** as shown is uncovered. However, a wire mesh or other decorative cover can be placed over this end provided that it permits air displacement from within the drum to pass through it.

To assemble the drum, the legs **16** are locked in supports **38** to position the skin **28** at a desired height and the foot pedal assembly **18** is attached by inserting screws **20**. If necessary the inclination of the foot plate **146** can be changed by repositioning screws **140** in the adjustable link **136**.

Once assembled, the drum is adjusted for use by tensioning the bolts **34** until the lowest required pitch is obtained. As the foot plate **146** is depressed, the drum will give a range of pitch beginning from the lowest and increasing in frequency to a maximum dictated by the tension in the skin **28**. This permits a drummer to strike the skin **28** and by moving the foot plate **146** he can vary the pitch of the resulting note until the note dies out. By combining this effect with notes struck with the pedal in any one of a number of different positions it is possible to obtain affects which are pleasing to the ear and which can be used in combination with other musical instruments to provide novel musical effects.

What I claim as my invention is:

1. An adjustable musical drum comprising:

a. a cylindrical casing having a vertical longitudinal axis;

b. a drum head comprising: a circular skin and a hoop attached to the periphery of the skin and adapted to fit relatively closely over the casing with the skin stretched over an upper end of the casing;

c. a rim adapted to engage the hoop for drawing the hoop over the casing to tension the skin on the said end of the casing;

d. adjustable means coupled to the casing and operable to draw the rim axially of the casing and towards the other end of the casing to apply a predetermined tension to the skin;

e. a tensioning mechanism operable to move the adjustable means axially thereby varying the tension in the skin between the predetermined tension and a higher tension;

f. a foot pedal assembly for coupling to the tensioning mechanism and to the mounting means for moving the tensioning mechanism to change the tension in the skin continuously between the said predetermined and higher tensions;

g. the adjustable means comprising: a plurality of axial bolts each of which has a head end engaged against the rim and a threaded end; and a plurality of sliders coupled to the casing for reciprocal axial movement, each slider having an axially extending opening for threadably receiving a corresponding threaded end of a bolt, the sliders being coupled to the tensioning mechanism so that the bolts can be tightened to draw the rim towards the sliders to apply the predetermined tension to the skin; and

h. the tensioning mechanism comprising:

i. a lower pivot block adapted to reciprocate along said axis in response to pedal assembly movements

ii. an axial push rod reciprocally coupled to the casing and having an upper end attached to the lower pivot block and a lower end coupled to the foot pedal assembly for transmitting movement from the foot pedal assembly to the lower pivot block;

iii. a plurality of lower arms extending radially of the lower pivot block and pivotally connected at their respective outer ends to the casing;

iv. means connecting the inner ends of the lower arms to the lower pivot block so that the arms are free to rotate about their outer ends in response to axial movements of the lower pivot block;

v. an upper pivot block adapted to reciprocate along said axis;

vi. a plurality of intermediate arms extending radially outwards and downwardly from the upper pivot block, each of the intermediate arms having an inner and connected to the upper pivot block and an outer end pivotally connected to a corresponding lower arm intermediate the ends of the lower arm so that movement of the lower pivot block in one axial direction is transmitted by the lower and intermediate arms to the upper pivot block to move the upper pivot block in the same direction;

vii. a plurality of upper arms extending radially from the upper pivot block and having outer ends projecting through the casing;

viii. fulcrum means coupling the upper arms to the casing adjacent outer ends of the upper arms for pivotal movement of the upper arms such that a relative large movement of the inner ends of the upper arms results in a relatively small movement of the outer ends; and

ix. means coupling respective inner and outer ends of the upper arms to the upper pivot block and to the sliders whereby axial reciprocal movement of the upper pivot block in response to

movement at the foot pedal assembly pivots the upper arms in the fulcrum means resulting in axial movement of the sliders in the opposite direction to the direction in which the upper and lower pivot blocks move.

2. An adjustable musical drum as claimed in claim 1 in which the foot pedal assembly comprises: a bell crank lever having an inner end and an outer end the bell-crank lever being pivotally attached to the casing intermediate the ends of the bell-crank lever; a foot-plate pivotally connected to the outer end of the bell-crank lever so that pressure in the foot-plate results in angular movement of the bell-crank lever; and means coupling the lower end of the push rod to the bell crank lever for transmitting upward movement of the inner end of the bell-crank lever to the push rod.

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