United States Patent

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[54] **VOLUME CONTROL AND SILENCING MECHANISM FOR RINGERS HAVING CLAPPER LOCKOUT**
9 Claims, 9 Drawing Figs.

[52] **U.S. Cl.** **340/402,** 340/396
[51] **Int. Cl.** **H04g 3/00,** H04g 3/10
[50] **Field of Search** 340/402, 392

[56] **References Cited**
UNITED STATES PATENTS
2,141,775 12/1938 Jarley 340/402

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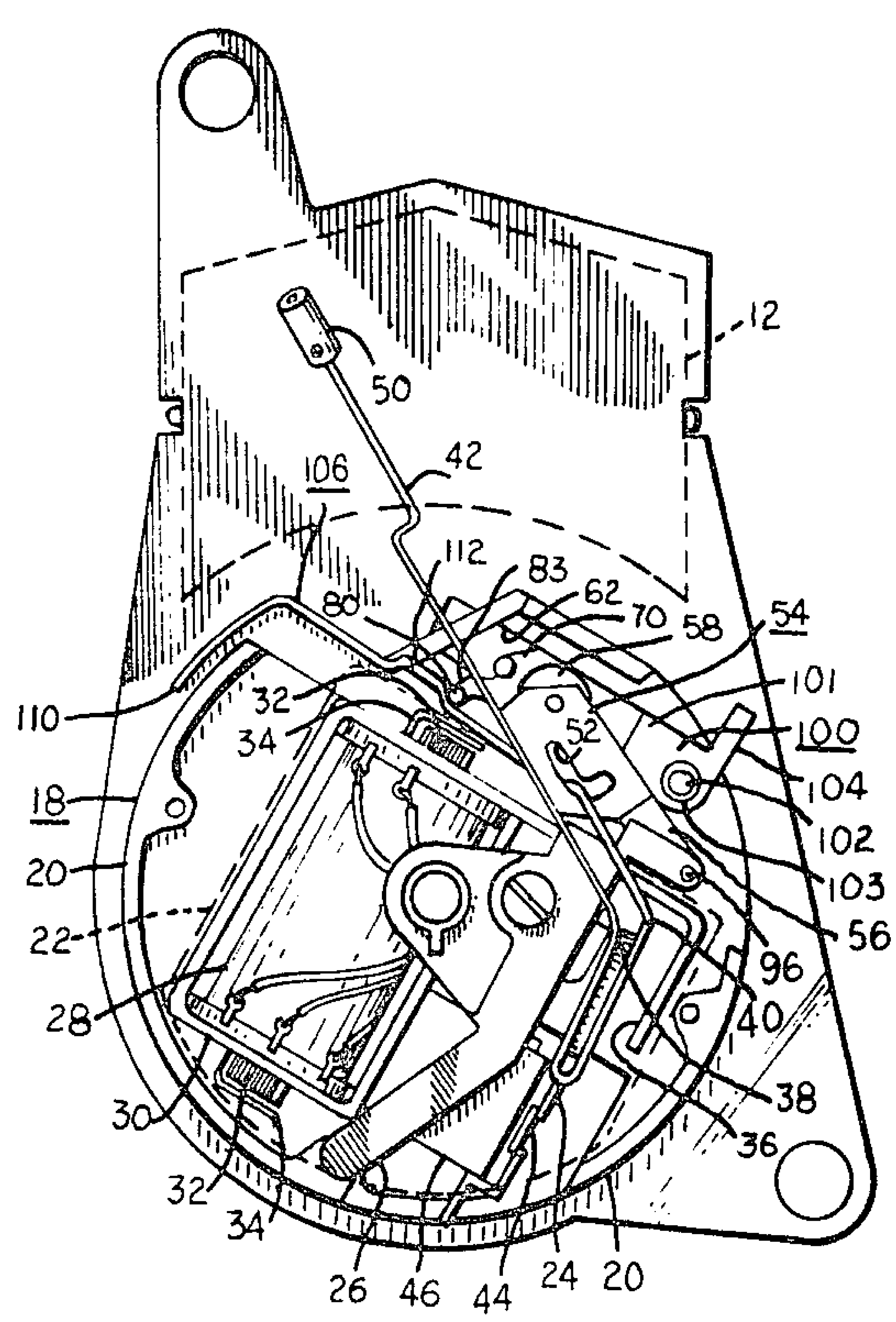
ABSTRACT: A volume control and silencing mechanism for a ringer having a clapper under the gong includes a movable actuator for engaging a spring in contact with the inside of the gong for controlling the volume of the of the ringer and also for positioning a guide for limiting the clapper movement to silence the ringer. A lockout lever is provided to prevent the actuator from inadvertently silencing the ringer when the ringer volume is adjusted.



