

Oct. 4, 1949.

R. D. BERGEY

2,483,570

MUSIC TIMING APPARATUS

Filed April 24, 1945

4 Sheets-Sheet 1

Fig. 1.

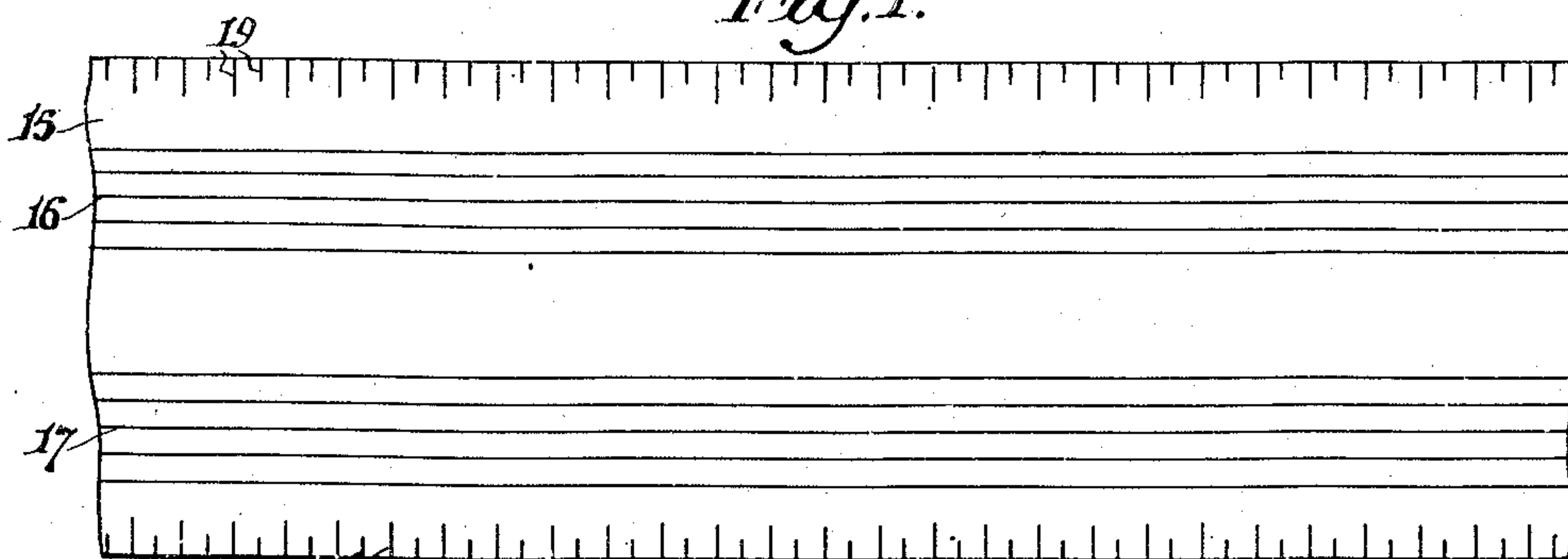


Fig. 2.

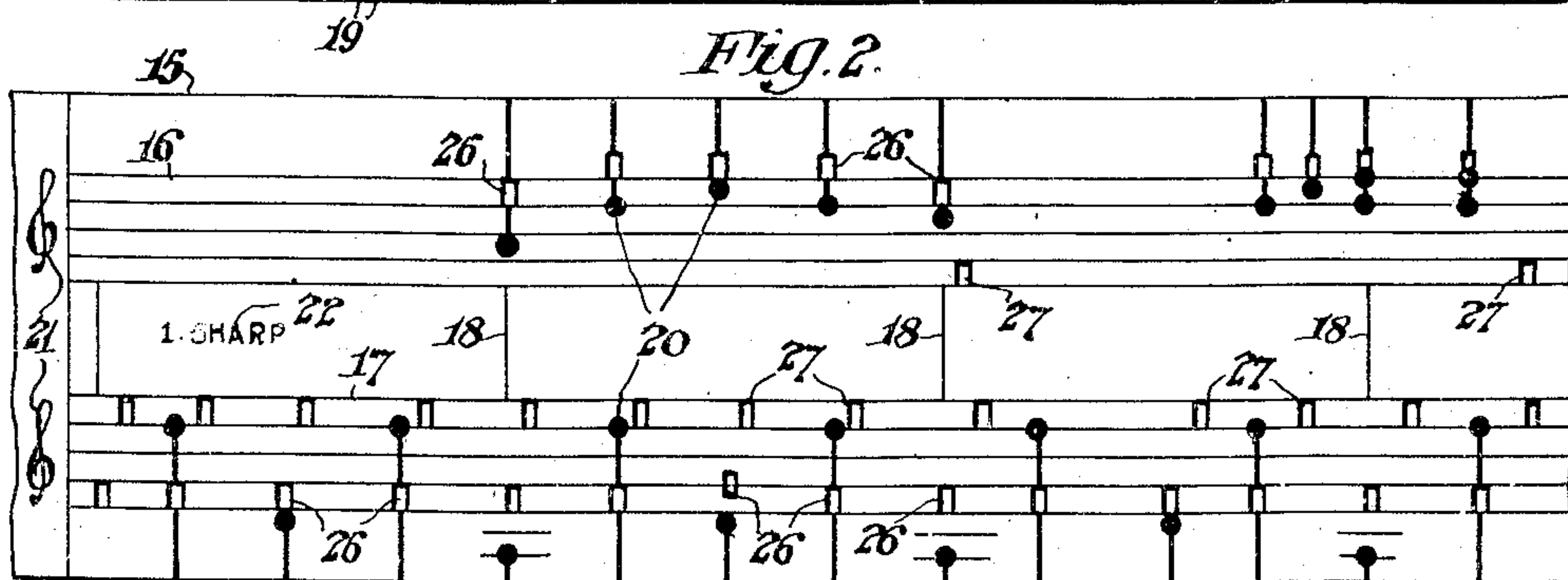
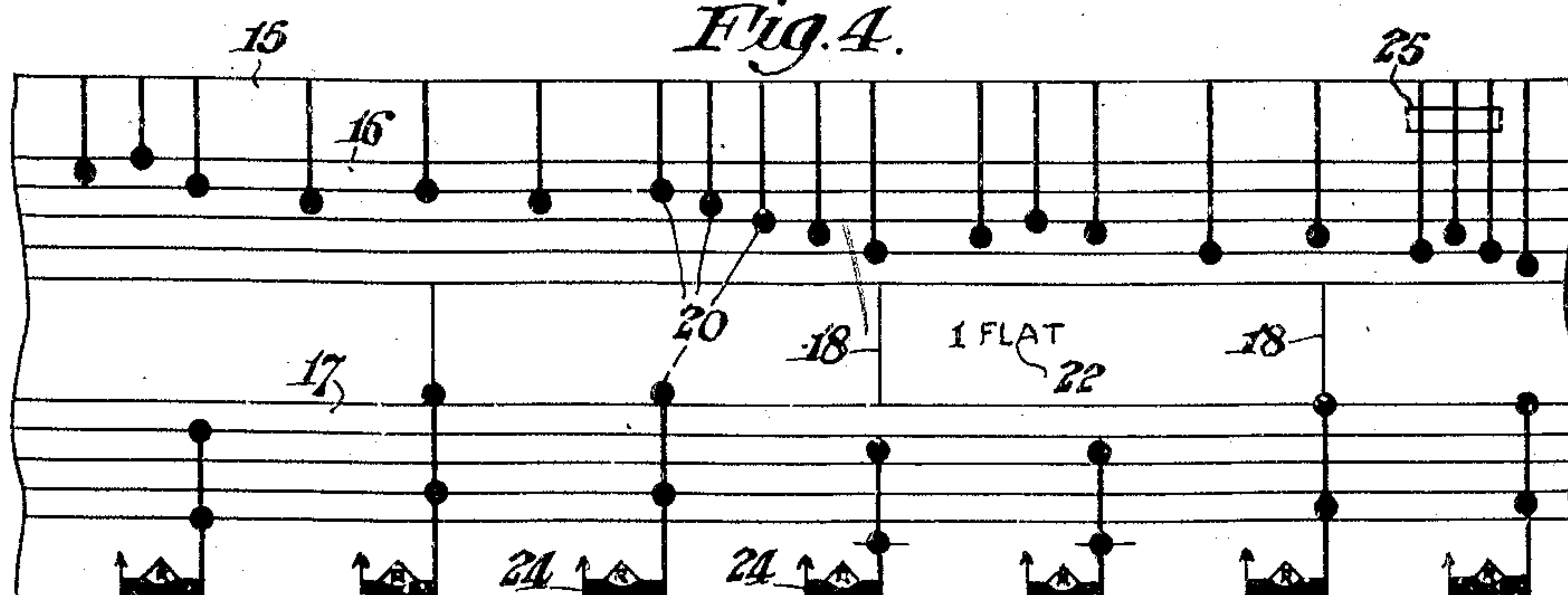


Fig. 3.



