United States Patent

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[54] **SLIDE RULE FOR COMPUTING MUSICAL RELATIONSHIPS**
10 Claims, 5 Drawing Figs.

[52] **U.S. Cl.** **84/473,** 84/471, 84/474
[51] **Int. Cl.** **G09b 15/02**
[50] **Field of Search** 84/473, 474, 475, 470, 471

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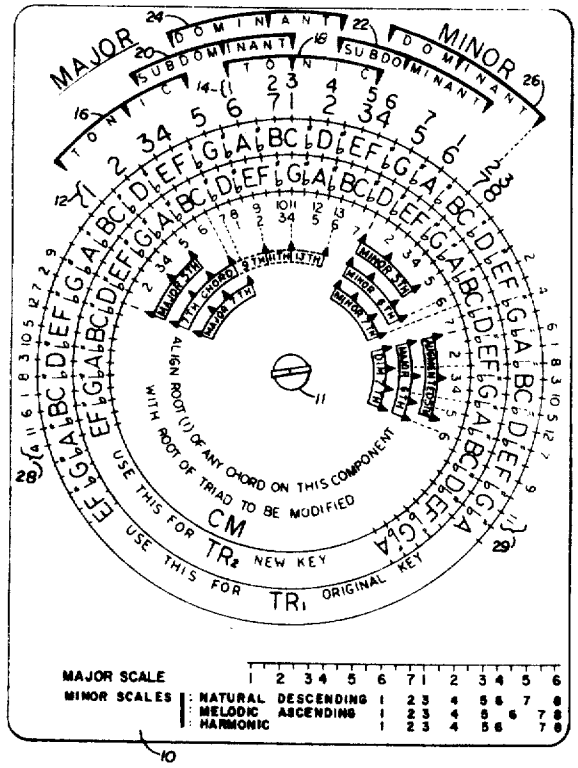
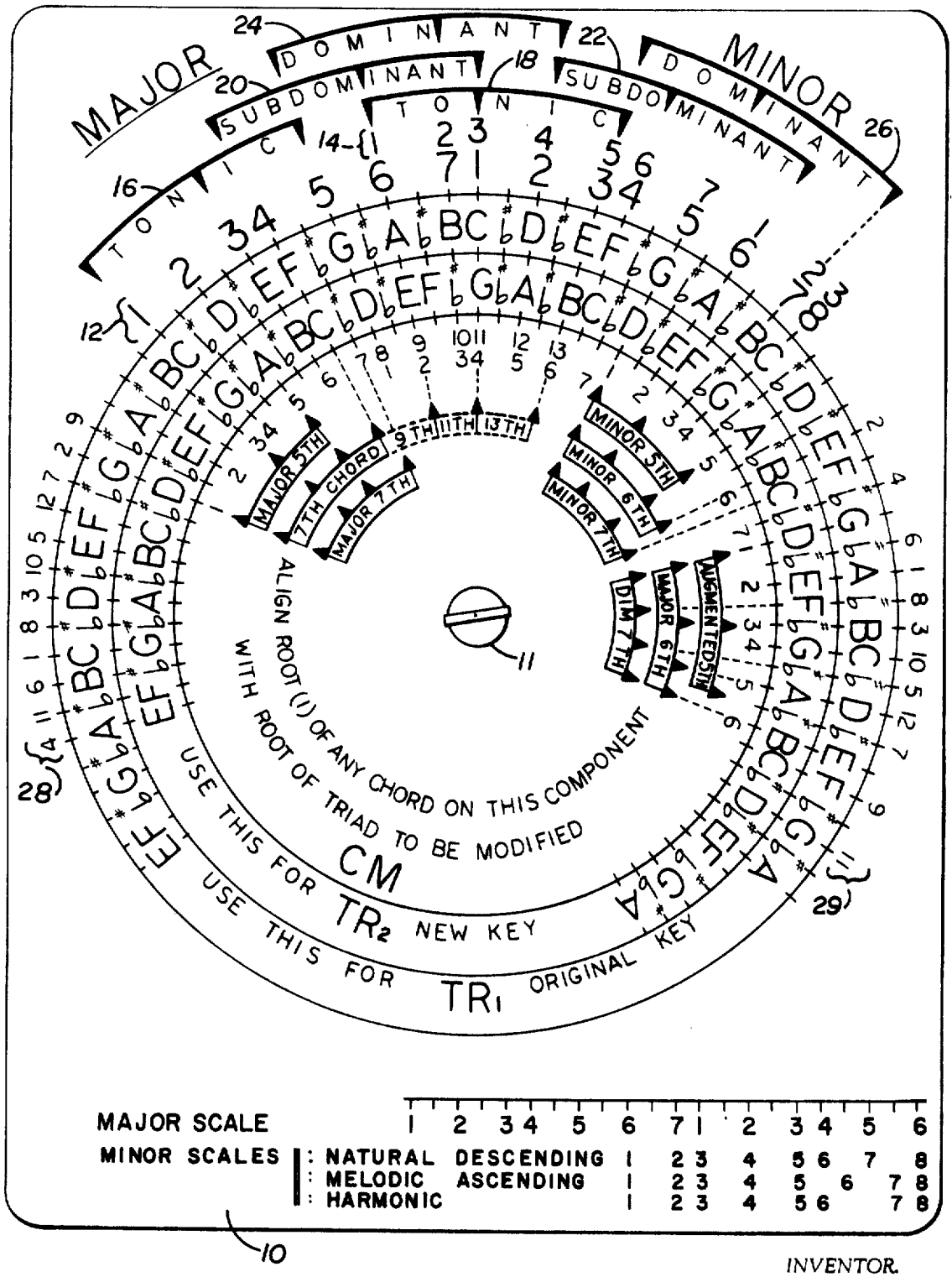
ABSTRACT: A slide rule capable of computing through mathematical constants substantially all significant musical relationships as they apply to any given key including chord structure and interval patterns of major and relative minor diatonic scales. The slide rule comprises a plurality of slidable members on the face and the back in cooperation with at least one stationary member, and may be linear or circular in form. A variety of marks and symbols representing musical tones, scales and chords are geometrically inscribed upon the moveable and stationary members so as simultaneously to depict an array of relationships, including interval patterns of major and relative minor diatonic scales and multiple chord combinations and variations applicable thereto in any major or relative minor key.





