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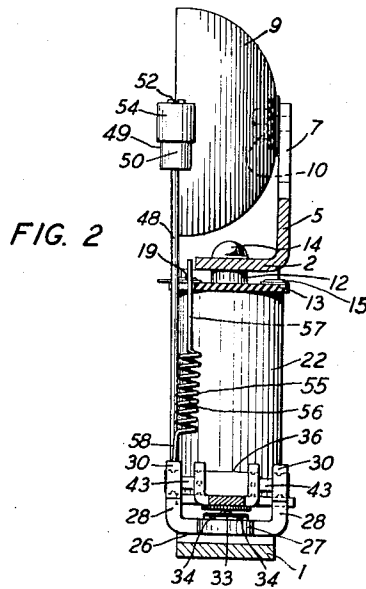
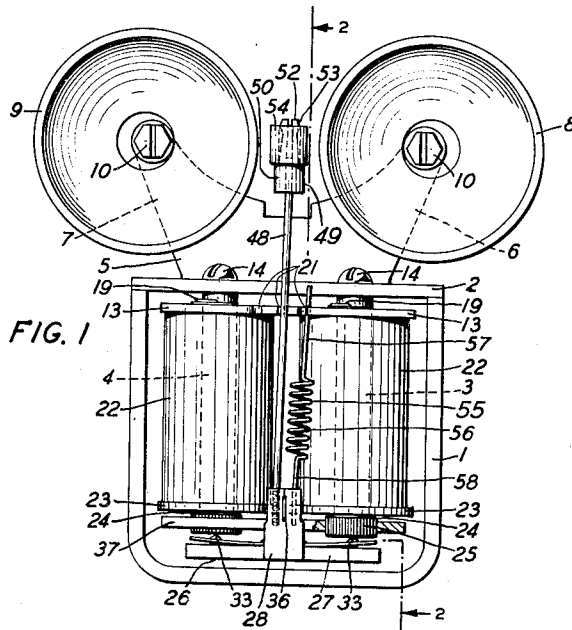
H. A. BREDEHOFT

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RINGER

Filed July 27, 1935

2 Sheets-Sheet 1



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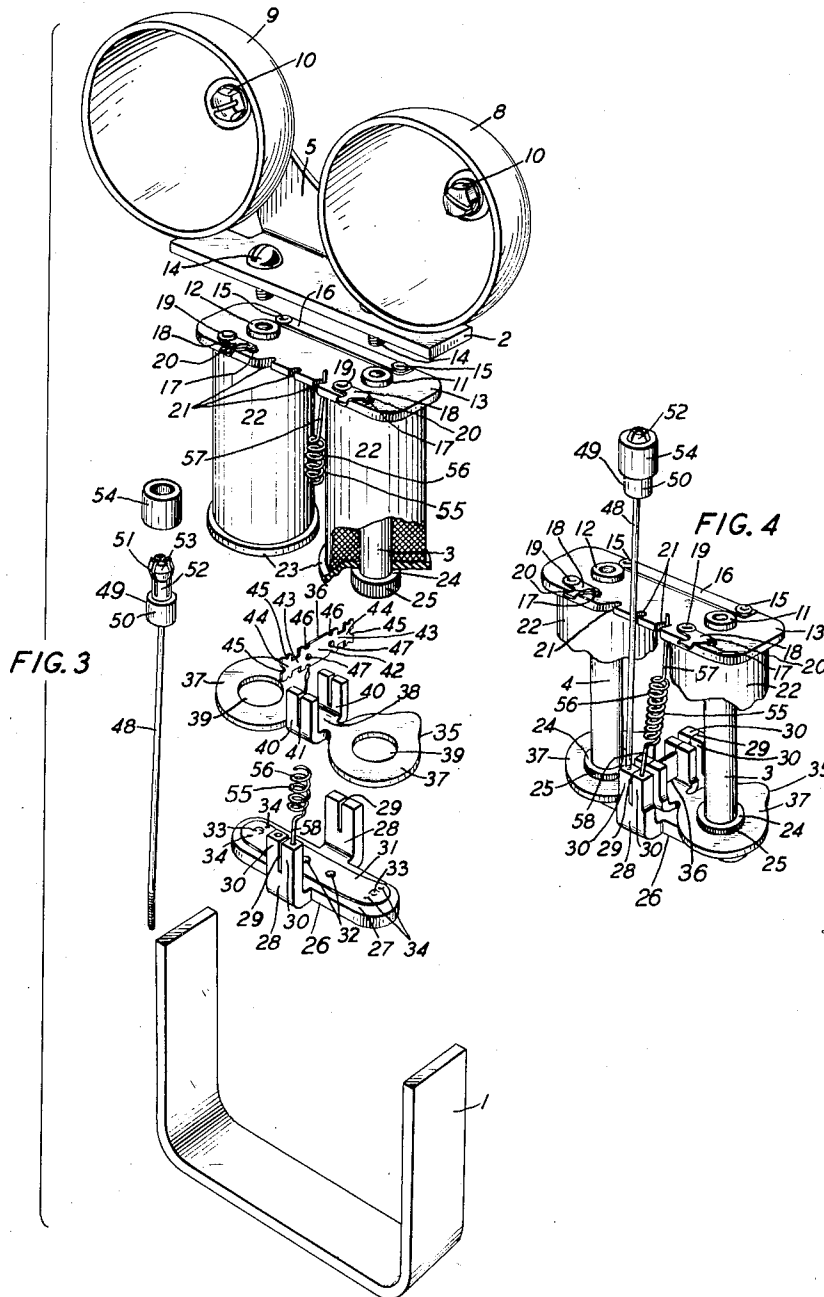
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UNITED STATES PATENT OFFICE