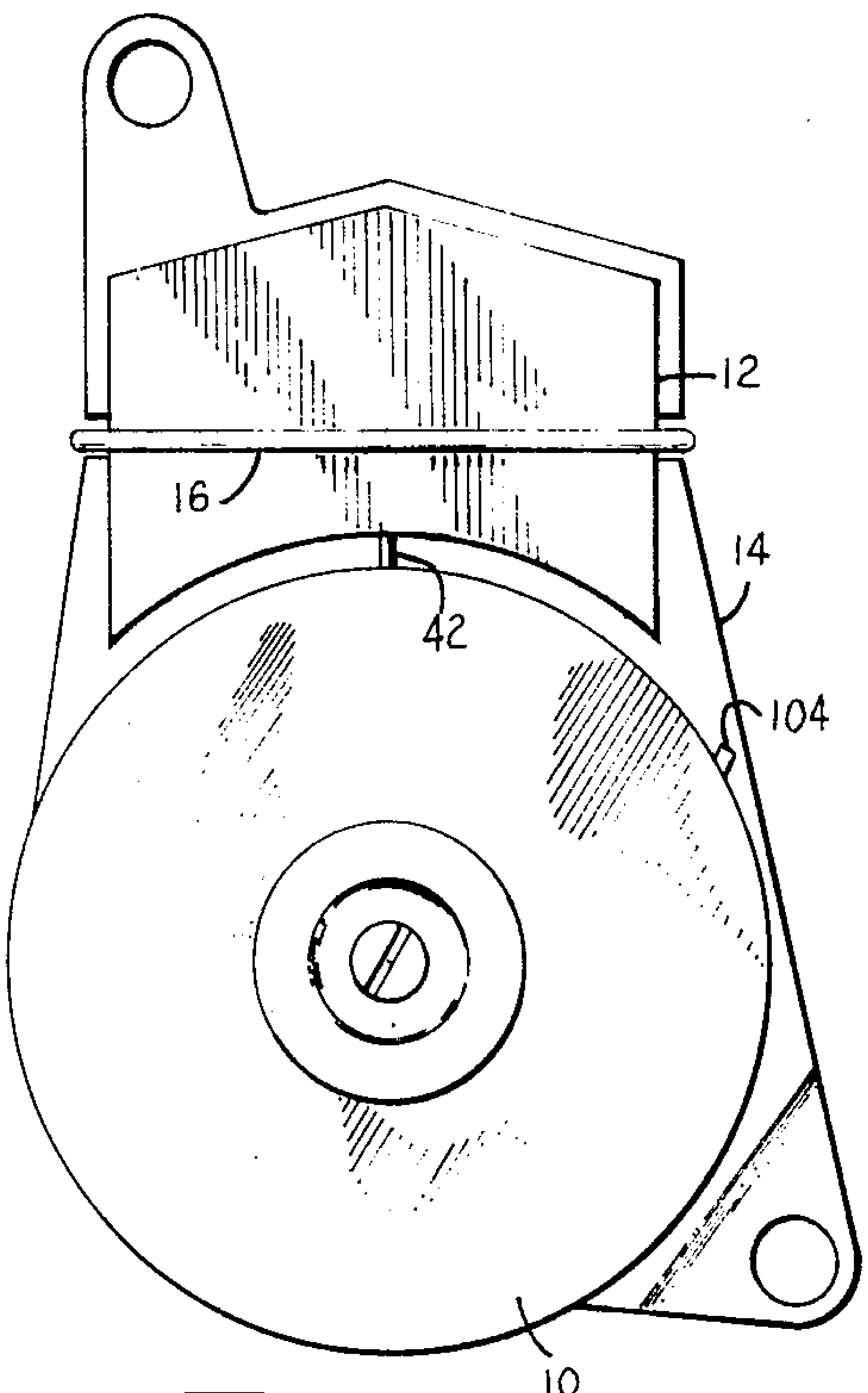


Fig. 1

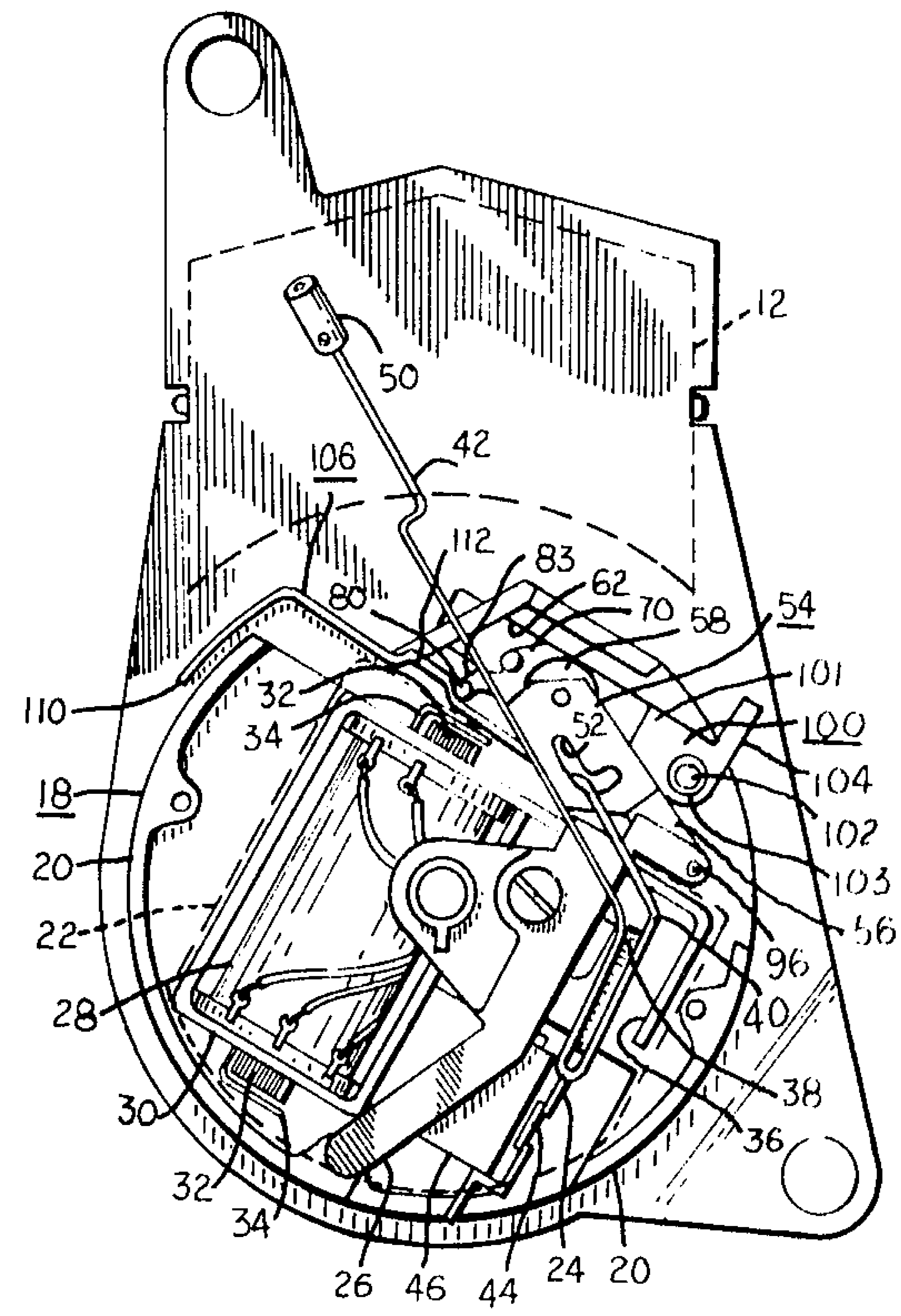


Fig. 2

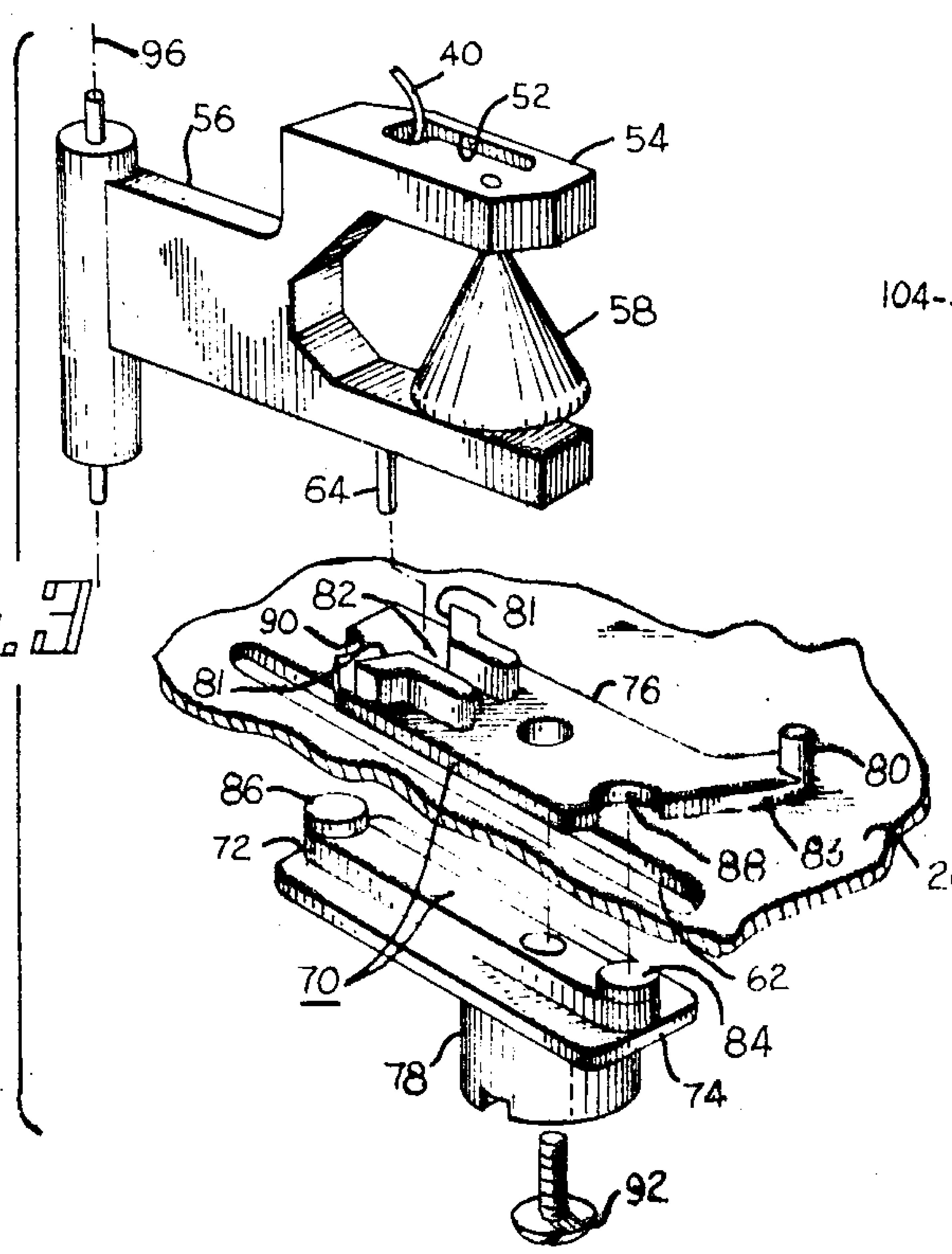