Fig. 4.



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Fig. 5.

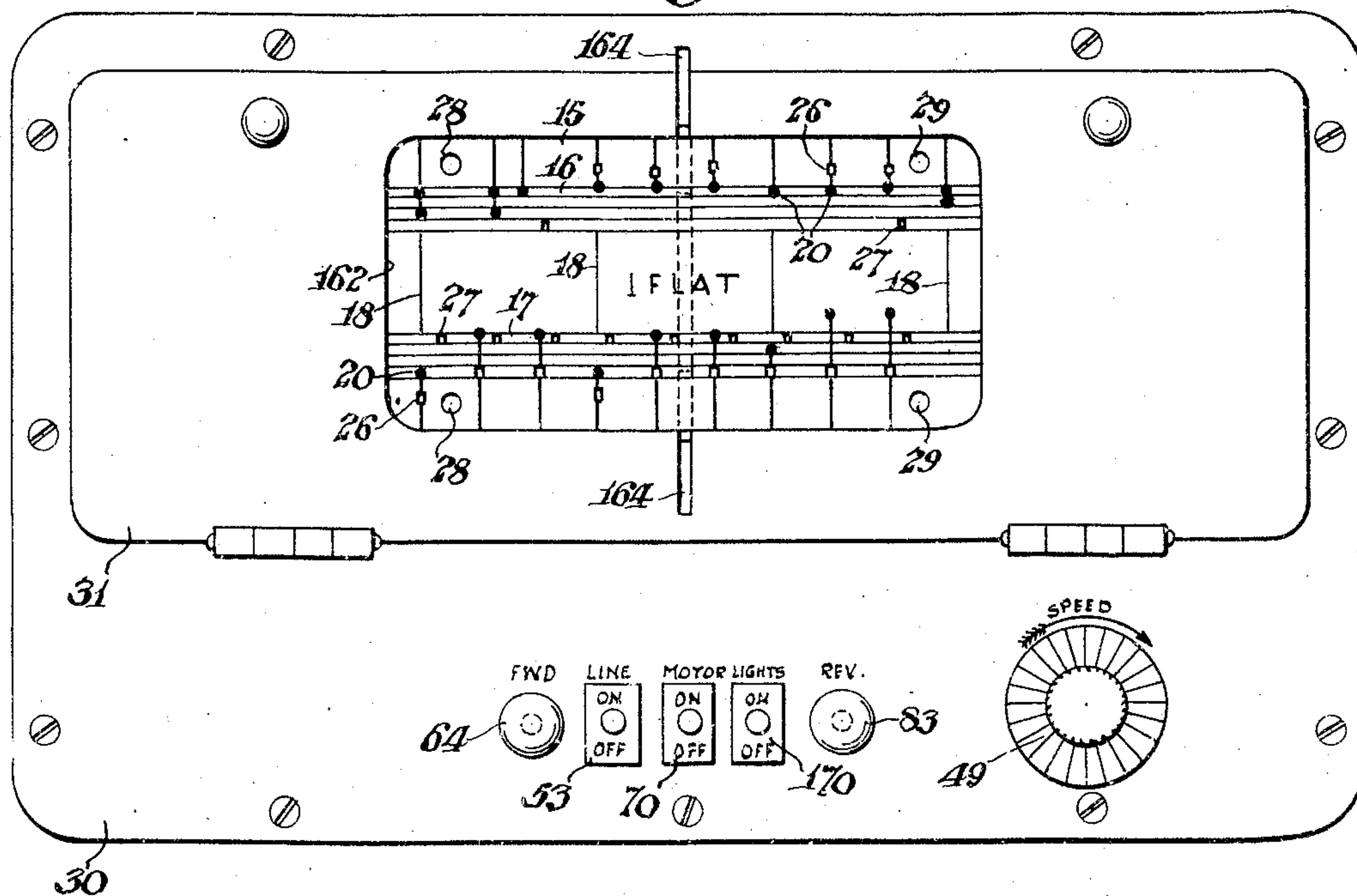
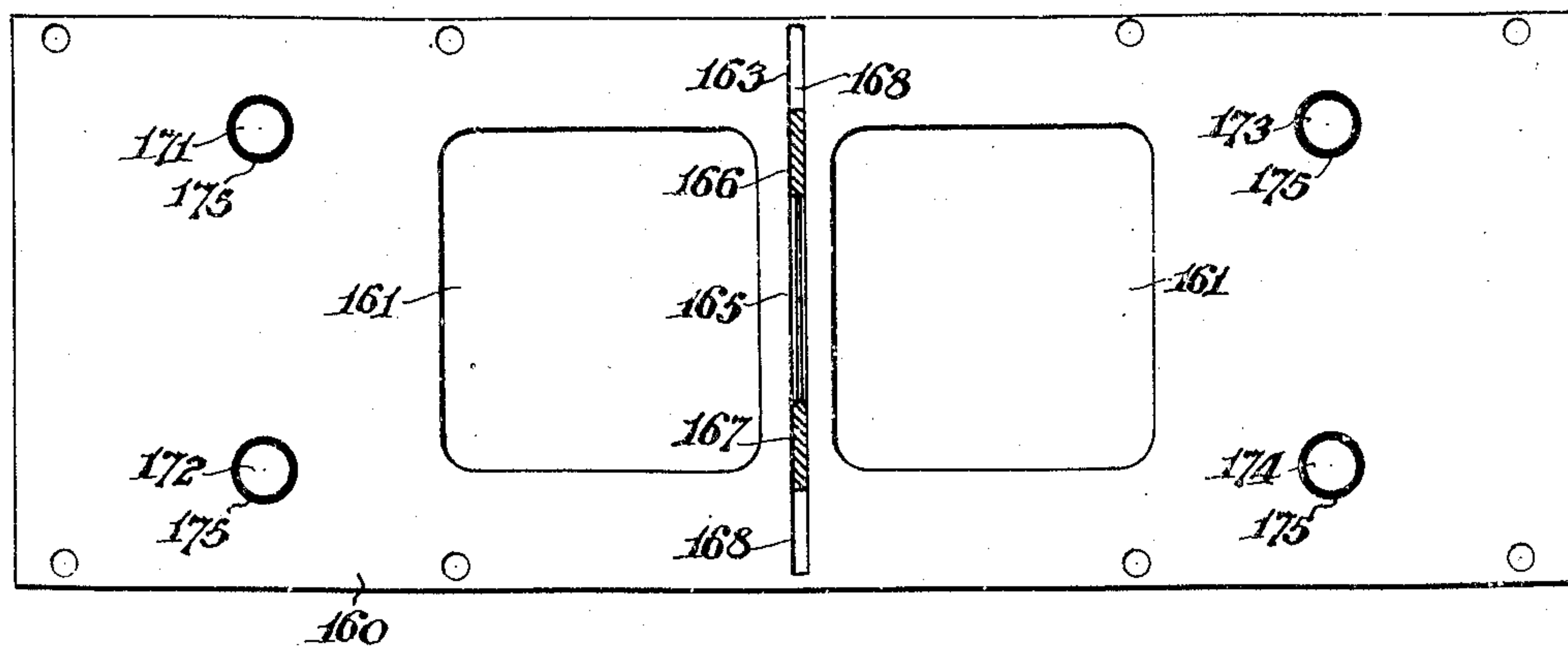


Fig. 6.