MAJOR SCALE		1	2	3	4	5	6	7	1	2	3	4	5	6
MINOR SCALES	NATURAL DESCENDING	1		2	3		4		5	6		7		8
	MELODIC ASCENDING	1		2	3		4		5		6		7	8
	HARMONIC	1		2	3		4		5	6			7	8

FIG. 1

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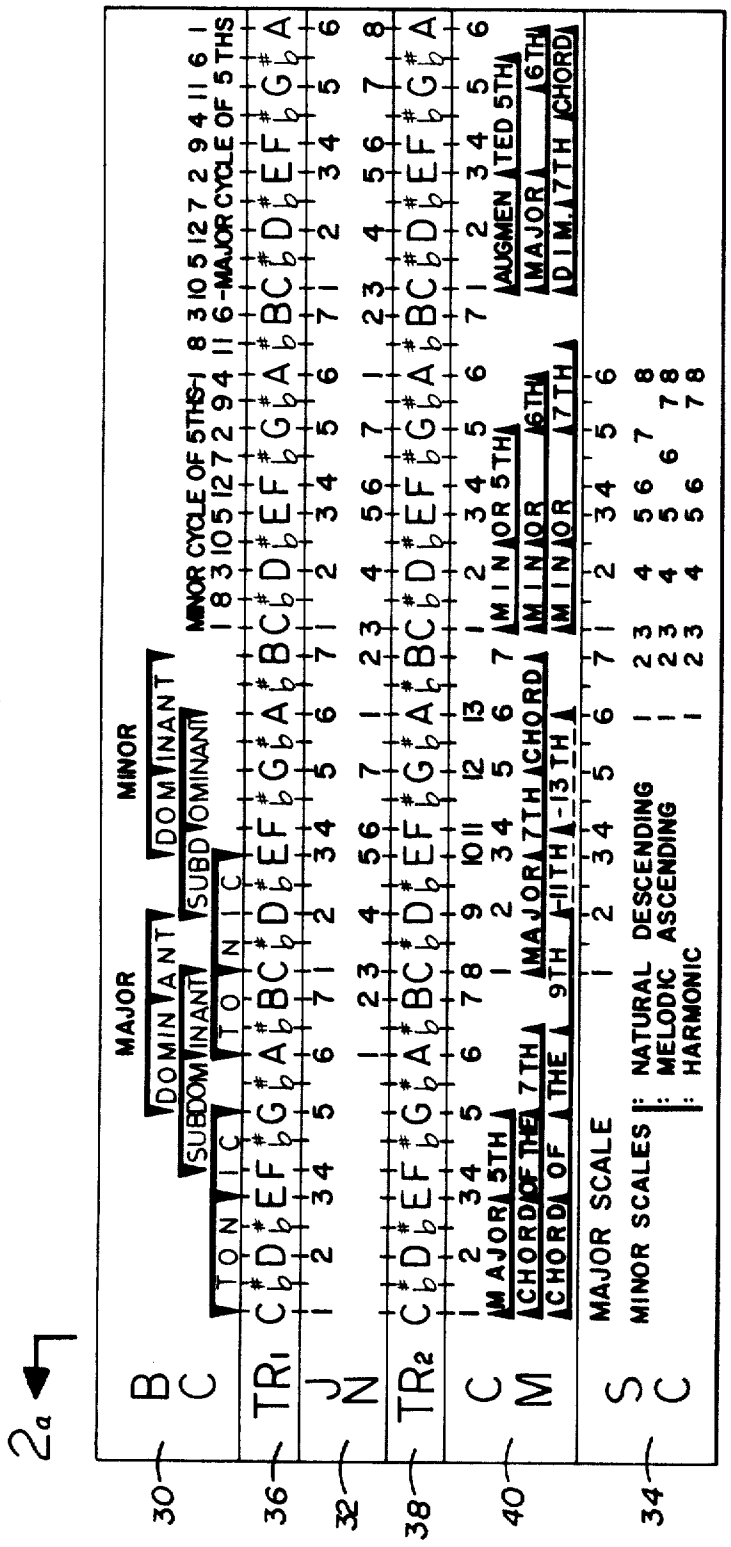