Fig. 3

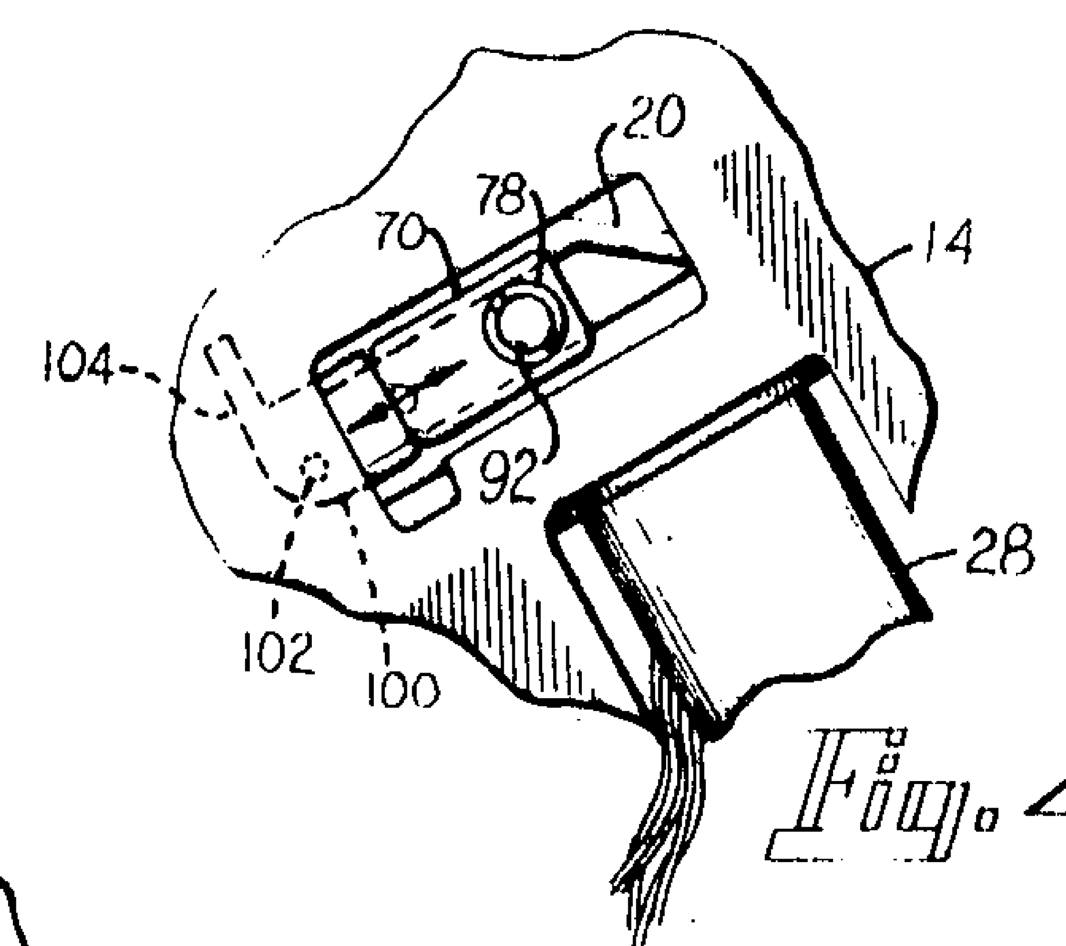


Fig. 4

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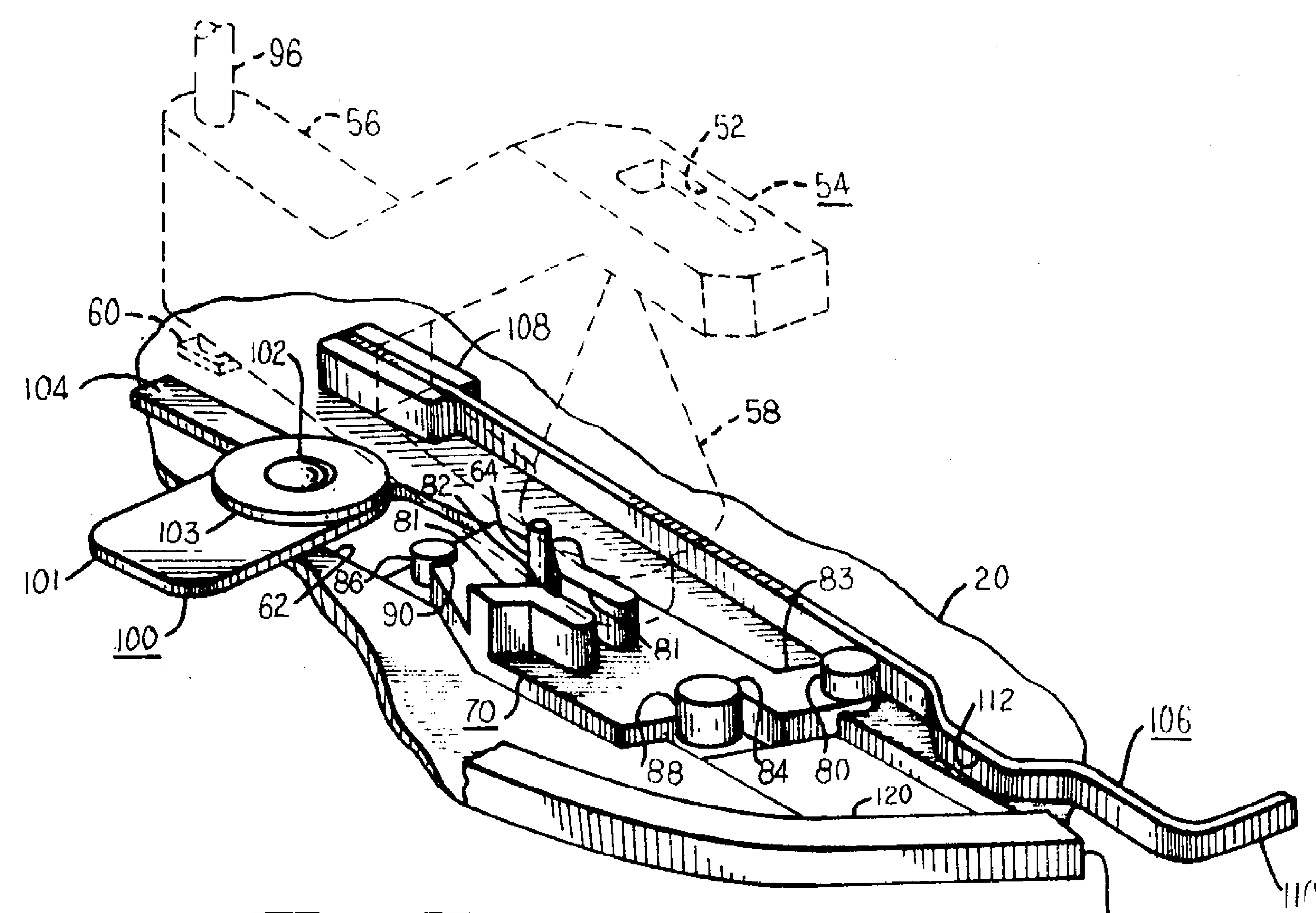