2,082,095

RINGER

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3 Claims. (Cl. 177-7)

This invention relates to electromagnetically operated ringing devices and more particularly to devices of this kind commonly known as telephone ringers.

The object of this invention is to provide a telephone ringer which after proper adjustment to its chief operating characteristic will not change its characteristic in service.

Features of this invention reside in a spring support for the armature, supporting means for the armature assembly, a biasing spring arrangement for biasing the armature, and means for removably supporting a bell striker on the free end of a rod.

In the drawings:

Fig. 1 is a top plan view of the ringer;

Fig. 2 is a side view, partly in section, taken on the line 2-2 in Fig. 1 and viewed in the direction indicated by the arrows;

Fig. 3 is a view in perspective of parts of the ringer partly assembled and with a portion of one of the coils broken away; and

Fig. 4 is a view in perspective of the electromagnetic driving coil assembly with parts of the coils broken away to disclose interior portions of the structure and the armature and armature support arrangement.

In electromagnetically operated bells it has been found that if an armature is supported by pivot point screws, the friction at the pivot points changes in service and under various climatic conditions. These changes necessitate rather frequent readjustments of the ringer to bring it back to its original operating characteristic. It has also been found that a certain spacing of an armature relative to end portions of the cores of the electromagnetic drive is important and that if any change is made in the spacing of these parts the efficiency of the ringer is changed.

In the telephone service, ringers having various operating characteristics are required to meet various line conditions. Springs and adjustable cords attached to armatures have been provided to bias the armature relative to ends of the electromagnetic cores to meet certain requirements. The springs and cords have a tendency to stretch in service and frequent readjustments of these parts are required.

Soft tone ringers are required in some cases while loud tone ringers are required in others.

This invention provides a ringer that meets the various requirements called for in the telephone service and which will not require frequent readjustment.