FIG. 2

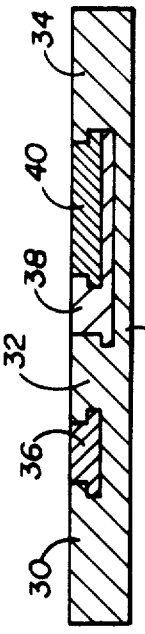

FIG. 2a

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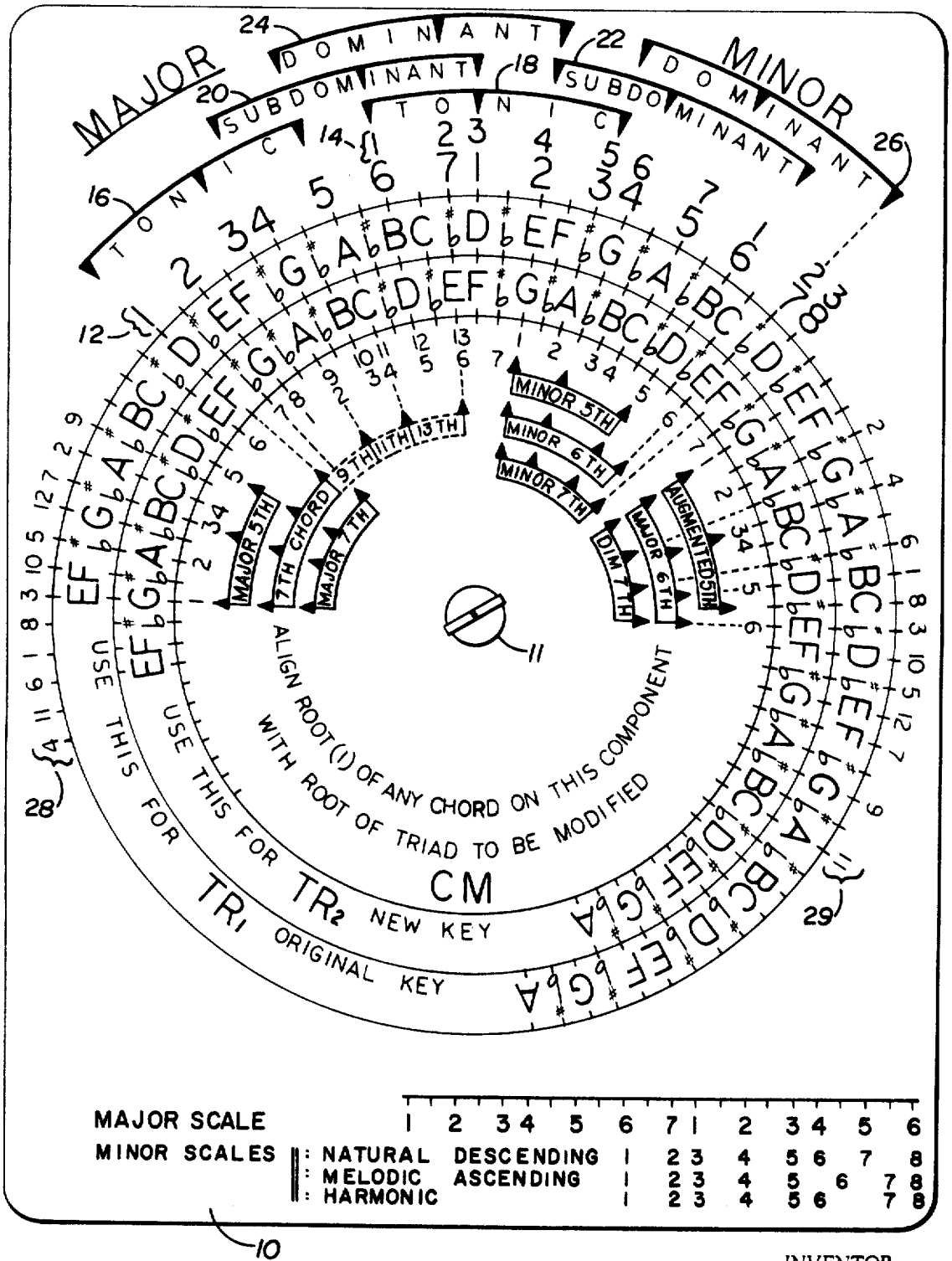

FIG. 3

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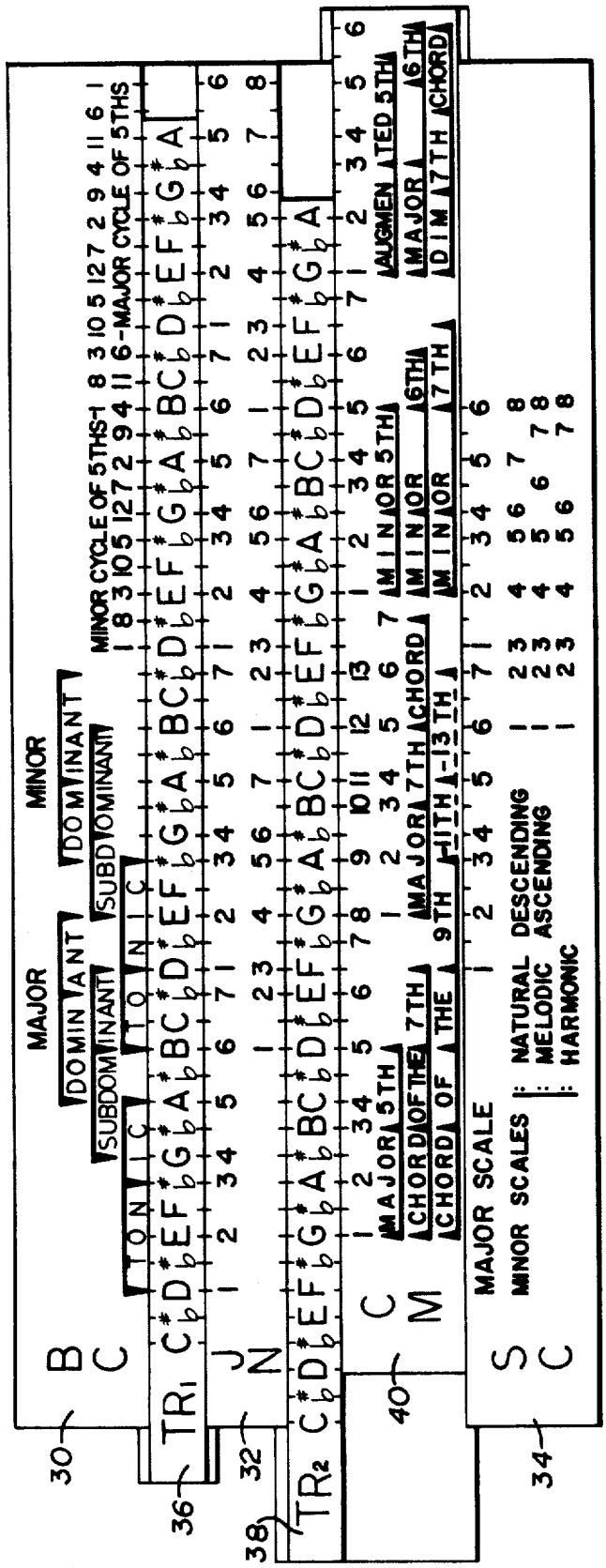