Fig. 5

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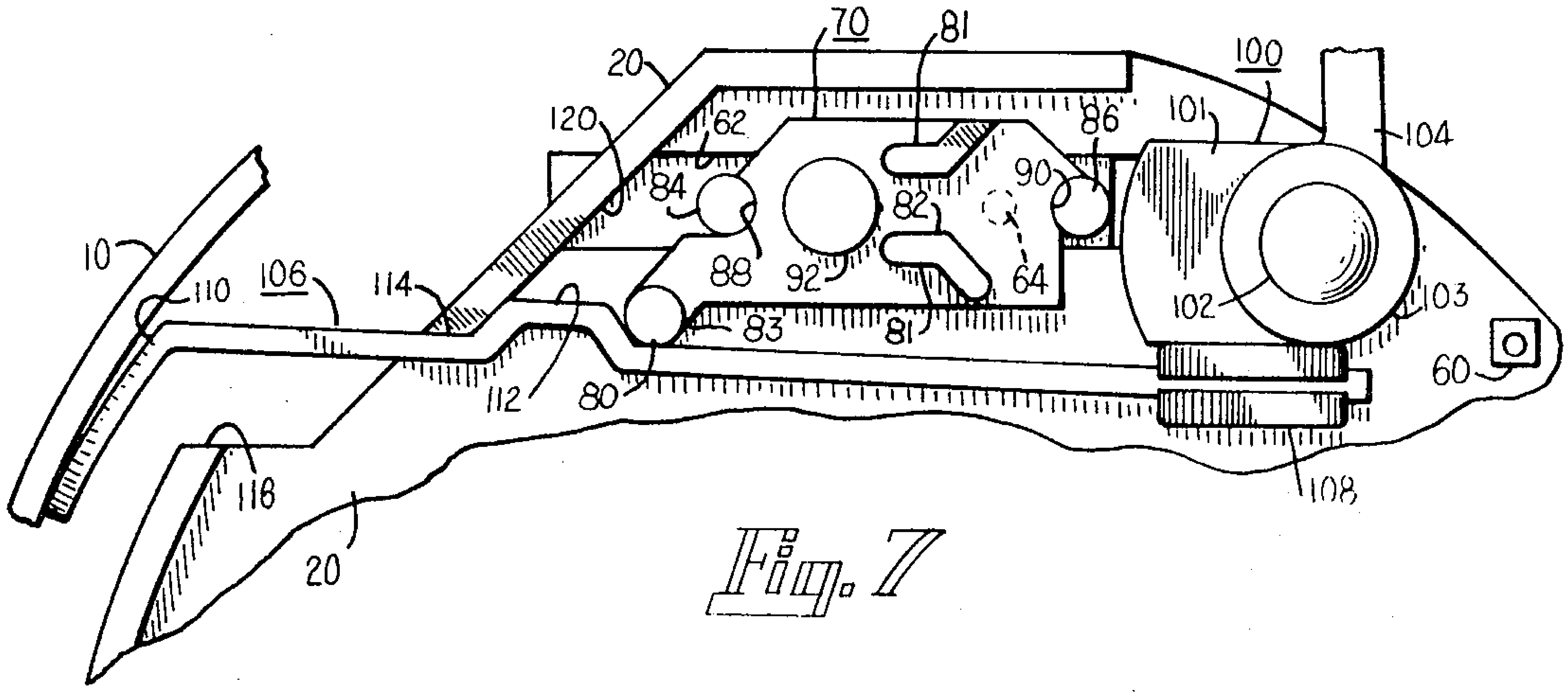
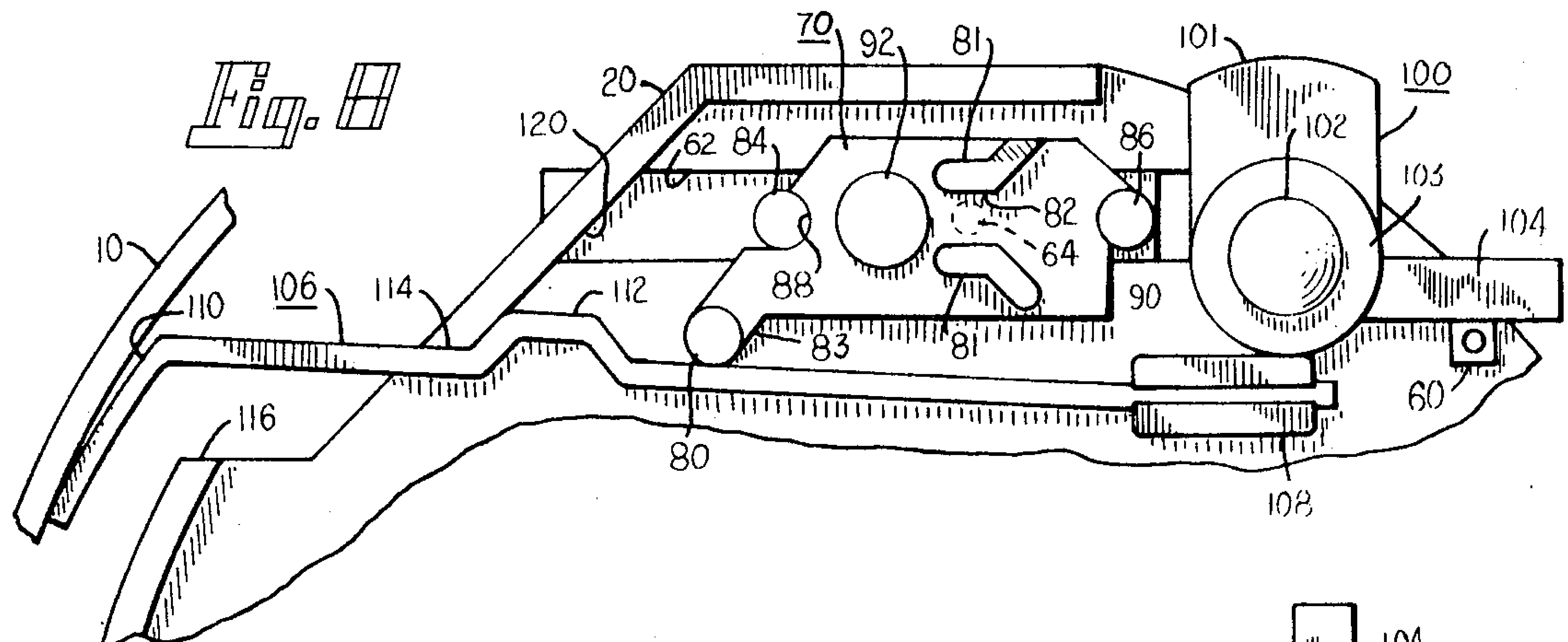