In the drawings in which like numerals in the different figures identify the same parts, 1 is a U-shaped permanent magnet and 2 is a cross-bar of magnetic material joining the two spaced ends of the permanent magnet 1. The cross-bar 2 is secured to the ends of the permanent magnet 1 preferably by welding the parts together and serves as a support for the spaced cores 3 and 4 of the electromagnets. The cross-bar 2 has a bell supporting portion 5 extending upward from one side edge and normal to the plane of the cross-bar 2. The bell supporting portion 5 has two diverging arms 6 and 7 to which bells 8 and 9 are respectively attached by suitable means such, for instance, as the screws 10. The bells 8 and 9 are preferably supported on the respective arms 6 and 7 in an inverted position as shown in Figs. 1, 2, and 3. The cores 3 and 4 are reduced in diameter at their respective upper ends 11 and 12 as shown in Figs. 3 and 4 to pass through spaced apertures in a plate 13 which serves as a spoolhead and is common to the two windings of the electromagnetic drive. The reduced ends 11 and 12 of the respective cores 3 and 4 are each drilled and tapped to receive a machine screw 14. The machine screws 14 extend through spaced apertures in the cross-bar 2 and thread into the drilled and tapped reduced end portions 11 and 12 of the cores 3 and 4 and secure the upper ends of the cores 3 and 4 to the cross-bar 2.

The plate 13 is a comparatively stiff rectangular strip of insulating material such, for instance, as phenol fibre and is provided with spaced apertures adapted to receive the reduced ends 11 and 12 of the cores 3 and 4. Adjacent the rear edge of the plate 13 are spaced apertures to receive metal eyelets 15. The eyelets 15 serve to secure to the plate 13 a metal strip 16 which forms an electrical connection between the two windings of the electromagnets, ends of the windings being electrically connected to the eyelets 15. Adjacent the front edge of the plate 13 are two pairs of spaced apertures 17 to accommodate tab terminals 18, the terminals 18 being secured to the plate 13 by metal eyelets 19. The metal eyelets 19 extend through the tab terminals and through one of each pair of the spaced apertures 17 and clamp the tab terminals 18 to the plate 13. A downwardly bent end portion 20 of each tab terminal 18 extends into the remaining aperture of each pair 17 and prevents rotation of the tab terminal 18 on the plate 13. The tab terminals 18 are electrically connected to free ends of the windings of the electromagnets and serve as

points of connection between ends of the windings and conductors of the telephone system. Spaced notches 21 are provided along the front edge of the plate 13 for a purpose to be subsequently explained.

The windings 22 of the electromagnets are wound on the cores 3 and 4 between the rectangular plate 13 and round spoolheads 23, the spoolheads 23 being located on the lower ends of the cores 3 and 4.

The lower end of each core 3 and 4 has an enlarged portion 24 projecting below the spoolhead 23. The enlarged portion 24 is knurled with a straight knurl so that substantially sharp, vertical spaced ribs 25 are formed on the enlarged portion 24 of each core.

An armature 26 is provided to be operated by energizations of the electromagnets. The armature 26 comprises a flat portion 27 of sufficient length and width to cover the enlarged portions 24 of the cores 3 and 4 and to extend across the space between the cores 3 and 4. Spaced arms 28 extend upward from the sides of the flat portion 27 in the mid-section of the armature. The spaced arms 28 are downwardly slit on the upper ends at 29 to form spaced fingers 30—30. A leaf spring 31 is attached by rivets 32 to the upper face of the flat portion 27 of the armature 26. The leaf spring 31 extends almost the full length of the flat portion 27 of the armature 26 and has free end portions that are turned slightly upward away from the upper surface of the flat portion 27. The free ends of the leaf spring 31 carry spaced embossings 33 and 34. The embossings 33 extend upward from the upper face of the leaf spring 31 and in line with the downwardly projecting cores 3 and 4. The embossings 34 extend downward of the leaf spring 31 and toward the upper face of the flat portion 27 of the armature 31. The leaf spring 26 is made of non-magnetic material such, for instance, as nickel-silver and serves as a buffer spring for the armature to prevent hammering of the armature 26 against the ends of the cores 3 and 4 and also as a non-freeze element to prevent sticking of the armature to the cores due to residual magnetism.

A yoke 35 and an armature supporting spring 36 are provided to support the armature 26 relative to the cores 3 and 4. The yoke 35 comprises two spaced ring portions 37 joined by a connecting bar 38. The ring portions 37 are flat rings having apertures 39 of a diameter slightly less than the outside diameter of the enlarged end portion 24 of the cores 3 and 4. The ring portions 37 of the yoke 35 may be force fitted over the knurled ends of the enlarged portion 24 of the cores 3 and 4. Extending upward from the connecting bar 38 are spaced arms 40, the upper ends of which are downwardly slit at 41, dividing the upper ends into two spaced fingers.