FIG. 4

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SLIDE RULE FOR COMPUTING MUSICAL RELATIONSHIPS

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to teaching devices for teaching the relativity of an array of musical relationship pertaining to music theory, as they relate to transposition, composition, and arrangement through harmonious chord combination and modification thereof. More particularly, the invention relates to a slide rule for computing an array of musical relationships through mathematical constants.

2. Description of the Prior Art

In the prior art of music slide rules and devices related thereto for teaching various aspects of music and music theory, there is a wide variety of devices which have been utilized from time to time. Certain of the prior art devices were conceived to aid only narrow and limited areas in the study of music, as for example, to aid in teaching chords as played on a piano or other similar instruments. Other such devices help teach the playing of stringed instruments such as the guitar, banjo, etc.

Some prior art devices were designed with extreme simplicity and low cost of manufacture in mind with the result that the amount of information obtainable therefrom is limited and often inadequate. In other cases, music slide rule devices were designed in such a complex manner that they are difficult to understand and offer little help or guide to the beginner or even intermediate student of music.

A significantly improved approach to the design of a music slide rule is needed in order to teach more efficiently and comprehensively the theory of music and the relativity of strict mathematical constants as they apply to scale and chord structure, in all their varied forms in any major or relative minor key, whether in chords per se or in arpeggio. Such an improved slide rule should provide a permanently useful tool for progressive study for the beginning student to the advanced composer or musician. The present invention provides these desired features by combining simplicity of construction and design with a completeness not yet achieved by any prior art device. All of the significant practical musical relationships are readily available and graphically displayed simultaneously by means of the present invention for any given major or relative minor key.

SUMMARY OF THE INVENTION

In accordance with the present invention, there is set forth a slide rule for computing musical relationships. These relationships include the following: major and relative minor diatonic scales and their interval patterns of full steps and natural half steps; basic major and relative minor chords as they pertain to any key and modifications thereof which include seventh chords, ninth chords, 13th chords, major sixth chords, minor sixth chords, major seventh chords, minor seventh chords, augmented fifth chords, and diminished seventh chords; factors governing key signatures; and major and minor cycles of fourths and fifths. The slide rule may be embodied in either a circular or a linear form.

The circular form comprises a number of individually rotatable discs mounted upon a base. A series of marks and indicators are inscribed upon the base in mathematically constant spatial orientation and which represent the means for integrating various scale and chord relationships. Upon each rotatable disc are a series of marks, letters, and numbers representing musical scales and tones. The uppermost disc also contains a series of marks which graphically indicate a variety of musical chord patterns and relationships making possible the modification of any major or minor triad in any major or minor key. On the base member is displayed the diatonic scale interval patterns for both major and relative minor scales, and there is also shown compatible basic triad patterns applicable to any key in both the major and relative minor domains.

The linear form of the slide rule contains a plurality of slidable members and a plurality of stationary members together comprising the face of the slide rule. The same markings which are found on the circular slide rule are also arranged on the linear slide rule to perform essentially the same function. These functions include, among others, the graphic representation of the seven-toned major and relative minor diatonic scale interval patterns which serve as mathematical constants for all major and relative minor keys. Another function is to represent the basic chords compatible with any given key in both the major and relative minor domain among which are the tonic, subdominant and dominant triads. A further function is to permit transposition from any major key into any other major key and from any minor key into any other minor key. Yet another function is to provide for modifying any of the basic chords in any of the major and relative minor keys, while still another function is to provide a graphical display of the important cycle of fifths and cycle of fourths relationship which are utilized in the areas of composition and harmony and in explaining factors governing key signatures. Each embodiment of the present invention performs these functions rapidly and in a manner which is easy for the operator to understand.

OBJECTS

It is therefore an object of the present invention to provide an improved, more complete and yet simplified, slide rule for computing through mathematical constants, an array of all of the significant musical relationships.

Another object of the present invention is to provide a music slide rule which graphically portrays through mathematical constants the basic interval patterns of the diatonic scales for both the major and relative minor domains and to adapt these interval patterns to all keys within their respective domains.

Still another object of this invention is to provide a music slide rule which will transpose single tones from any major key to any other major key and from any minor key to any other minor key.

A further object of this invention is to provide a music slide rule which will rapidly and simultaneously transpose an array of relationships including the diatonic scale and basic chords and modifications thereof from any major or minor key into any other major or minor key.

A still further object of the present invention is to provide a music slide rule which will simultaneously display the major and relative minor diatonic scales and the full range of chords which are compatible therewith within a given key.

Still other objects, features, and attendant advantages of the present invention will become apparent to those skilled in the art from a reading of the following detailed description of embodiments constructed in accordance therewith, taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 illustrates a view of the present invention designed in the circular form;

FIG. 2 illustrates the present invention designed in the linear form;

FIG. 2*a* shows a cross section view of FIG. 2 revealing the relation between slidable members and stationary members;

FIG. 3 illustrates the circular slide rule in a variable position to accomplish a given task; and

FIG. 4 illustrates the linear slide rule shifted in order to perform a task similar to that represented in FIG. 3.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to FIG. 1, there is shown a preferred embodiment of the present invention in the circular form. A base member 10, which may be made circular in form, is shown having a rectangular shape in this preferred embodiment and is designed to fit within a notebook for convenience.