Fig. 7

Fig. 8



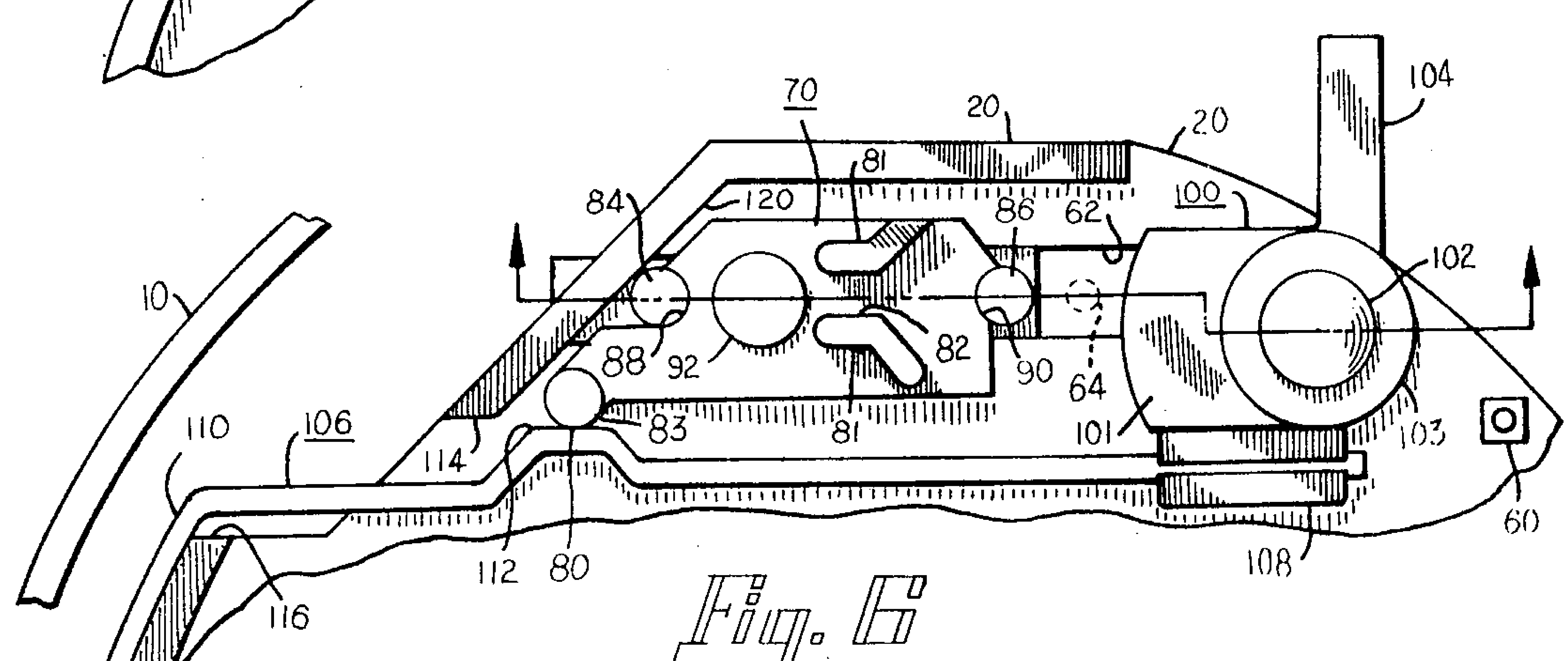


Fig. 6

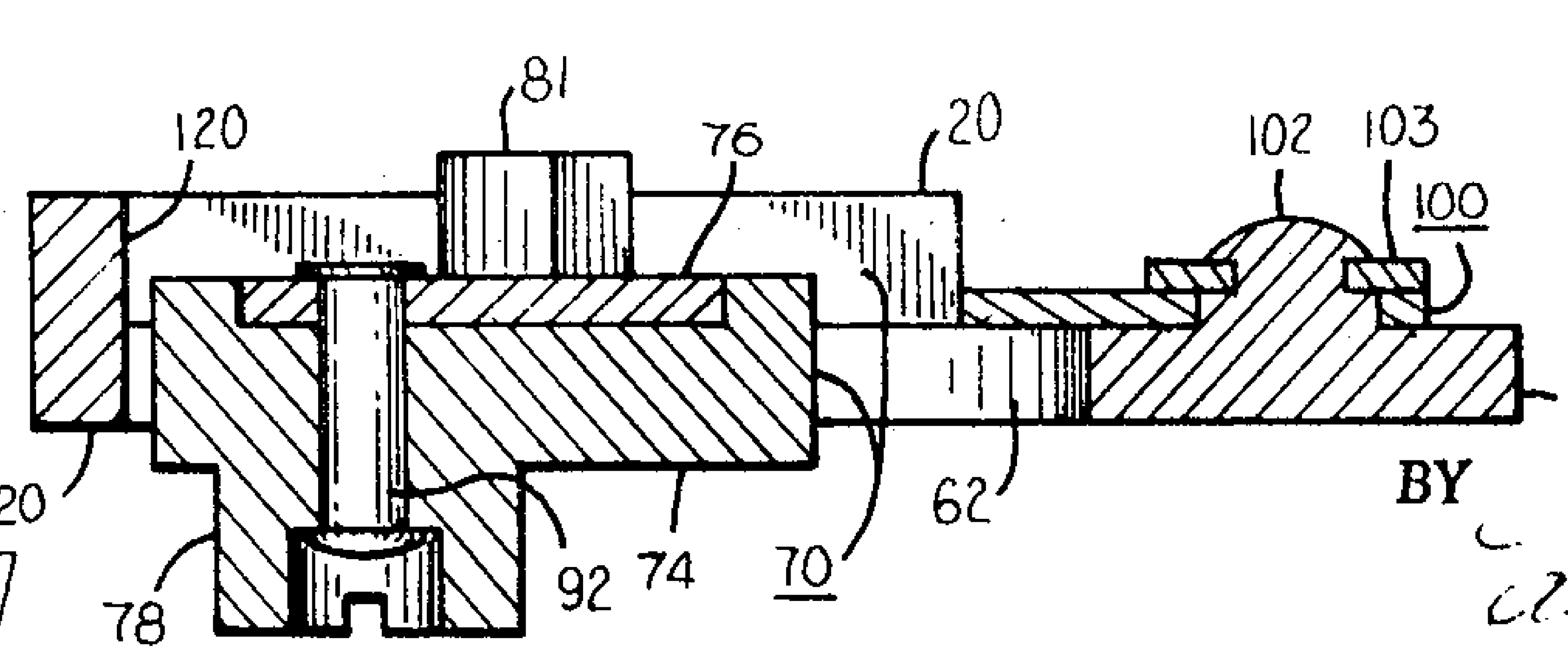


Fig. 9

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VOLUME CONTROL AND SILENCING MECHANISM FOR RINGERS HAVING CLAPPER LOCKOUT

BACKGROUND OF THE INVENTION

This invention relates to a volume control and silencing mechanism for electromagnetic ringers in general, and more particularly to a volume control and silencing mechanism for telephone frequency ringers.

It has been a goal of the telephone industry to provide telephone subscribers with variations in the telephone sets to suit their individual needs. The ringer in the telephone set provides the signalling mechanism for notifying the subscriber of an incoming call. Therefore, it is desirable to provide means for the individual subscriber to control the loudness of the ringer or to silence the ringer by simple adjustments to suit his individual needs at a particular time. A loudness control mechanism must operate reliably for long periods of time and should include a safeguard to prevent the subscriber form inadvertently silencing the ringer when the subscriber is attempting to change the volume. Also, preferably the size of the ringer should not be increased by the addition of a volume control and silencing mechanism.

In the prior art, the volume of nonfrequency selective ringers was generally controlled by limiting the travel of the clapper by such devices as screw stops, levers carrying stops, and electromagnetic shunts. However, these devices are not satisfactory for use with frequency selective ringers. In frequency selective ringers, the armature assembly operating the clapper is made responsive to a selected frequency. Limiting the travel of the clapper affects the frequency response of the ringer and is, therefore, undesirable.

In the prior art, the volume control mechanisms for frequency selective ringers included various types of springs movably mounted outside the gong in a manner such that the spring can be moved to contact the outside of the gong to dampen the vibration (and thus reduce the volume). In some ringers, a screw stop has been provided to prevent inadvertent silencing of the ringer. When the screw is removed the ringer can be silenced.

The volume control and silencing mechanisms of the prior art ringers are not suitable for use in the modern miniaturized frequency selective ringers of the type wherein the clapper is positioned under the gong. Since the clapper is positioned under the gong, any silencing mechanism which limits clapper movement is also required to be located under the gong. In addition, since the size of the ringer is a limiting factor, it is also desirable if the volume control mechanism can be located under the gong to further reduce the space requirement of the ringer.

Accordingly, it is an object of this invention to provide a new and improved volume control mechanism for frequency selective ringers.

Another object of this invention is to provide a new and improved silencing mechanism for frequency selective ringers of the type wherein the clapper is positioned under the ringer gong.

An object of this invention is to provide a new and improved volume control and silencing mechanism for frequency selective ringers including means for insuring that the ringer is not inadvertently silenced.

BRIEF DESCRIPTION OF THE INVENTION