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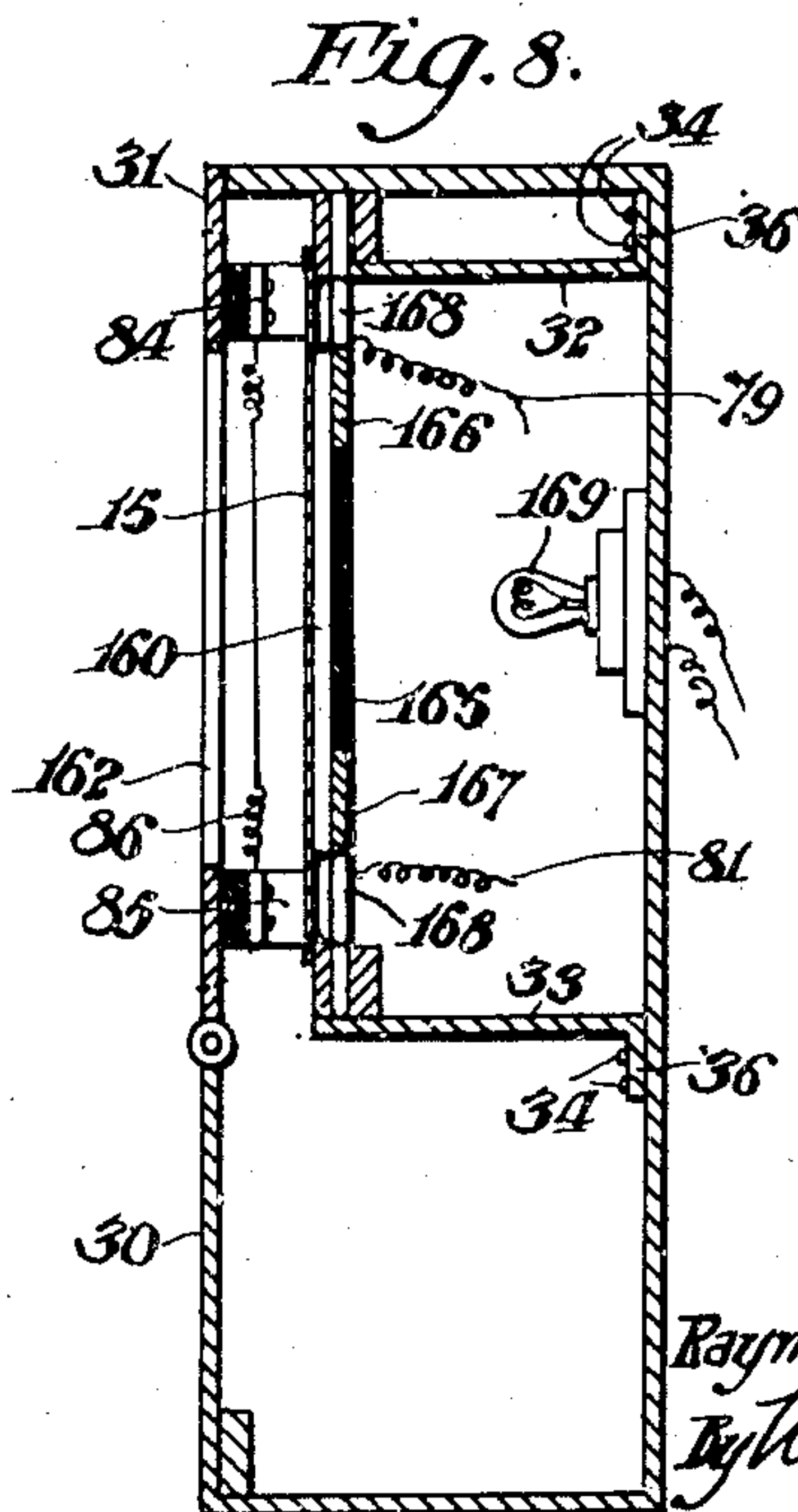
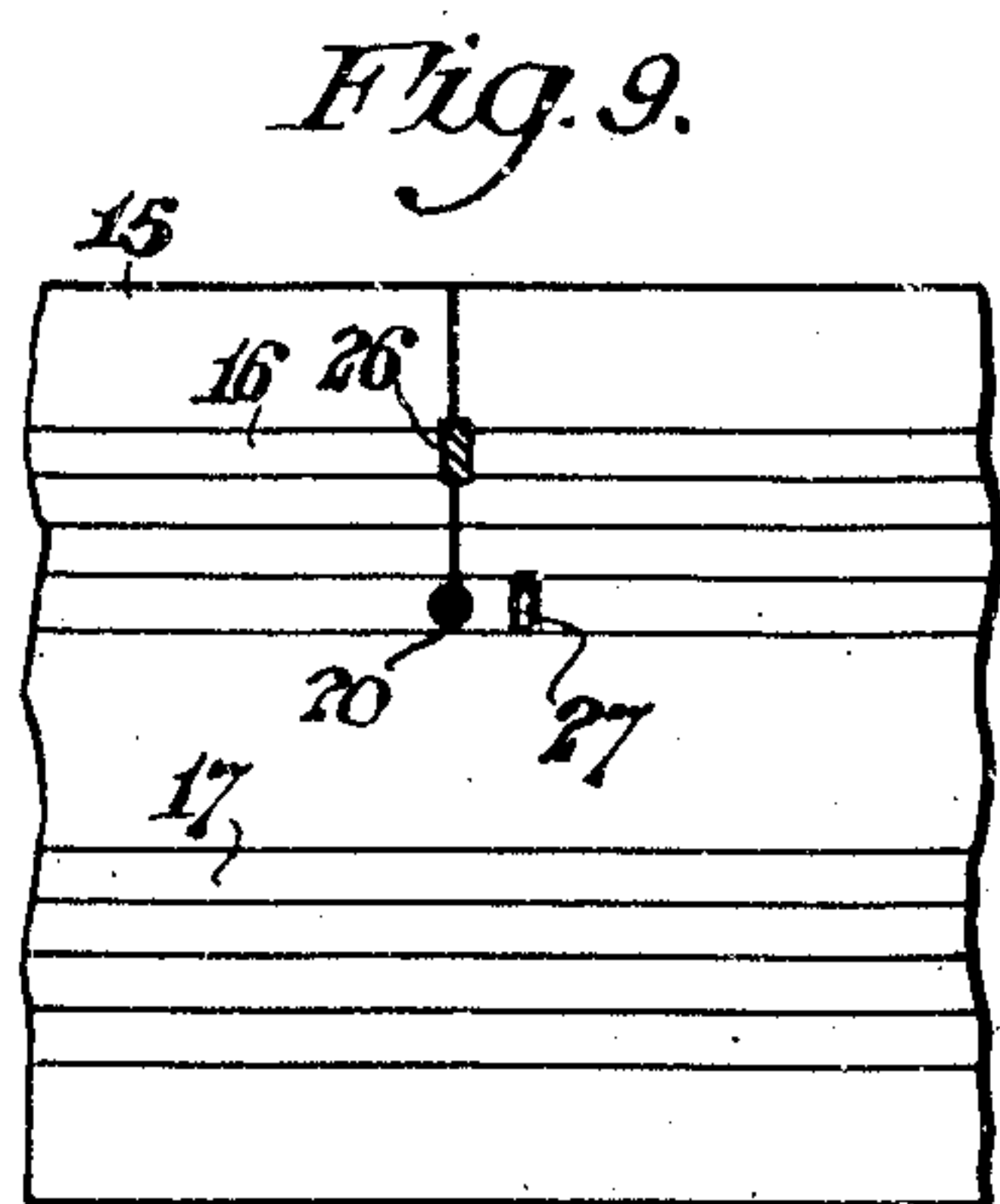
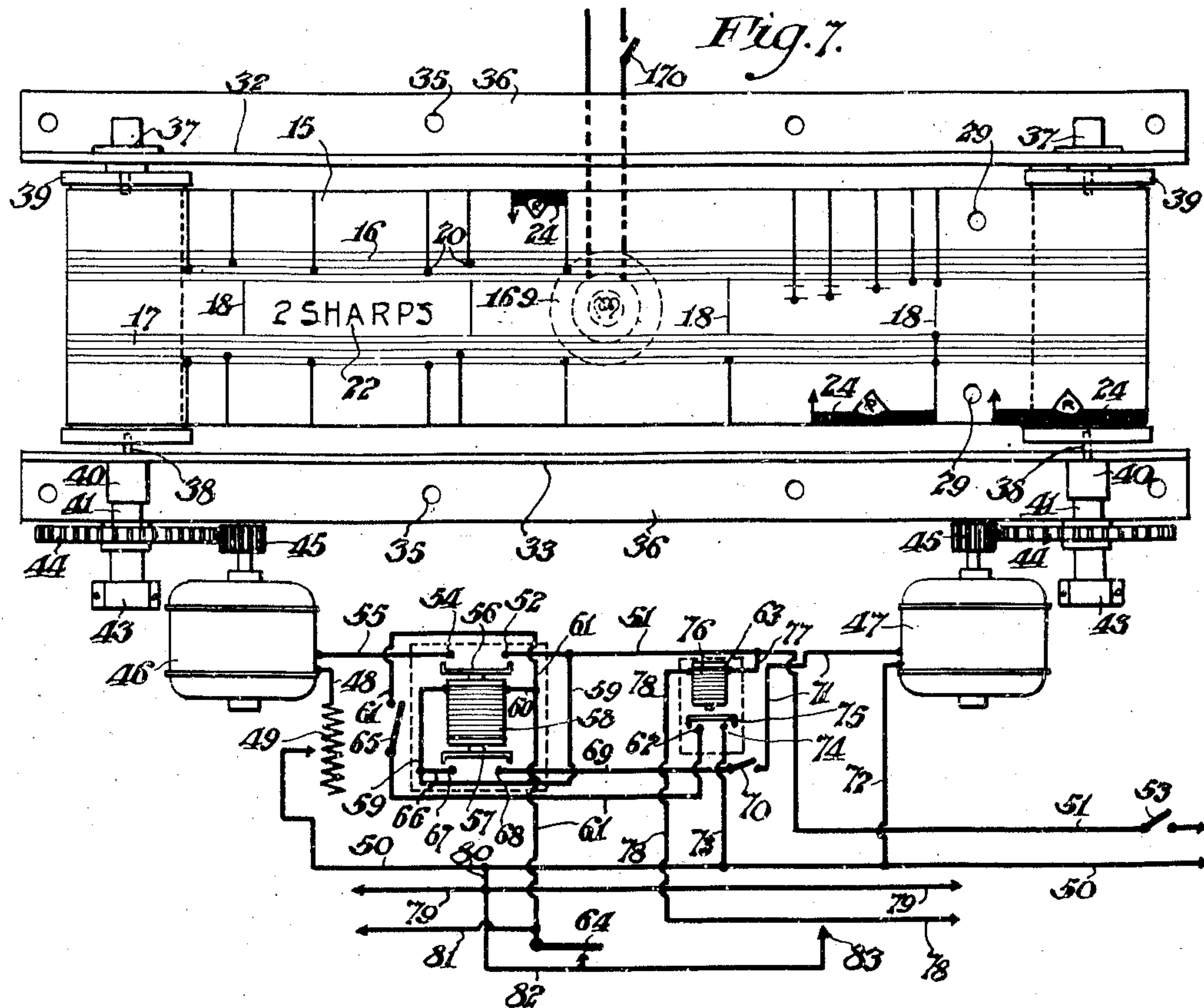
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4 Sheets-Sheet 3