The armature supporting spring 36 comprises a flat strip of spring metal having a rectangular central portion 42 terminating at each end in reduced and longitudinally extending arms 43, the outer ends of which terminate in enlarged end portions 44. The outer edges of the enlarged end portions 44 are notched at 45. Spaced notches 46 are provided in the upper and lower edges of the central portion 42. Spaced apertures 47 are also provided in the central portion 42. The length of the rectangular central portion 42 of the spring 36 corresponds to the distance between the upwardly extending arms 40 of the yoke 35 plus the thickness of the two arms 40. The distance between the spaced notches 46 on the upper edge of

the rectangular portion 42 of the spring 36 and the distance between the notches 46 on the lower edge of the spring 36 and the distance between the spaced apertures 47 in the rectangular portion 42 of the spring 36 corresponds to the center to center measurement between the spaced arms 40 of the yoke 35. The overall length of the spring 36 corresponds to the distance between the arms 28 of the armature 26 plus the thickness of the arms. The measurement between the notches 45 in the upper edges of the enlarged end portions 44 of the spring 36 and the distance between the notches 45 on the lower edges of the enlarged end portions 44 of the spring correspond to the center to center measurement between the arms 28 of the armature 26. The distance between the arms 28 of the armature 26 is greater than the distance between the spaced arms 40 of the yoke 35 by an amount equal to the combined length of the reduced portions 43 of the spring 36.

To mount the armature 26 relative to the lower enlarged ends 24 of the cores 3 and 4 the spring 36 is placed in the slits 41 in the upwardly extending arms 40 of the yoke 35 so that the apertures 47 in the spring 36 come between the spaced fingers of the arms 40 of the yoke 35. The spaced fingers of the arms 40 are then squeezed together by means of a suitable pressure device to clamp the spring 36 between the spaced fingers of the arms 40 and to force some of the metal of the spaced fingers into the apertures 47 of the spring 36 and past the notches 46. This leaves the reduced portions 43 of the spring 36 extending outward beyond the spaced arms 40 of the yoke 35. The enlarged ends 44 of the spring 36 are then placed in the slits 29 of the spaced arms 28 of the armature 26, with the arms 40 of the yoke 35 and the arms 28 of the armature 26 both extending upward in parallel relation one with the other. The spaced fingers 30 of the arms 28 of the armature 26 are then squeezed together by means of a suitable pressure device to clamp the enlarged ends 44 of the spring 36 between them and to force some of the metal in the spaced fingers 30 into the notches 45 in the outer ends of the spring 36. With the spring 36 clamped in the spaced arms 40 of the yoke 35 and the outer ends of the spring 36 clamped between the spaced fingers 30 of the arms 28 of the armature 26 the armature 26 is pivotally supported by means of the spring 36 on the yoke 35 and beneath the yoke 35.

After the armature 26 has been assembled on the yoke 35 the spaced ring portions 37 of the yoke 35 are force fitted onto the enlarged and knurled ends 24 of the cores 3 and 4 so that the ribs 25 of the knurled portions of the cores 3 and 4 slightly cut into the metal surrounding the apertures 39 in the rings 37 of the yoke 35. The adjustment of the yoke 35 on the knurled ends of the cores 3 and 4 is gauged so that the armature 26 is spaced from the lower ends of the cores 3 and 4 a predetermined distance, the spacing of the parts having been predetermined by tests to find the spacing required for most efficient operation of the ringer. The adjustment of the yoke 35 on the knurled ends of the cores 3 and 4 and the consequent spacing of the armature 26 relative to the lower ends of the cores 3 and 4 is done at the factory and since the ring portions 37 of the yoke 35 must be force fitted on the knurled ends of the cores 3 and 4 the adjustment of the parts will not change in service and cannot readily be altered by any one tampering with the apparatus. The

ringer therefore will not change its characteristic in service because the armature cannot be as a whole moved from its normal and required spacing relative to the cores of the electromagnets.