A volume control and silencing mechanism for a frequency ringer having a clapper under a gong has an actuator positionable to select the ringer volume or silence the ringer. A damping means is biased to contact the inside of the gong to dampen the ringer volume. The actuator is positionable to control the damping means. In addition, the actuator carries a limit means under the gong. By positioning the actuator, the limit means can be positioned to limit the clapper movement to prevent the clapper from striking the gong thus silencing the ringer. A rotatable lever means is provided to prevent the actuator from being positioned so that the ringer is not inadvertently silenced.

BRIEF DESCRIPTION OF THE FIGURES

FIG. 1 shows a top view of a frequency selective ringer including the invention with the resonator mounted adjacent to the ringer gong.

FIG. 2 shows the ringer of Figure 1 including the invention with the gong and the resonator removed.

FIG. 3 is an exploded view of the clapper assembly and a portion of the volume control and silencing mechanism of the invention.

FIG. 4 shows a bottom view of a portion of the ringer of Figures 1 and 2 showing the actuator of the volume control, silencing mechanism, and the slot in which it is positionable with the lockout lever shown in phantom.

Figure 5 shows a perspective view of the volume control and silencing mechanism of the invention with the clapper assembly shown in phantom and the actuator positionable to silence the ringer.

FIG. 6 shows the movable actuator positioned in the slot so that the leaf spring is away from the gong and the lockout lever is in position to prevent silencing of the ringer.

FIG. 7 shows the actuator positioned in the slot so that the leaf spring rests against the gong to allow damped ringing volume and the lockout lever positioned to prevent silencing the ringer.

FIG. 8 shows the lockout lever in position to permit the movable actuator to be positioned wherein the clapper assembly movement is limited, thereby silencing the ringer.

FIG. 9 is a cross-sectional view taken along the line 9—9 of Figure 6 showing the actuator assembled in the slot in the base plate and the lockout lever pivotally mounted to the base plate.

PREFERRED EMBODIMENT OF THE INVENTION

Referring now to the drawings, a ringer assembly covered by a gong **10** and a resonator **12** are mounted on a support plate **14**. The resonator **12** has an opening (not shown) on the side adjacent to the gong **10**. A spring clip **16** placed around the outside of the resonator **12** and partially under the support plate **14** attaches the resonator **12** to the support plate **14**.

The ringer assembly **18** (Figure **2**) includes a nonmagnetic base plate **20** with an electromagnetic circuit **22** (within dotted lines in Figure **2**) which operates an armature assembly **24**. The ringer assembly **18** is covered by the gong **10**. The gong **10** is attached to a pivot casting **26** which is supported by a mounting post (not shown) formed as part of the baseplate **20**.

The electromagnetic circuit **22** includes a coil **28** encircled by a unitary pole piece **30**. A laminated iron core **32** extends through the center of the coil **28**. Retainer clips **34** hold the laminated core **32** in place. The ends of the core **32** project through apertures (not shown) in the pole piece **30**. The pole piece **30** is shaped so that it butts against the coil **28** ends to obtain good magnetic coupling between the coil **28** and the pole piece **30**. The pole piece **30** has a pair of spaced apart ends **36** (only one shown) which define an air gap.