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MUSIC TIMING APPARATUS

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Fig. 10.

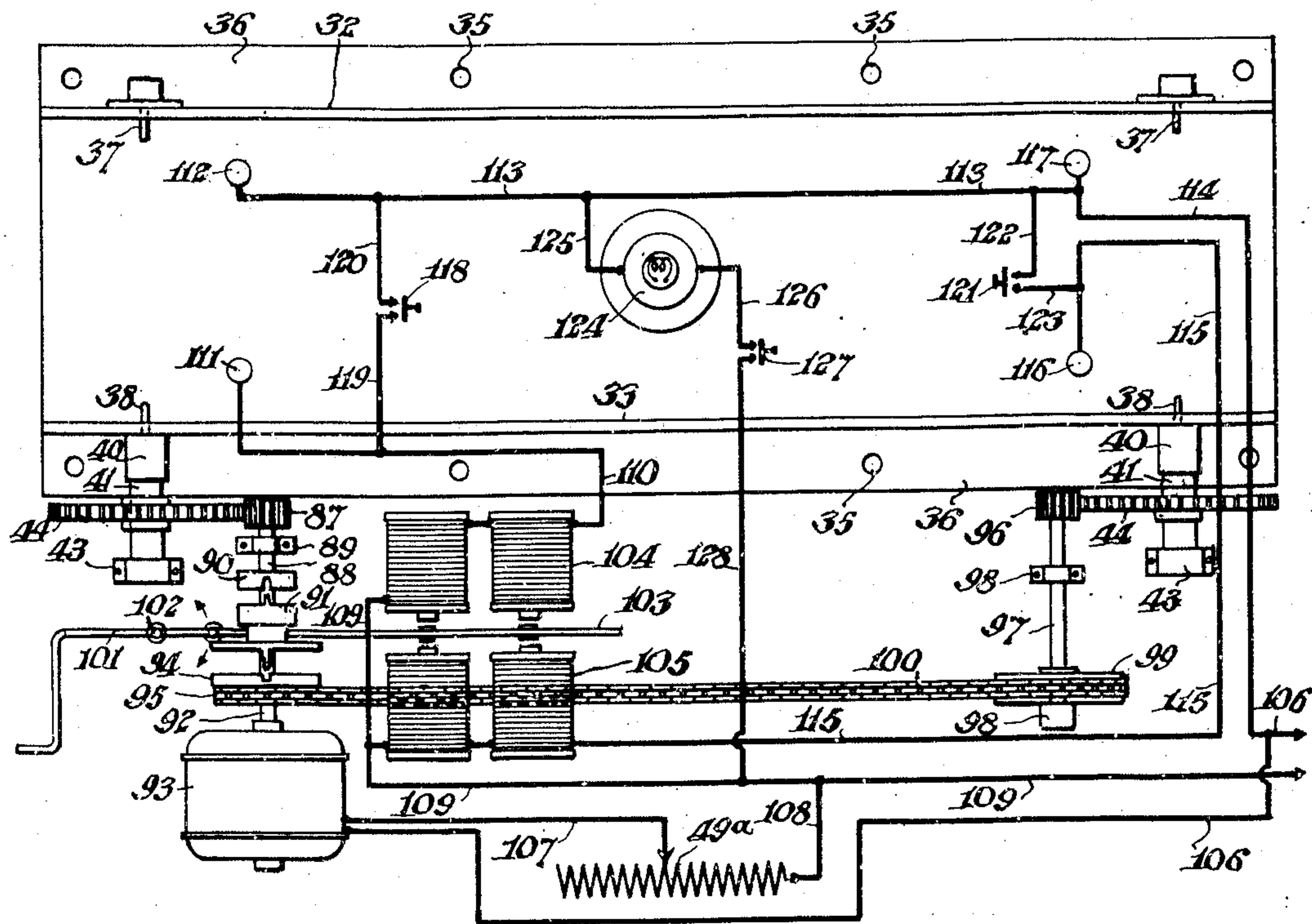
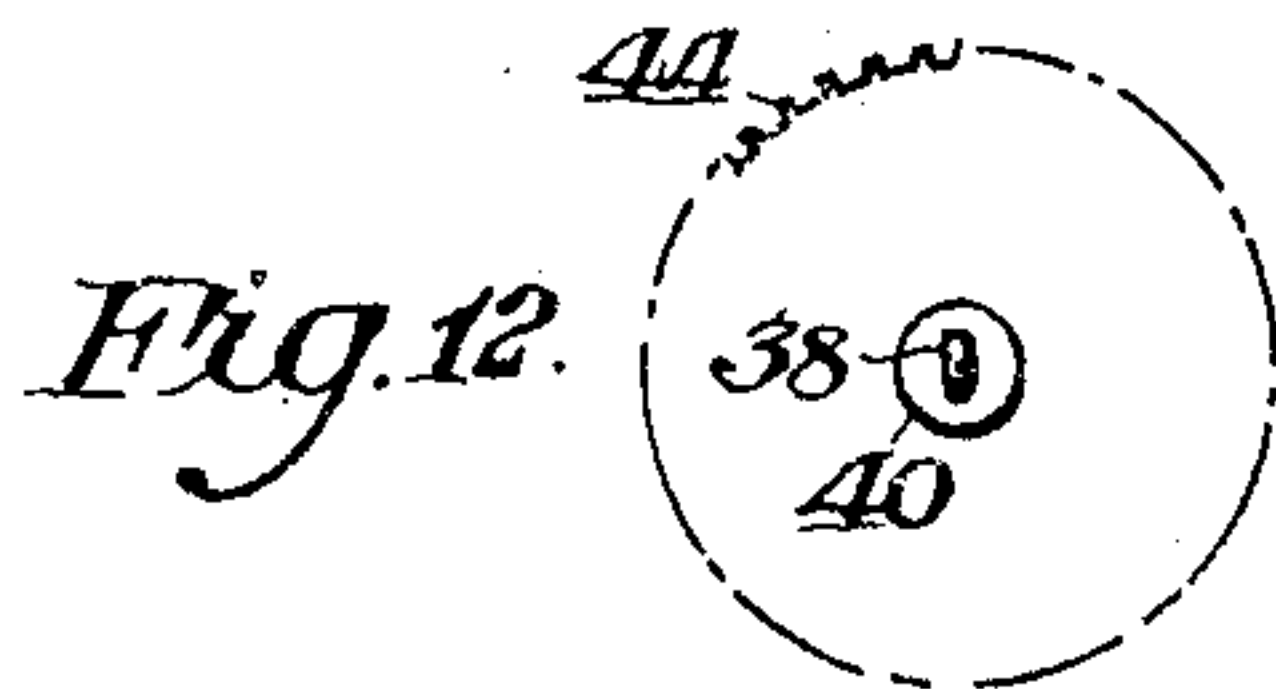
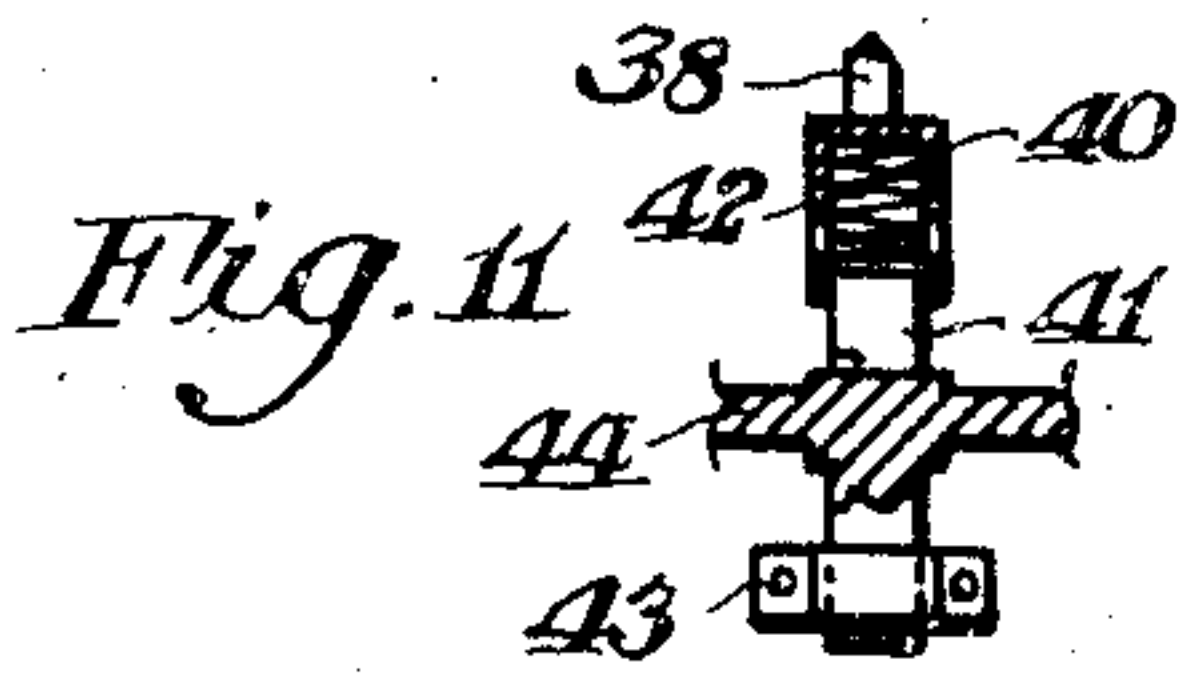
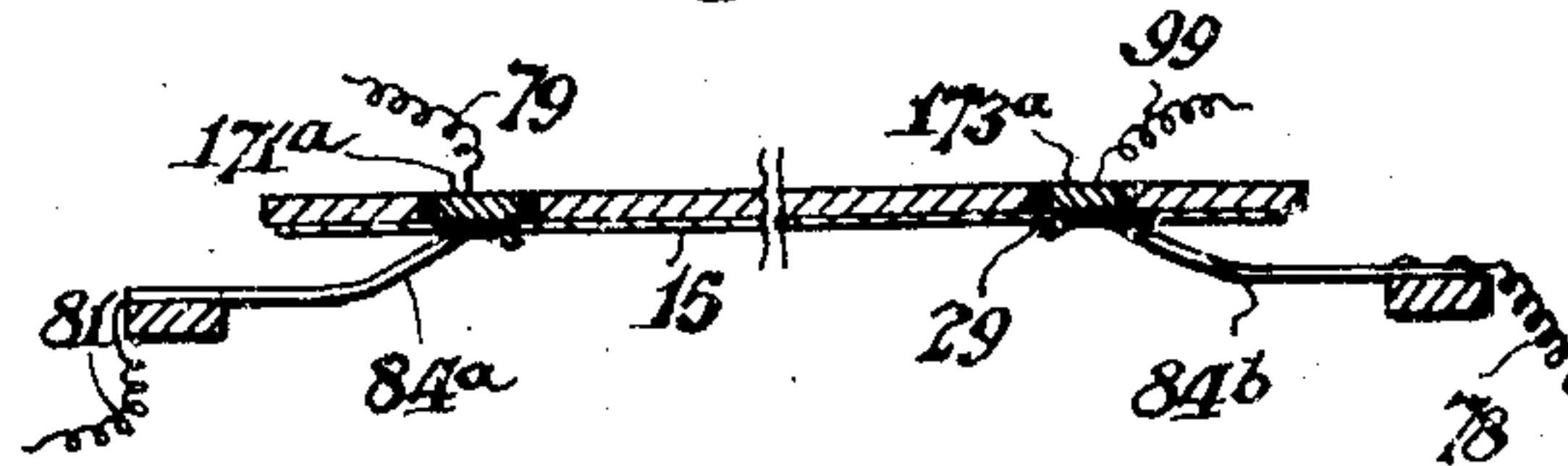


Fig. 13.