One very basic aspect of music theory, which the present invention graphically and geometrically portrays, is the relationship between the chromatic scale pattern and the interval patterns of the diatonic scales in the major and relative minor domains. As shown in FIG. 1, there is a circular wheel labeled TR_1, mounted to rotate about an axis 11, and having thereon a series of equidistant marks along with the tonal alphabet and symbols to be discussed later. These equidistant marks represent the chromatic scale which has 12 equal intervals between like degrees of the scale (e.g., tone C and the next higher tone C). Upon base member 10, on the upper portion thereof and immediately adjacent to the disc TR_1, corresponding equidistant marks are inscribed. Next to some of these marks there are a pair of interval patterns 12 and 14 which constitute mathematical constants applicable throughout all operations of the music slide rule. Interval pattern 12 represents the major diatonic scale. The numbers 1 through 7, and the next successive 1, represent the seven degrees of the major diatonic scale and the first degree at the octave or prime level. The significant feature of the major diatonic scale is its interval pattern is which there are two natural half steps which occur between degrees 3 and 4 and between 7 and 1. This is illustrated as follows:

Chromatic Scale	'	'	'	'	'	'	'	'	'	'	'	'	'
Diatonic Scale	1		2		3	4		5		6		7	1
Key of C Major	C	♯	D	♯	E	F	♯	G	♯	A	♯	B	C

This same interval pattern is applicable and transferable to all other major keys be relating the mathematical constants (the degree numerals on base member 10) to the tonal letters and sharps or flats on discs TR_1 or TR_2. This will be explained later in more detail.

With disc TR_1 in the position shown, i.e., tone C aligned with numeral 1 of interval pattern 12, tone C is indicated as being the first tone in the diatonic scale of the key of C major. The significant feature of the diatonic scale in the key of C major is the absence of any sharps or flats. The diatonic scale in all other major keys has at least one sharp or flat in order to maintain the interval pattern having natural half steps between degrees 3 and 4, and between degrees 7 and 8 (1 at the prime level), which interval pattern is a mathematical constant applicable to any major key.

Interval pattern 14, representing the minor diatonic scale, involves the same basic spacial relationships as interval pattern 12 only the pattern begins at a different point. In the natural minor diatonic scale the two natural half steps occur between degrees 2 and 3 and between degrees 5 and 6.

This is illustrated as follows:

Chromatic Scale	'	'	'	'	'	'	'	'	'	'	'	'	'
Diatonic Scale	1		2	3		4		5	6		7		1
Key of A Minor	A	♯	B	C	♯	D	♯	E	F	♯	G	♯	A
												♭	

This same interval pattern is applicable and transferable to all other minor keys by relating the mathematical constants (the minor degree numerals on base member 10) to the tonal letters and sharps or flats on discs TR_1 or TR_2.

With disc TR_1 in the position shown, i.e. tone A aligned with degree numeral 1 of interval pattern 14, the diatonic scale pattern of the key of A minor is indicated. Here again there is an absence of sharps and flats since all degree numerals on base member 10 are aligned with tonal letters on disc TR_1. For this reason the key of A minor is said to have a special relationship with the key of C major. The key of A minor is called the relative minor of the key of C major, since they both have the same key signature, namely no sharps or flats.

By having interval pattern 12 and 14 (the mathematical constants) graphically inscribed together upon base member 10, the student of music quickly obtains a feel for the interrelationship between the major and relative minor domains. For any given key in the major domain there is a corresponding relative minor. When disc TR_1 is moved to place the first tone of a particular key beneath numeral 1 of interval pattern 12, the relative minor scale is simultaneously readable under numeral 1 of interval pattern 14.

Also inscribed upon base member 10 are other mathematical constants, namely chord indicators that indicate the basic chord (or triad) groups which exist in any given key in both major and relative minor domains respectively. These triads are the tonic 16 and 18, the subdominant 20 and 22, and the dominant 24 and 26. With disc TR_1 in the position shown, the indicated chords of the major domain pertain to the key of C major and those of the relative minor domain pertain to the key of A minor. One observes that the tonic triad of C major is made up of the first, third and fifth tones of the major diatonic scale. These, in turn, relate to the tones C, E and G on disc TR_1. In a similar manner, the subdominant and dominant triads are designated as being made up of the tones F, A, C and G, B, D respectively. In the relative minor domain the tonic triad also consists of the first, third and fifth tones of the natural minor diatonic scale, which are tones A, C and E for the key of A minor as seen on disc TR_1. The subdominant and dominant triads in the relative minor domain in the key of A are readily observed to be comprised of tones D, F, A and E, G, B respectively.

A second rotatably disc labeled TR_2 is mounted about axis 11 and has a diameter somewhat less than disc TR_1. The markings and symbols upon TR_2 are substantially the same as those of TR_1. The equal intervals of the chromatic scale are inscribed thereon and also the tonal alphabet with intervening sharps and flats. One of the main functions of disc TR_2 is to permit transposition of musical scales and chords from any key into another. As shown in FIG. 1, disc TR_2 is rotated in order that tonal letter G is aligned with tonal letter C of disc TR_1. In such position the diatonic scale in the key of C major, and chords compatible with that key, are transposable into the diatonic scale in the key of G major and chords compatible therewith. One must merely follow the degree numerals of the major diatonic scale on base member 10 in order to see the diatonic scale pattern in the key of G major. Note that in the transpositional process, C becomes G, D becomes A, E becomes B, F becomes C, G becomes D, A becomes E, and B becomes F♯. The chord indicators 16, 20 and 24 simultaneously indicate the various basic triads, namely the tonic, subdominant and dominant, by pointing directly to the proper tones. In the key of G the tonic triad comprises the tones G, B, and D. Likewise with subdominant and dominant chords the notes are C, E, and G, and D, F♯, A respectively. The relative minor key corresponding to the major key of G can be found as the key of E minor, since the tonal letter E is aligned with the numeral 1 of interval pattern 14. The E minor diatonic scale and the tonic, subdominant and dominant chords in the relative minor domain are determined in the same manner as the major diatonic scale and chords were determined except that they relate to interval pattern 14; and chord indicators 18, 22 and 26 are utilized. A further example of transposing from one key into another key will be more thoroughly discussed in connection with FIG. 3 where both discs TR_1 and TR_2 are illustrated in a rotated position.