An armature assembly **24** having a movable armature **38** which carries two rods **40** and **42** is connected at substantially the center of a reed spring **44**. The armature **38** projects into the pole piece air gap and moves in the air gap in response to magnetic flux changes occurring between the armature **38** and the pole piece ends **36**. A permanent magnet **46** is positioned close enough to one end of the armature **38** to magnetically polarize the armature **38**. The other pole of the permanent magnet **46** abuts the unitary pole piece **30** to magnetically polarize the pole piece ends **36**. The magnetized armature **38** rests in a position of equilibrium between the pole piece ends **36**. When the coil **28** is energized by an *a–c* signal, the magnetic flux induced in the pole piece **30** interacts with the magnetic flux of the permanent magnet **46** to cause the armature **38** to swing back and forth between the pole piece ends **36** at the frequency of the applied *a–c* signal.

The armature **38** carries two rods **40** and **42**, both of which move as the armature **38** moves. The rod **42** extends out from under the gong **10** and into the resonator **12** through the aperture (not shown) in the resonator **12**. The rod **42** is adapted to carry a weight **50** within the resonator **12**. Positioning the weight **50** on the rod **42** is used to maximize the resonant response of the armature assembly **24** to a predetermined magnetic flux change.

The rod **40** engages a slot **52** in the clapper assembly so that movement of the rod **40** drives the clapper assembly **54**. The clapper assembly **54** includes a frame **56** for carrying a clapper **58**. One end of the frame **56** is pivotally mounted between a post **60** (Figure **5**) formed as part of the baseplate **20** and the pivot casting **26**. The slot **52** and the clapper **58** are spaced away from the pivotally connected end of the frame **56** so that sufficient movement of the rod **40** in the slot **52** will move the clapper assembly **54** to drive the clapper **58** against the gong **10**. A projection **64** (shown in Figure **3**) from the bottom of the clapper frame **56** is positioned near the clapper **58**. This projection **64** will be described later in connection with the silencing mechanism of the ringer.

In order to get the clapper **58** to strike the gong **10**, there must be sufficient amplitude of movement of the armature **38**. The amplitude of movement of the armature **38** is determined by the resonant response of the armature assembly **24** to the coil **28**. When the resonant frequency is applied to the coil **28**, the movement of the armature assembly **24** is maximized thus causing the clapper **58** to strike the gong **10**. When a signal other than the resonant frequency is applied to the coil **28**, the movement of the armature assembly **24** is insufficient to cause the clapper **58** to strike the gong **10**.

A more detailed explanation of the operation of a frequency selective ringer which utilizes the above-described armature assembly and means of maximizing its movement, clapper assembly and electromagnetic circuit can be found in copending U.S. Pat. application Ser. No. 887,051, filed on Dec. 22, 1969 for Robert W. Collier, and entitled "Compact Frequency Selective Ringer". This ringer is a suitable ringer for utilizing the following described volume control and silencing mechanism of the invention.

A volume control and silencing mechanism includes an actuator **70** slideably mounted in a slot or guide **62** in the base plate **20**. The actuator **70** extends through an opening in the support plate **14**. The actuator **70** is positionable to control the ringing loudness or to silence the ringer. The actuator **70** includes an elongated cam surface **72** (shown in Figure **3**) that fits into a slot **62** formed in the base plate **20**. For simplicity, only the slot **62** in the baseplate **20** will be described. The actuator **70** includes two attachable portions **74** and **76** as shown in the exploded view of Figure **3**. The lower portion **74** of the actuator **70** has a cylindrical projection **78** providing a handle for enabling the subscriber to slide the actuator **70** back and forth along the direction of the slot **62** to adjust the loudness of the ringer, or to silence the ringer. The upper portion **76** of the actuator **70** has a pair of angular guide walls **81** extending toward the clapper assembly **54** which define a converging channel **82** wherein the narrow portion of the channel has a wall separation slightly greater than the diameter of the projection **64** on the clapper assembly **54**. In addition, the upper portion **76** of the actuator **70** has an arm or extension **83** including a cylindrical cam surface **80** at the end of the arm **83**.

The upper and lower portions **76** and **74** of the actuator **70** are designed to be mating parts. The lower portion **74** includes a pair of cylindrical positioning projections **84** and **86**, one near each end. The upper portion **76** of the actuator **70** has two openings **88** and **90** designed to mate with the two positioning projections **84** and **86** when the actuator **70** is assembled.

To assemble the actuator **70** the lower portion **74** of the actuator **70** is inserted into the back of the ringer so that the cam surface fits into the slot **62** with the projections **84** and **86** extending into the ringer. The upper portion **76** of the actuator **70** is positioned on the baseplate **20** so that the openings **88** and **90** mate with the cylindrical positioning projections **84** and **86**, respectively. A rivet **92** (Figure **3**) or other fastening means is used to connect the upper and lower portions (as shown in Figure **9**).

As can be seen in Figure **3**, the pivotally mounted clapper frame **56** includes a projection **64** adjacent the clapper **58** that extends toward the baseplate into the path of movement of the actuator **70**. As the actuator **70** is moved to silence the ringer, the projection **64** fits into the narrow portion of the converging substantially Y-shaped channel **82** (Figure **3**) so that movement of the projection is greatly limited and the clapper **58**, therefore, cannot strike the gong **10**.

An L-shaped lockout lever **100** is pivotally connected to a projection **102** extending from the base plate **20** with a locking washer **103**. The lever **100** includes an arm **104** that extends out from under the gong **10** providing access for the subscriber to selectively position the lockout lever **100**. In the position illustrated in Figures **2**, **6** and **7**, the arm **101** of the lever **100** covers a portion of the slot **62**, so that the actuator **70** cannot be moved to that end of the slot **62** (illustrated in Figure **4**). Hence, the actuator cannot be moved to a position wherein the converging channel **82** captures the projection **64**. If the lockout lever arm **104** is rotated to the position shown in Figure **8**, the arm **101** is pivoted away from the slot **62** and the actuator **70** can be positioned at the end of the slot **62** wherein the converging channel **82** captures the projection **64** to silence the ringer. The channel **82** has a converging shape to allow variations in the position of the clapper projection **64** when the actuator **70** is moved into position to silence the ringer.

An elongated leaf spring **106** is mounted at one end to a post **108** formed in the baseplate **20** (see Figures **6**,**7** and **8**). The spring **106** extends in the direction of the slot **62** and adjacent to the actuator **70**. The spring **106** is positioned to resiliently contact the gong **10**. The end **110** of the spring **106** is adapted to contact the gong **10** and has a substantially L-shaped contact surface which reduces the volume when in contact with the gong **10**.

The spring **106** has a U-shaped bend **112** formed in it. The cylindrical cam **80** on the arm **83** can be positioned in response to the movement of the actuator **70** to contact the bend **112** and force the spring **106** away from contact with the gong **10** as illustrated in Figure **6**.

Two stopes **114** and **116** formed in the baseplate **20** are provided to limit the range of movement of the spring **106**. The spring **106** is resiliently biased in a direction to contact the stop **114** when the actuator is in the position shown in Figures **7** and **8** wherein the spring also contacts the gong **10**. When the arm **83** of the actuator **70** forces the spring **106** away from the gong **10** (Figure **6**), the spring **106** rests against the stop **116**.