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UNITED STATES PATENT OFFICE

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MUSIC TIMING APPARATUS

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Application April 24, 1945, Serial No. 590,013

7 Claims. (Cl. 84-484)

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My invention relates to new and useful methods of writing music and means for timing the same and has for one of its objects to provide means for depicting musical compositions in any and all playing and singing times.

Another object of the invention is to provide a strip of material having graduations thereon, one or more of which represent the spaces between notes of lowest time value and multiples thereof represent notes of higher time values.

Another object of the invention is to provide a strip of material having graduations thereon, one or more of which represent the playing time between notes of lowest value, and, multiples thereof representing the playing time between notes of higher values.

Another object of this invention is to provide a strip of material having musical symbols thereon arranged to visually convey to a player the time between various notes of a score and to synchronize playing between two or more players.

Another object of the invention is to provide a strip of material having musical notes with the stems of all of them reaching an edge of the strip in combination with means cooperating with the stems to indicate the time when the respective notes are to be played thus properly and accurately timing the entire musical score.

Another object of the present invention is to provide a sheet of material having musical notes thereon and apertures therein associated with said notes, in combination with signals of different colors visible through said apertures to indicate when each note should be played and the moment the playing should stop and the periods of rest.

Another object of the invention is to eliminate all confusing symbols and lines from a musical composition in order to simplify the reading of a traveling strip bearing the various notes and other symbols.

Another object of the invention is to provide means for expediting the musical education of students and produce more accurate and a higher quality of playing for the scholar.

Another object of this invention is to form all of the musical notes of the same character regardless of time value.

Another object of the invention is to project the stems of musical notes beyond the staff or staves, either above or below the staves, and utilize the projecting ends of said notes as a low frequency tract to assist a person to quickly and

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easily read the notes in time without giving any thought as to their time elements.

Another object of the invention is to provide a strip of material in endless belt form with graduations thereon so that anyone may depict chosen musical notes upon the same, or with musical notes depicted thereon for repeat performance, as a practice exercise.

A further object of this invention is to provide apparatus for moving a strip of material, bearing musical notes, either in a progressive or a reverse direction, actuated at variable speeds controlled by manual or automatic mechanism.

A still further object of the invention is to provide means in the apparatus to indicate the time when notes are to be played, such indicator comprising a narrow line of light.

With the above and other objects in view this invention consists of the details of construction and combination of elements hereinafter set forth and then designated by the claims.

In order that those skilled in the art to which this invention appertains may understand how to make and use the same, I will describe the formations in detail referring by numerals to the accompanying drawings, forming a part hereof, in which—

Fig. 1 is a strip of material having staves and graduations depicted thereon.

Fig. 2 is a similar strip of material having the staves, signatures, bars and notes depicted thereon, and provided with apertures to permit the passage of light rays from a suitable light source thereby producing go and stop signals.

Fig. 3 also is a similar strip of material, on a reduced scale, having staves, notes, bars and certain symbols depicted thereon.

Fig. 4 likewise is a similar strip of material, on the larger scale, showing in particular, symbols for rests and a triple.

Fig. 5 is a front view of apparatus for causing a strip of material to travel forwardly or backwardly past indicator and signal lights, said apparatus being capable of automatic control after being started.

Fig. 6 is a face view of a plate constituting a portion of the indicator, signal and automatic control.

Fig. 7 is a view of the mechanism inside of the apparatus with the electrical controls illustrated diagrammatically.

Fig. 8 is a vertical sectional view through the casing of the apparatus, in the region of the indicator and signal, without the operating and some elements of the control mechanism.

Fig. 9 is an enlarged detail face view of a portion of a strip of material showing the formation of a single musical note and the apertures relative thereto for producing the go or play and stop signals.

Fig. 10 is a view of the automatically and manually controlled mechanism for the inside of an apparatus with the electrical equipment illustrated diagrammatically.

Fig. 11 is a fragmentary sectional elevation of one of the pintle structures for receiving the spools.

Fig. 12 is a top end view thereof.

Fig. 13 is a fragmentary sectional view of the control plate illustrating a modified means for changing the direction of travel of the strip of material.

In carrying out my invention as herein embodied 15 represents a strip of material, such as paper, having one or more musical staves delineated thereon. For purposes of illustration I have shown to staves, one above the other, of five lines each and constituting the treble staff 16 and the base staff 17.

These staves are suitably spaced from each other and particularly from adjacent edges of the strip of material thus leaving room for the delineation of the bars 18 between the staves and spaces for the low frequency tracts outside of the staves as well as places for notes above the treble staff and below the base staff.

Referring particularly to Fig. 1, I provide graduation marks 19 equally spaced along one or both edges of the strip 15 that a person can easily copy music from any source and write it onto the strip for use in either ribbon or belt form on an apparatus to be presently described. In this case space between two or more of the graduations are taken to represent the time value or playing time between notes of lowest value and proper multiples thereof are then used to represent the time values or playing times between notes of higher values. In actual practice, the graduations should be shown in very light lines so as not to interfere with the playing of the notes which are written on the strip.

It might be well to state at this time that whenever a strip of material is referred to, it is to include a ribbon form thereof that can be wound upon spools or an endless band that travels like a belt over spools or pulleys.

In an original musical composition the notes 20 are delineated on the staff or staves in proper order as illustrated in Figs. 2, 3 and 4. All of the notes are depicted in the same identical manner and their time values are determined by the spacing thereof on the strip of material and the speed at which said strip passes a preselected point or indicator.

On the forward end of the strip are any of the various signatures 21, Fig. 2, and at several locations throughout the length of the musical piece, between the staves, are notations 22, Figs. 2 and 4. Also symbols 23 representing a phrase, Fig. 3, as well as those denoting rests 24, Fig. 4, are placed wherever necessary or desirable. The unique rest symbols each comprise a block having an inner edge of the general outline of a bracket such as used in printing, with the major portion solid leaving a space for the letter "R" and an arrow at the forward end. A triplet symbol 25 is an oblong open figure as shown in Fig. 4, and embraces the note stems.

As previously stated, every note 20 is identical, including chords, in that they are of the same

configuration, regardless of time value, that is, each note consists of a head, either solid or open and of desirable shape, preferably round, and a stem which projects outside of the staff relative to the edges of the strip of material. In other words each note stem of the upper or treble staff projects above said staff while each note stem in the base or lower staff projects below its staff. All of the stems extend to the edges of the strip of material or a line, real or imaginary, adjacent and parallel the edge of said strip of material.

The portions of the stems which are located within the spaces outside of the staves, or above and below the treble and base staves, respectively, form the low frequency tracts, and controls the timing of all notes as they are played, when played as they pass a predetermined point or indicator, to be hereinafter described.

Where the strip of material is to be used in conjunction with go or play and stop signals employing light rays of different colors, one set of apertures 26 are formed in the strip in line with the notes or in the note stems, Fig. 2, and another set of apertures 27 are formed in the strip in locations following the notes or note stems.

In order to automatically control the movements of the strip of material 15 for causing the same to travel forwardly and also in a reverse direction for rewinding, said strip of material has holes 28 Fig. 5 and 7 at the forward end thereof and other holes 29, Figs. 5 and 13 at the rear end of the same to allow the closing of an electric circuit, to be presently described. In actual practice the pairs of holes are not as close together as shown in Fig. 5 but they are thus depicted here for purposes of illustration only.