There is also shown in FIG. 1 a third rotatable disc labeled CM, which is also mounted to rotate about axis 11 and is smaller in diameter than disc TR_2. Inscribed upon disc CM are the equally spaced chromatic scale intervals. In addition, the interval pattern of the major diatonic scale is indicated with degree numerals. There are further inscribed on disc CM a plurality of chord indicators which are clearly labeled. These include an indicator for the major fifth chord, the seventh chord, the ninth chord, the 11th chord, the 13th chord, and the major seventh chord. There is also shown an indicator for the minor fifth chord or triad, the minor sixth chord and the minor seventh chord. And finally, there is also shown chord indicators for the augmented fifth chord, the major sixth chord, and the diminished seventh chord. All of these chords are frequently utilized in the process of composing and arranging music.

The purpose of these chord indicators is to provide a means

or modifying the major and relative minor tonic subdomi ..t and dominant triads, and for defining and modifying any f the other triads that may be formed within the structure of the major and minor diatonic scales. To do this, one first determines the root of the chord to be modified. The root of a chord is the first tone in ascending order. For example, the root of the major tonic triad in the key of C is the tone C. To take an example from the slide rule as illustrated, the dominant chord in the key of G major is seen to be comprised of the ones D, F♯ and A, which are indicated by the bracket or chord indicator **24** and are read from disc TR_2. To modify this dominant chord a numeral **1** on disc CM must be aligned with the root of the chord to be modified, which in this case is the tone D as shown. The dominant seventh chord in the key of G is then determined from chord indicator labeled seventh chord which points to the notes D, F♯, A, and C. Any of the modifying chords inscribed upon disc CM could be utilized to modify the dominant chord in the key of G, or any other of the basic triads in that key.

Another function of component CM is to indicate any of the other triads which may be formed. Each of the seven degrees of the diatonic scale may constitute the root of a triad and each one has its own name as expressed in the table below (for the C major scale).

	Tones			Triad
Degree:				
1st	C	E	G	Tonic.
2d	D	F♯	A	Supertonic.
3rd	E	G♯	B	Mediant.
4th	F	A	C	Subdominant.
5th	G	B	D	Dominant.
6th	A	C♯	E	Submediant.
7th	B	D♯	F♯	Leading tone.

The Major fifth (triad) or Minor fifth (triad) chord indicators on component CM will indicate, at the discretion of the operator of the music slide rule, the triads not pointed out by the brackets on base member **10**. They are the supertonic, mediant, submediant and leading tone. This is done by aligning the numeral **1** of the major or minor fifth chord indicator on disc CM with the root of the triad to be indicated on disc TR_2. Each of the above triads may be modified in the various ways described for modifying the tonic, subdominant and dominant.

Also, inscribed upon base member **10** are two series of numbers **28** and **29**. These series are designed to indicate the cycle of fifths in the major and the relative minor domains. By setting disc TR_1 in a position where the tone C is opposite the number **1** of series **28**, the key signature for each successive fifth is directly readable from the series. The first fifth from tone C is tone G, the next fifth from tone G is tone D, and so on. The same applies in the relative minor domain where the tone A is placed directly opposite the number **1** of series **29**. The first fifth from tone A in the minor cycle of fifths is E, the next fifth from tone E is tone B, and so on. The cycle of fifths is significant in that the diatonic scale beginning with each successive fifth picks up one sharp. The fifth degree in the key of C major for example is G. The key of G has one sharp. Subsequently, the fifth degree of the G major scale is D. The key of D major has two sharps, etc. Number series **28** and **29** point out the order in which the fifths progress from C major and A minor respectively. The cycle of fifths is also used to indicate chord progressions. An actual circle of fifths may be constructed from the data on this slide rule providing additional work and drill in music practice.

Referring now to FIG. **2**, there is shown a linear embodiment of the present invention. As shown, the face of the linear slide rule is divided into six portions. Three portions are in a fixed relationship with each other and are rigidly fastened to a backing member not shown. These portions comprise the top section **30**, labeled BC for basic chords, the third section **32** from the top, labeled JN for maJor and miNor, and the bottom section **34**, labeled SC for scale comparison. Between section **30** and section **32** is slidable member, section **36**, which is labeled TR_1. Between sections **32** and **34** are two slidable members **38** and **40** which are labeled TR_2 and CM respectively.