In operation, the actuator **70** can slide along the slot **62** to three positions, each of which corresponds to a different mode of ringer operation. In the first position of the actuator **70** (Figure **6**), the end of the actuator **70** is located near to, or in contact with, the stop **120** formed in the baseplate **20**. In this position, the cylindrical surface **80** of the extension **83** of the actuator **70** presses against the U-shaped portion **112** of the leaf spring **106** to force the spring **106** away from the gong **10** to allow the gong **10** to produce maximum ringing volume when the ringer is energized.

In the second position of the actuator **70** (Figure **7**), the actuator **70** is positioned so that the extension **83** does not engage the U-shaped bend **112** and wherein the spring **106** contacts the gong **10** to dampen the ringing volume.

In both the first and second positions, the lockout lever **100** is positioned to prevent the actuator from moving to the third position (Figure **8**) wherein the ringer is silenced. Before the actuator **70** can move to its third position, the lockout lever **100** must be moved to pivot the arm **101** away from the slot **62**. In the third position, the actuator **70** is positioned so that the projection **64** from the clapper assembly **56** (shown in phantom in Figure **8**) is captured in the channel **82** so that the clapper **58** cannot move sufficiently to strike the gong **10** and, therefore, the ringer is silenced.

As can be seen in Figure 1, the arm **104** of the lockout lever **100** projects from under the gong **10** and is readily accessible. This arm **104** provides a means for rotating the lockout lever **100** to either of its two positions (as shown in Figures **6** and **7** or Figure **8**). The lockout lever **100** in the position shown in Figure **8**, allows the actuator **70** to slide into its extreme right-hand (third) position wherein the channel **82** captures the projection **64** to silence the ringer. In this position the post **60** mounted on the baseplate **20** acts as a stop for the lever arm **104**. In order to avoid inadvertent silencing of the ringer, the lockout lever **100** is pivoted into its second position, as illustrated in Figures **6** and **7**, wherein the arm **101** of the lever acts as a limit stop for the movement of the actuator **70** by covering a portion of the slot **62**, so that the actuator **70** cannot be moved to the third position wherein it silences the ringer. In the second position of the lever **100**, the post **108** acts as a stop.

The ringer volume can be selected by positioning the actuator **70** in any of the three positions by means of handle **78** projecting from the bottom of the ringer baseplate **20**. The arm **104** of the L-shaped lever **100** projects out from under the gong **10** so that the lever **104** is accessible to be used to pivot the lever **100** in either of the two positions.

Thus, it can be seen from the foregoing description that the volume control mechanism of the invention does not affect the clapper movement and, therefore, does not affect the frequency response of the ringer. In addition, a silencing mechanism has been provided for frequency selective ringers including means which does not require the use of extra tools or removable parts for insuring that the ringer is not inadvertently silenced. The novel volume control and silencing mechanism for frequency selective ringers disclosed herein fits neatly under the gong so that the size of the ringer is not increased. It is simple to operate, easily accessible, and very reliable. This novel volume control and silencing mechanism for frequency selective ringers can easily be operated by the subscriber with the assurance that the desired ringing volume has been correctly selected.

What is claimed is:

1. A volume control and silencing mechanism for a frequency selective electromagnetic ringer having a base supporting a frame carrying a clapper covered by a gong comprising:

damping means mounted on said base for damping the volume of said ringer gong by engaging the inside of the gong;

actuator means slidably mounted in said base to extend under said gong so that said actuator means is positionable to control said damping means, and

limit means on said actuator so that said actuator is positionable to engage said clapper frame to prevent said clapper from striking said gong.

2. A volume control and silencing mechanism as set forth in claim **1** wherein:

a portion of said actuator extends from said ringer to provide means for positioning said actuator;

said clapper frame includes a projection, and

said limit means includes a pair of walls forming a channel on a portion of said actuator under said gong for capturing said projection.

3. A volume control and silencing mechanism as set forth in claim **2** including:

a lever having an arm extending out from under said gong, said lever being pivotally mounted to said base so that movement of said arm to a first position provides a stop for limiting the motion of said actuator and movement of said arm to a second position allows said actuator to be positioned to capture said projection in said channel.

4. A volume control and silencing mechanism as set forth in claim **2** wherein:

said actuator has an extension arm, and

said damping means is a leaf spring having a bent portion extending toward said extension arm, the arrangement being such that said extension arm engages said bent portion to disengage said spring from said gong.

5. A volume control and silencing mechanism as set forth in claim **2** wherein:

said pair of walls define a substantially Y-shaped channel.

6. A frequency ringer comprising:

a baseplate;

an electromagnetic circuit mounted on one side of said baseplate;

a frame carrying a clapper mounted on said side of said baseplate, said frame having a projection;

an armature assembly mounted on said side for moving said frame to drive said clapper in response to the energization of said electromagnetic circuit;

a gong supported on said side of said baseplate, said gong covering said electromagnetic circuit, said armature assembly and said clapper, so that said clapper strikes the inside of said gong in response to the energization of said electromagnetic circuit;

spring means mounted under said gong so that an end of said spring means is resiliently biased to contact the inside of said gong to provide a damping effect;

an actuator slideably mounted on said base, said actuator having a limit means and an extension arm, said actuator being slideable to a first position wherein said extension arm engages said spring means to force said spring means out of contact with said gong, a second position wherein said actuator disengages said spring means to allow said spring means to contact said gong, and a third position wherein said limit means on said actuator engages said projection to prevent said clapper from striking said gong, and

a movable stop mechanism for selectively limiting the movement of said actuator to said third position.

7. A frequency ringer as set forth in claim **6** wherein:

said limit means is a pair of walls forming a channel shape to capture said projection to prevent said clapper from striking said gong, and

said movable stop mechanism is a lever with a portion extending out between said gong and said side of said baseplate for operation of said lever from outside said gong.

8. A frequency ringer as set forth in claim **7** wherein:

a portion of said actuator extends through said baseplate so that said actuator can be positioned from the outside of the ringer.

9. A telephone frequency ringer comprising:

a gong;

a baseplate;

an electromagnetic circuit mounted on said baseplate;

an armature assembly mounted on said baseplate;

a clapper assembly mounted on said baseplate under said gong, said clapper assembly being coupled to said armature assembly so that said armature assembly drives said clapper to strike the inside of said gong in response to the energization of said electromagnetic circuit;

a projection on said clapper assembly;

spring means in contact with the inside of said gong to damp the sound volume of said gong;

movable means projecting through said baseplate, said movable means being positionable from outside said ringer to any of three selectable and sequential positions so that in a first position said movable means positions said damping means out of contact with said gong to allow the ringer to have full ringing volume, in a second position said spring means is allowed to contact said gong so that said gong has a damped ringing volume;

a pair of walls forming a Y-shaped channel formed on said movable means, so that when said movable means is in the third position, said channel captures and holds said projection so that said clapper is prevented from striking said gong thus silencing said ringer, and

lever means positionable to prevent said movable means from being placed in said third position.