When the coils of the electromagnets are energized the armature 26 is rocked back and forth on its points of suspension which are the reduced portions 43 of the spring 36. The reduced portions 43 of the spring 36 due to the character of the material from which the spring is formed have a tendency to resist the movements of the armature 26 and to restore the armature 26 to normal position.

Since the armature 26 in normal operation is never rocked to such an extent as to cause permanent distortion of the metal in the reduced portions 43 of the spring 36, the restoring characteristic of the spring 36 will not be changed.

In the armature suspending means there are no pin pivot points in which frictional changes would occur with a change in temperature or climate or wearing of the parts. The ringer, therefore, will not change in characteristic in service.

One of the spaced fingers 30 of an arm 28 of the armature 26 is drilled and tapped to receive a threaded end of a striker rod 48. The striker rod 48 carries on its upper end a striker holder 49 comprising a collar portion 50 and a reduced upper end 51. The upper end 51 is longitudinally split to provide spring fingers 52. The spring fingers 52 are deformed on the upper ends to provide a split knob 53. The split knob 53 is adapted to receive a striker 54 which may be a tubular piece of metal or other hard material if a loud ringing device is required or may be a tube of wood or other comparatively soft material if a soft ringing device is required. The striker 54 may readily be removed from the striker holder 49 and replaced by another like element of different material as required.

One of the spaced fingers 30 of an arm 28 of the armature 26 is longitudinally drilled to receive a lower end of a biasing spring 55. The biasing spring 55 has a helical central portion 56 and comparatively straight upper and lower portions 57 and 58 respectively. The lower portion 58 is secured in the upper end of one of the spaced fingers 30 of an arm 28 of the armature 26. The upper end of the spring 55 rests in one of the spaced notches 21 in the rectangular plate 13. Since the armature 26 is supported on the yoke 35 by means of the spring 36, movement of the upper end 57 of the spring 55 from one notch 21 to another notch 21 in the plate 13 will cause biasing of the armature 26 relative to the pole pieces 3 and 4.

When the ringer is installed in a telephone substation the installer may readily change the bias of the armature relative to the cores of the electromagnets to meet a line condition by moving the upper end of the biasing spring 55 from one notch 21 to another notch 21 in the plate 13. The installer may also readily change the ringer from a loud tone ringer to a soft tone ringer or vice versa as required by removing the striker 54 and replacing it with another striker of different material. The spacing of the armature 26 relative to the cores 3 and 4 of the electromagnets, however, cannot readily be changed either intentionally or accidentally by the installer.

Although in the above description the spaced notches 21 for receiving the free end of the biasing spring 55 have been described as being located in an edge of the plate 13, the notches 21 might be located in an edge of the cross-bar 2 without departing from the spirit of the invention.

What is claimed is:

1. In a telephone ringer, in combination, a pair of magnet cores, a yoke attached to the magnet cores, spaced arms on the yoke, a flat spring secured in the spaced arms of the yoke, end portions of said spring extending outwardly beyond said arms, an armature and spaced lugs on the armature attached to said outwardly extending ends of said flat spring.

2. In a telephone ringer, in combination, a pair of magnet cores, a yoke supported on said magnet cores, spaced arms on the middle portion of said yoke, a flat spring secured in said spaced arms, free end portions of said spring extending outwardly of said spaced arms, an armature and spaced arms on the middle portion of said armature and extending upwardly about said yoke, and secured to the outwardly extending free end portions of said flat spring.

3. In a telephone ringer, in combination, a pair of magnet cores, a yoke supported on said magnet cores, spaced arms extending upwardly from the middle portion of said yoke, a flat spring secured edgewise in said spaced arms, free end portions of said flat spring extending outwardly of said spaced arms, an armature and spaced arms on the middle portion of said armature and extending upwardly about said yoke in parallelism with the spaced arms of said yoke and secured to the outwardly extending free end portions of said flat spring, the effective part of said flat spring being a relatively small portion of the length of said spring.

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