This linear embodiment of the slide rule performs the same functions as the circular embodiment. Each of the sections have marked thereon equally spaced intervals which represent the chromatic scale. The major and minor diatonic scales are inscribed upon section **32** in their relative positional relationship and consist of degree numerals used as mathematical constants. The initial tone of the minor octave falls in line with the sixth tone of the major octave, and each pattern is repeated across the length of section **32**. Upon section **30** are inscribed the basic triads by means of labeled chord indicators showing the tonic, subdominant, and dominant F , for both the major and F . relative minor domains. On the right-hand side of section **30** are inscribed two sets of numbers which are labeled the major (lower set) and minor (upper set) cycle of fifths. In order to obtain the major cycle of fifths starting with C, a tone C located on slidable member TR_1 is placed beneath the numeral **1** of the set of numbers relating the major cycle. Each successive fifth for all of the major cycle of fifths is then directly readable underneath the corresponding number in ascending order. In order to get the same information in the minor domain, a note A is positioned beneath the numeral **1** of the set of numbers relating to the minor cycle, ans the above process is repeated. For the purposes of progression, however, in composition and arrangement, the cycle of fifths may begin with the first degree in any key and continue as the subject numerals on section **30** dictate.

The marks and letters and symbols found on slides TR_1 and TR_2 in the linear embodiment are identical with those found on similarly labeled discs of the circular embodiment, described in FIG. **1**. Likewise section **40** or slide CM contains markings and numerals which correspond with disc CM of the circular embodiment. The interval pattern of the major diatonic scale is represented by properly spaced numerals and the same chord indicators are inscribed thereon and labeled.

Section **34**, or stationary member labeled SC, has inscribed thereon the major scale and the natural minor scale plus two variations thereof labeled melodic (ascending) and harmonic. These scales are useful for student reference and instructional purposes.

In operation, the linear slide rule functions to provide all of the data obtainable with the circular embodiment. When slide TR_1 is placed with tone C above the numeral **1** of the J series, then the tonic, subdominant and dominant triads are directly readable upon the TR_1 slide, and would be CEG, FAC, and GBD respectively in the key of C major. In like manner, the tonic, subdominant and dominant chords are directly readable in the relative minor domain. To transpose from the key of C major into any other key one needs merely to leave the TR_1 slide in its normal position with the letter C over the numeral **1** on the J series of stationary member **32**. One then shifts the TR_2 slide to the left until the point representing the first degree of the new key (tone F for example) is directly under the numeral **1** of the J series on stationary member **32**. Then each of the basic triads of the new key is directly readable upon slide TR_2. One may transpose from the key of A minor to any other minor key in the same manner except reference is made to the minor triad indicators on stationary member **30**, and the numeral **1** of the N series is used on stationary member **32**. The process of transposing from a key other than C in the major domain or than A in the relative minor domain, into any other key in the major or minor domains involves manipulating slides TR_1 and TR_2 together. This process will be explained in conjunction with FIG. **4**, where these slides are shown in a different position.

Finally, the process of modifying the basic chords is accomplishing through the use of section **40** or slide labeled CM. After determining which chord one wishes to modify, the root thereof is ascertained. For example, the root of the subdominant chord in the key of C major would be tone F. One then would place a numeral **1** on the slide CM beneath a tone F on slide TR_2. Thereafter the tones are directly readable above the fingers of the chord indicators on slide CM. An example of

this will be further detailed in connection with FIG. 4 where the slide CM has been shifted

Referring now to FIG. 2a, there is shown a cross section of the linear embodiment described in FIG. 2 cut along the lines 2a. There is shown a base member 44 to which sections 30, 32 and 34 are rigidly attached. There is also shown slidable sections 36, 38 and 40. Section 38 is designed to carry section 40 when it is moved. However, section 40 is able to slide independently of section 38. Therefore, section 40 can be easily positioned with respect to section 38. The linear slide rule may be constructed out of a variety of practical substances, such as wood, metal or plastic.

Referring now to FIG. 3, the present invention in the circular embodiment is shown with discs TR_1, TR_2 and CM each shifted to a position different than that shown in FIG. 1. As shown, disc TR_1 has the tone D situated beneath the numeral 1 of interval pattern 12. In this position the tones readable under the basic triads (tonic, subdominant and dominant) in the major domain, all apply to the key of D major, and in the relative minor domain they apply to the key of B minor. For example, the major tonic triad reads D, F♯, A, and the relative minor tonic reads B, D and F♯.

By rotating disc TR_2 until tone F aligns with tone D of disc TR_1 (as shown) it may be demonstrated how the present invention can transpose an array of relationships from the key of D major into the key of F major, or from the key of B minor into the key of D minor. With disc TR_2 in the position shown, all of the basic chords of the key of D major are simultaneously transposed into the key of F major by merely allowing the eye to follow down from disc TR_1 onto TR_2. For example, the tonic chord in the key of F major is F A C, and in the key of D minor is D F A.

Each of the basic chords of either the key of D major or B minor or the key of F major or D minor may be modified into the various chords shown on disc CM merely by aligning the root of a given chord with a numeral 1 on the CM disc. For example, the root of the subdominant chord in the key of D major is G. By placing a numeral 1 of the CM disc in line with a G on the TR_2 disc, the subdominant chord in that given key can be modified into all of the other designated chords. In the position shown, the subdominant root in the key of F major is B♭. This subdominant chord could be modified by a slight rotation of disc CM which would align a numeral 1 thereon with a B♭ on the TR_2 disc.

As one can now appreciate, the present invention provides an extremely simplified yet very thorough means for simultaneously presenting a wide array of data relating to musical theory. The user of this device not only is able to quickly obtain the needed harmonic relationships and chord modifications that he may desire, but he will soon develop a fuel for the overall interrelationship between the major domain and the relative minor domain. The user will soon learn the basic chords of each domain, how these basic chords can be transposed back and forth among the various keys, and how they can be modified into the various other harmonic chords.

Referring now to FIG. 4, the linear embodiment of the present invention is again shown with slidable members 36, 38 and 40 in nonneutral positions. Corresponding to the example set up for the circular embodiment in FIG. 3, slide TR_1 has been shifted to the left to align tone D above numeral 1 of the J interval pattern, and slide TR_2 has been shifted to the left in order to align tone F with the same numeral 1 and with tone D of TR_1. With slides TR_1 and TR_2 in this relationship, chords in the key of D major or the key of B minor, which is the relative minor of D major, may be transposed into the keys of F major or D minor respectively; D minor being the relative minor of F major. That D minor is the relative minor of F major is shown because the tone D on slide TR_2 is now positioned below the number 1 of the minor, or N, interval pattern on section 32.