For propelling the strip of material in a progressive or retrograde direction, I provide certain apparatus including, for example, a case or cabinet 30, Figs. 5 and 8, having one or more hinged parts, as represented by the door 31, for easy access to the interior of said cabinet. Within the cabinet are mounted two vertically spaced brackets 32 and 33, Figs. 7, 8 and 10, and may be secured to the back wall by screws 34 passing through holes 35 in the toes 36 of said brackets.

A plate or panel 160, Figs. 6 and 8, is mounted inside of the cabinet adjacent the front thereof, preferably between the brackets 32 and 33. Said plate or panel has two openings or windows 161 which, combined, have approximately the same area as the sight opening 162 in the front or door 31 of the cabinet, Fig. 5, and with which they are in alignment. There is sufficient material between the windows to allow for the formation of a slot 163 which is directly behind the location of the short slots 164 extending above and below the sight opening in the front of the cabinet.

Mounted on back of the panel or plate 160 and disposed across the middle portion of the slot is a sheet of red material 165. Above and below the red sheet are sheets of green material 166 and 167 and above and below the respective top and bottom green sheets are white sheets 168 or these portions of the slot may be left uncovered. While I have referred to red and green colored sheets it is obvious that other suitable contrasting colors can be used. A light 169 inside of the cabinet is controlled by a switch 170 located on the front of the said cabinet.

Electrical contacts 171, 172, 173 and 174 may be mounted on the frame behind holes in the plate

or panel 160 or on said panel as shown in Fig. 6, and in the latter case, if the panel is of metal, said contacts are insulated as shown at 175. These contacts are arranged in pairs with one member above the other in each pair.

On the upper bracket 32 are mounted the round pintles 37, one adjacent each end, and on the lower bracket 33 are mounted the flat pintles 38, directly in line with the round ones. One set of pintles, as the flat ones 38, are constructed for retraction and projection to permit easy assembly or removal of the spools or reels 39 therefrom. A form of construction suitable for this purpose is shown in Figs. 11 and 12, wherein the flat pintle 38 is carried by a cap 40 slidably mounted on a post 41 to which it may be keyed or splined and said cap is urged outwardly by a spring 42.

The flat pintles 38 are to be revolved for transmitting motion to the spools or reels and the strip of material thereon, so the posts 41 are mounted in suitable bearings 43 attached to the cabinet, or some component part thereof, and each post 41 carries a gear 44.

Now referring particularly to Fig. 7, the gears 44 mesh with pinions 45 on the shafts of separate motors 46 and 47. The motor 46 is the progressive motor and the motor 47 is the reversing one.

A conductor 47 leads from one side of the motor 46 to a speed regulator 49, such as a variable resistance or choke coil, and from the speed regulator leads a conductor 50 to one side of the line or source of electrical supply. From the other side of the line or source of supply leads a conductor 51 to a contact terminal 52 of a dual relay and said conductor 51 has a switch 53 interposed therein. A companion contact terminal 54 is connected by conductor 55 with the other side of the motor 46. The gap between the contact terminals 52 and 54 is closed by the contact blade 56 when moved in the proper direction.

The contact blade 56 is connected with another contact blade 57 for movement in unison and said blades are actuated in that direction which will cause the contact blade 56 to engage the contact terminals 52 and 54 by the solenoid 58 having one side connected by a conductor 59 with the conductor 51. The other side of the solenoid 58 is connected by a conductor 60 with the conductor 61 that leads in one direction to the contact terminal 62 of a single relay 63 and also leads in another direction to a push button 64. A retaining contact 65 is located in the circuit which includes the conductor 61, and is a part of the relay.

From the conductor 59 leads a conductor 66 to the contact terminal 67 and its companion contact terminal 68 is connected by a conductor 69 with a cut-out switch 70 which, in turn, is connected by a conductor 71 with one side of the motor 47. The other side of said motor 47 is connected by a conductor 72 with the conductor 50. A conductor 73 is also connected to the conductor 50 and leads to the contact terminal 74 associated with the contact terminal 62.

The gap between the contact terminals 62 and 74 is normally closed by the contact blade 75 controlled by the solenoid 76 of the relay 63 which, under certain conditions is energized by a current in a circuit including a conductor 77 leading from the conductor 51 to said solenoid, and a conductor 78 leading from the solenoid 76 to one of the reversing contacts, as 174, Fig. 6. Another conductor 79 is common to the other reversing contact, as 173, and one of the forward or progressive contacts, as 171, and said

conductor 79 is tapped onto the conductor 50 at 80. The other contact 172 has a conductor 81 leading to one side of the push button 64, which is connected through a conductor 82 with the conductor 50, as through the tap 80, and with one side of another push button 83, whose other side is connected to the conductor 78. For completing circuits through the pair of contacts 171 and 172 or 173 and 174, spring contacts or fingers 84 and 85 are shown, Fig. 8, and these are electrically connected, as by a conductor 86.

The material strip 15 travels over the front face of the plate or panel 160 and behind the spring fingers 84 and 85 so that said fingers provide a desirable tension upon the material strip and the latter normally holds the spring fingers out of engagement with their respective contacts 171, 172, 173 and 174. Whenever the pairs of holes 28 or 29 in the material strip come into alignment with said contacts and spring fingers, the latter engage the contacts to complete certain circuits as set forth below.

To start the operation of the apparatus the master switch 53 is closed but the switch 70 is temporarily left open. Now by pressing the push button 64 a circuit will be momentarily completed through conductors 51 and 59 to the relay solenoid 58, thence through conductor 60 and 61 by the push button 64 and finally through conductor 82 and tap 80 to the conductor 50. This will open the gap between the contact terminals 67 and 68 so that the switch 70 may be closed to place the reversing motor 47 in a still open circuit, and simultaneously close the gap between the contact terminals 52 and 54 and place the retaining contact 65 in operative position. This will close a circuit through conductor 51, relay blade 56, and conductor 55 to one side of the forward propelling motor 46 and from the other side of said motor through conductor 48 and speed regulator 49 to conductor 50, causing said motor to operate and rotate the spool 39 at the left hand side of Fig. 7 which will wind the material strip on said spool to cause the strip to travel forwardly.

The circuit of the motor 46 will be maintained even after the push button 64 is released and so long as the retaining contact 65 is held in its operative position which is accomplished by a circuit including conductors 51 and 59, solenoid 58, conductors 60 and 61 through said retaining contact 65 to the contact terminal 62, across the contact blade 75 of the relay 63 to the contact terminal 74, and conductors 73 and 50.

Should it be desired to reverse the material strip at any time, the push button 83 is actuated which will momentarily complete a circuit through conductors 50, 80 and 82, said push button 83, and conductor 51. This will temporarily open the gap between the contact terminals 62 and 74 thus opening the circuit of the dual relay and causing the contact blades 56 and 57 to retract, therefore the circuit to the motor 46 will be broken. At the same time the contact blade 57 will bridge the gap between the contact terminals 67 and 68 to close the reversing motor circuit through the conductors 51, 59, 66 to the contact terminal 67, thence through the blade 57 to the contact terminal 68 and through conductor 69, switch 70 and conductor 71 to the motor 47, and finally through conductors 72 and 50. The material strip will now be run in the reverse direction until the reversing motor is stopped and the forward motor 46 again started, as previously described, or the material strip is completely re-

wound on the spool or reel 39 at the right hand side of Fig. 7.

The starting and rewinding of the material strip can also be accomplished automatically. In such a case, the forward end of the material strip is attached to the spool or reel 39 at the left hand side and enough of the strip wound on the spool at the left hand side until the forward holes 28, Fig. 5, align with the contacts 171 and 172, Fig. 6. Then the switch 70 is opened or noted that it is open and the master switch 53 is closed to complete a circuit through conductors 51 and 59 to the dual relay solenoid 58, thence through conductors 60, 61 and 81 to the contact 172, Fig. 6, through spring finger 85, Fig. 8, conductor 86, spring finger 84, conductors 79, 80 and 50. This will start the motor 46 and cause the material strip to travel forwardly. When the holes 29 in the material sheet reach the contacts 173 and 174, Fig. 6, a circuit will be momentarily completed through conductors 50, 80, and 79, contact 173, a pair of spring fingers 84 and 85 and their associated conductors 86, contact 174, conductor 78, the solenoid 76 of the relay 63, and conductors 77 and 51. This will open the circuit to the forward motor 46 and close the circuit to the reversing motor 47, as previously described, thus rewinding the material strip.