To accomplish chord modification, slide CM has been shifted to the right in order to modify the subdominant chord in the key of D major. Therefore, the numeral 1 of CM slide is positioned below the tone G on the TR_2 slide. The tone G was chosen, of course, because it is the root of the subdominant chord in the key of D major. As described before, this process is repeatable for any of the other basic chords merely by shifting slide CM to place the index 1 beneath the root of the given basic chord to be modified.

The whole array of relationships, including chord modification, may be transposed from one key to another by basically the same operation as shown in FIG. 4 with the following variation. Numeral 1 on slide CM may be aligned with tone G on slide TR_1 or B♭ on slide TR_2 in the position shown. G is the first tone of the subdominant triad in the key of D major, and B♭ is the first tone of the subdominant triad in the key of F major. If the sixth chord variation were desired using this alignment, the fingers of the chord bracket on slide CM would indicate the subdominant sixth to be GBDE in the key of D major and B♭ DFG in the key of F major.

Another embodiment of the present invention, not shown in the figures, involves the use of both front and back sides of the base member with additional slidable members mounted on the back side. One advantage of such an embodiment is to have one side of the slide rule designed for beginning students and the other for more accomplished musicians and experts in the field of music. The simplified side would have fewer movable members mounted thereon, and would be designed to operate upon the most basic musical relationships.

Although the invention has been described in detail, it is to be understood that the same is by way of illustration an example only, and is not to be taken by way of limitation, the spirit and scope of this invention being limited only by the terms of the appended claims.

What I claim is:

1. A slide rule for computing musical relationships
comprising at least one base member forming a portion of the face of a said slide rule,
said base member having a scale of equally spaced marks thereon representing the steps of a chromatic scale and numerical designators for designating major and relative minor diatonic scales with respect to said chromatic scale and further having a plurality of chord indicators inscribed thereon for indicating basic major and minor musical chords, and
a plurality of movable members forming the remaining portion of said slide rule face and positioned to move with respect to said base member and with respect to themselves,
said movable members having a scale of equally spaced marks thereon representing said steps of said chromatic scale and further having alphabetical and symbolical designators for defining the musical tones represented by said chromatic scale, and
said base and movable members being positioned relative to each other at a plurality of positions determined by said scale of equally spaced marks with each position simultaneously displaying a plurality of musical relationships defined by said marks, scales, designators and chord indicators, which relationships include chord indication and transposition.

2. The device of claim 1 wherein said slide rule has a linear form with said movable members slidable in parallel directions with respect to said base member and with respect to themselves.

3. The device of claim 2 wherein said base member as further inscribed thereon two cycle-of-fifths scales of numerical indicators spaced to correspond with said equally spaced chromatic scale marks on said movable members and cooperating with either movable member to display a complete and different cycle-of-fifths in the major and minor musical domains for each different setting of said chromatic scale marks with respect to said cycle-of-fifths scales.

4. The device of claim 1 wherein said slide rule has a circular form with said movable members rotatable about an axis common to themselves and to said base member.

5. The device of claim 4 wherein said base member has further inscribed thereon two cycle-of-fifths scales of numerical indicators spaced to correspond with said equally spaced

chromatic scale marks on said movable members and cooperating with either movable member to display a complete and different cycle-of-fifths in the major and minor musical domains for each different setting of said chromatic scale marks with respect to said cycle-of-fifths scales.

6. A slide rule for computing musical relationships comprising

a base member forming a portion of the face of said slide rule and having a scale of equally spaced marks thereon representing the steps of a chromatic scale and numerical designators for designating major and relative minor diatonic scales with respect to said chromatic scale and further having a plurality of chord indicators inscribed thereon for indicating basic major and minor musical chords, and

first and second movable members forming a portion of said face and each having a scale of equally spaced marks thereon representing said steps of said chromatic scale and further having alphabetical and symbolical designators for defining the musical tones represented by said chromatic scale, and

a third movable member forming a portion of said face and having a scale of equally spaced marks inscribed upon the rim thereof representing said steps of said chromatic scale and further having a plurality of differing chord indicators thereon for modifying said basic major and minor musical chords in any preselected key,

said base member and said movable members cooperating with each other for changing between a plurality of positions determined by said scale of equally spaced marks the relative orientation of said marks, scales, designators and chord indicators with respect to each other thereby providing for simultaneous transposition of musical notes and chords between different keys and modifications of said chords.

7. The device of claim 6 wherein said slide rule has a linear form with said first and second movable members slidable in parallel directions with respect to said base member and with respect to themselves.

8. The device of claim 7 wherein said base member has further inscribed thereon two cycle-of-fifths scales of numerical indicators spaced to correspond with said equally spaced chromatic scale marks on said first and second movable members and cooperating with either of said first or second movable member to display a complete and different cycle-of-fifths in the major and minor musical domains for each different setting of said chromatic scale marks with respect to said cycle-of-fifths scales.

9. The device of claim 6 wherein said slide rule has a circular form with said first second and third movable members rotatable about an axis common to themselves and to said base member.

10. The device of claim 9 wherein said base member has further inscribed thereon two cycle-of-fifths scales of numerical indicators spaced to correspond with said equally spaced chromatic scale marks on said first and second movable members and cooperating with either first or second movable member to display a complete and different cycle-of-fifths in the major and minor musical domains for each different setting of said chromatic scale marks with respect to said cycle-of-fifths scales.