In lieu of the contacts 171, 172, 173 and 174, arranged in pairs, single contacts can be used as shown in Fig. 13. Here a single forward contact 171a is connected to the common conductor 79 and a spring finger 84a for the conductor 81. Likewise a single reversing contact 173a is provided and connected with the common conductor 79 while the spring finger 84b for cooperation with the contact 173a, is connected with the conductor 78. These single contacts, when wired as described will function in a manner similar to the paired contacts for placing the motors 46 and 47 in operation alternately.

The material strip can be propelled and reversed by mechanism, including a single motor as illustrated in Fig. 10. With this form of the apparatus a pinion 87 meshed with the gear 44 for revolving the forward or propelling pintle structure at the left hand side of Fig. 10. Said pinion 87 is mounted on a shaft 88 journaled in suitable bearing such as shown at 89. On the shaft 88 is fixed one member 90 of a clutch to be selectively engaged by a two-way intermediate clutch member 9, which is splined to the shaft 92 of the motor 93, for rotation with said motor shaft and longitudinal sliding movements thereon. The two-way intermediate clutch member 91 also coacts with another clutch member 94 loosely or revolvably mounted on the motor shaft and said last named clutch member 94 carries a sprocket wheel 95 or an equivalent, such as a pulley.

A second pinion 96 meshes with the gear 44 for revolving the reversing pintle 38 at the right hand side of Fig. 10. This pinion 96 is fixed to a shaft 97 journaled in suitable bearings 98, which shaft also carries a sprocket wheel 99 or an equivalent, such as a pulley. A chain 100 passes over the sprocket wheels for transmitting motion from one to the other, especially from the sprocket 95 to the sprocket 99. Where pulleys are substituted for the sprockets, a belt is used instead of the chain.

The two-way intermediate clutch member 91 is manually actuated by the lever action 101 pivoted at 102 or by the armature plate 103 located between opposed electromagnets 104 and 105, or their equivalents. A motor circuit in-

cludes a conductor 106 from one side of a line or source of electric current to one side of the motor 93, a conductor 107 from the other side of the motor to the speed regulator 49a, and conductors 108 and 109 back to the other side of the line or source of current.

A circuit for the electromagnets 104 includes the conductor 109 leading to one side of the coils, a conductor 110 leading from the coils to the forward automatic contact 111, thence to the spring fingers such as previously described and shown in Fig. 8, then to the companion forward automatic contact 112, to conductor 113 to conductor 114 and finally to the conductor 106, to energize the coils of magnets 104 to throw in the clutch 90 for running the material strip in a forward direction.

A circuit for the electromagnets 105 includes the conductor 109 leading to one side of the coils of magnets 105, a conductor 115 leading from the coils to the rear automatic contact 116, thence to the spring fingers, such as previously described and shown in Fig. 8, then to the companion rear or reversing contact 117, to conductor 114, to conductor 106, to energize the coils of magnets 105 to throw in the clutch 94 for reversing the direction of travel of the material strip.

A push button 118 is shunted across the conductors 110 and 113 by conductors 119 and 120 so that said push button 118 is in parallel with the contacts 111 and 112, to also energize the coils of magnets 104 to throw in the clutch 90 for causing the material strip to travel in a forward direction.

Another push button 121 is shunted across the conductors 113 and 115 by conductors 122 and 123 so that said push button 121 is in parallel with the contacts 116 and 117, to also energize the coils of magnets 105 to throw in the clutch 94 for reversing the direction of travel of the material strip. Other forms of motive power can be used, such as a spring, air or other motor.

A lamp 124 is provided to furnish the necessary light for making the notes on the material strip visible, producing the line light indicator and providing the differently colored signals. A circuit for this lamp may include a conductor 125 leading from the conductor 113 to said lamp, a conductor 126 from the lamp to a switch 127 and a conductor 128 from said switch 127 to the conductor 109.

From the foregoing it will be apparent that I have eliminated all lines and data, except the notes, usually contained within the staves and which are generally very confusing to the player, especially a beginner or student of music. Instead of crowding all signs, data and lines in the staves, I place the bars 18 and some data between said staves and dispose other data within the low frequency tracts above and below the upper and lower staves respectively. This simplifies and improves the reading of the notes as they travel before the eyes of a player. Further, since all of the notes are depicted alike and the distances from one another control their time value, in conjunction with the speed at which the material strip travels, the player is not required to give any thought to time but merely to play the notes as the stem portions within the low frequency tract reach a preselected location shown by an indicator preferably comprising a relatively thin illuminated line, referred to as a line light. Another way to indicate when to play and stop playing is by the use of the indicating signals of different or contrasting colors which become

visible, alternately, through the apertures in the material strip.

In actual practice a material strip having any desired musical composition depicted thereon is placed in the machine and said machine started. Thereafter the material strip will travel forwardly at a predetermined speed, or a preselected speed according to or compatible with the spacing of the notes on said material strip. By playing each note as it reaches the indicating means, the time of the composition is unconsciously maintained by the player in accordance with the measure of the piece of music.

Of course, I do not wish to be limited to the exact details of construction, herein shown and described as these may be varied within the scope of the appended claims, without departing from the spirit of my invention.

Having described my invention, what I claim as new and useful is:

1. In a device of the character described, the combination with a light, of an opaque material strip having musical staves and notes thereon and movable past the light, said strip having an aperture at each note to indicate the playing of such note when the light becomes visible through the aperture.

2. The structure of claim 1 wherein the material strip has additional apertures, one adjacent to and spaced behind each note.

3. In a device of the character described, the combination with differently colored lights, of an opaque material strip having musical staves and notes thereon and movable past said differently colored lights, said strip having an aperture at each note to indicate the playing of such note when a light of one color becomes visible through the aperture at the note, and said strip further having an additional aperture adjacent to and following the location of the note to indicate when to stop playing said note as a light of a different color becomes visible through said additional aperture.

4. In a device of the character described, the combination of a fixed source of light, and a strip of opaque material movable past said source of light and having musical staves and notes on the

outer face to be visible to a musician, said strip having apertures positioned at the note locations to indicate that said notes are to be played as the light becomes visible successively through the apertures.

5. In a device of the character described, a light located in a fixed position, and an apertured strip of material movable past said light to cause the latter to intermittently become momentarily visible, said apertures being positioned according to musical time in relation to the speed of travel of the strip, and said strip having musical staves and notes depicted thereon in the region of the apertures.

6. Music timing means comprising, a combination, a fixed light, an appreciably long strip of opaque material movable past said light only in one direction during functional operation, and a musical staff and notes depicted on the obverse face of said strip, said strip having apertures therethrough in the region of the notes to indicate the instant each note is to be played.

7. The music timing means according to claim 6 in combination with mechanical means to propel the strip of material forwardly at a constant speed of travel.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
585,681	Latta	July 6, 1897
1,120,171	Trist	Dec. 8, 1914
1,324,277	Schantz	Dec. 9, 1919
1,559,758	Little	Nov. 3, 1925
1,571,110	Ebert et al.	Jan. 26, 1926
1,607,226	Wood	Nov. 16, 1926
1,642,810	Grimaldi	Sept. 20, 1927
1,837,948	Carpenter	Dec. 22, 1931
2,223,009	Rupp et al.	Nov. 26, 1940

FOREIGN PATENTS

Number	Country	Date
131,710	Australia	Feb. 10, 1933