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F. A. COX

2,412,968

RELAY

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FIG. 1

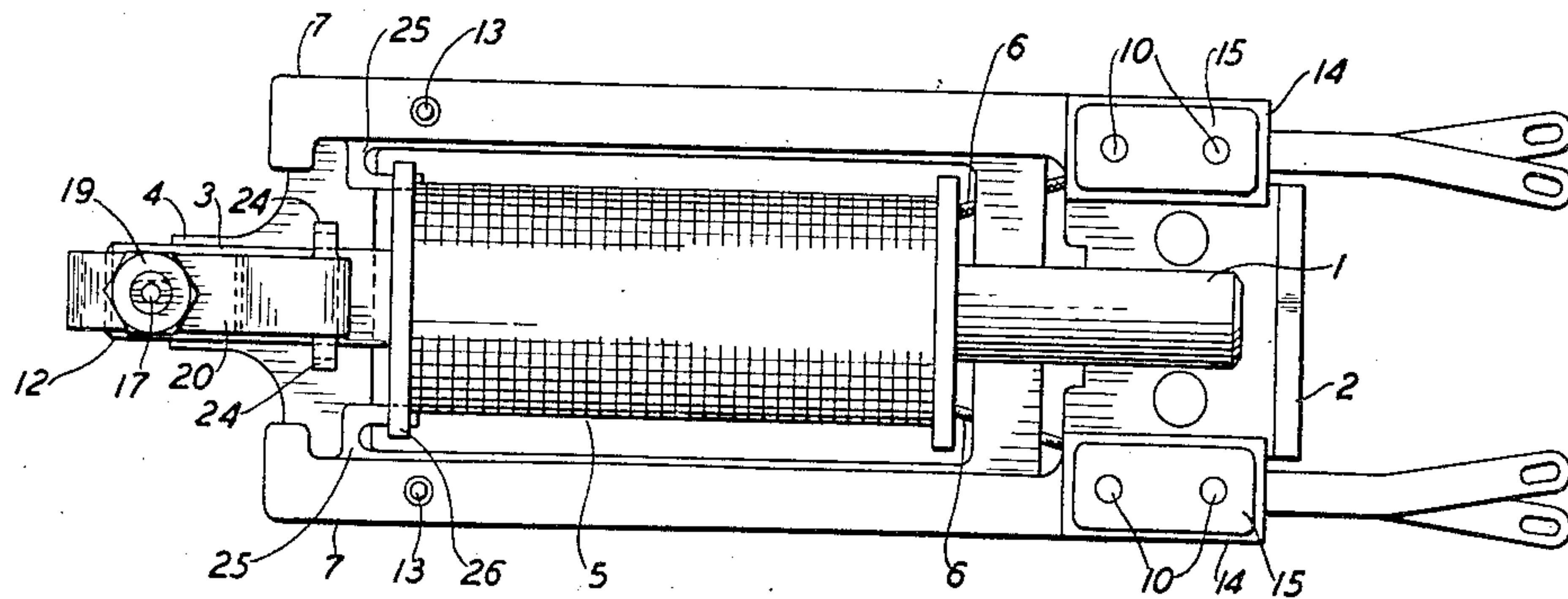


FIG. 2

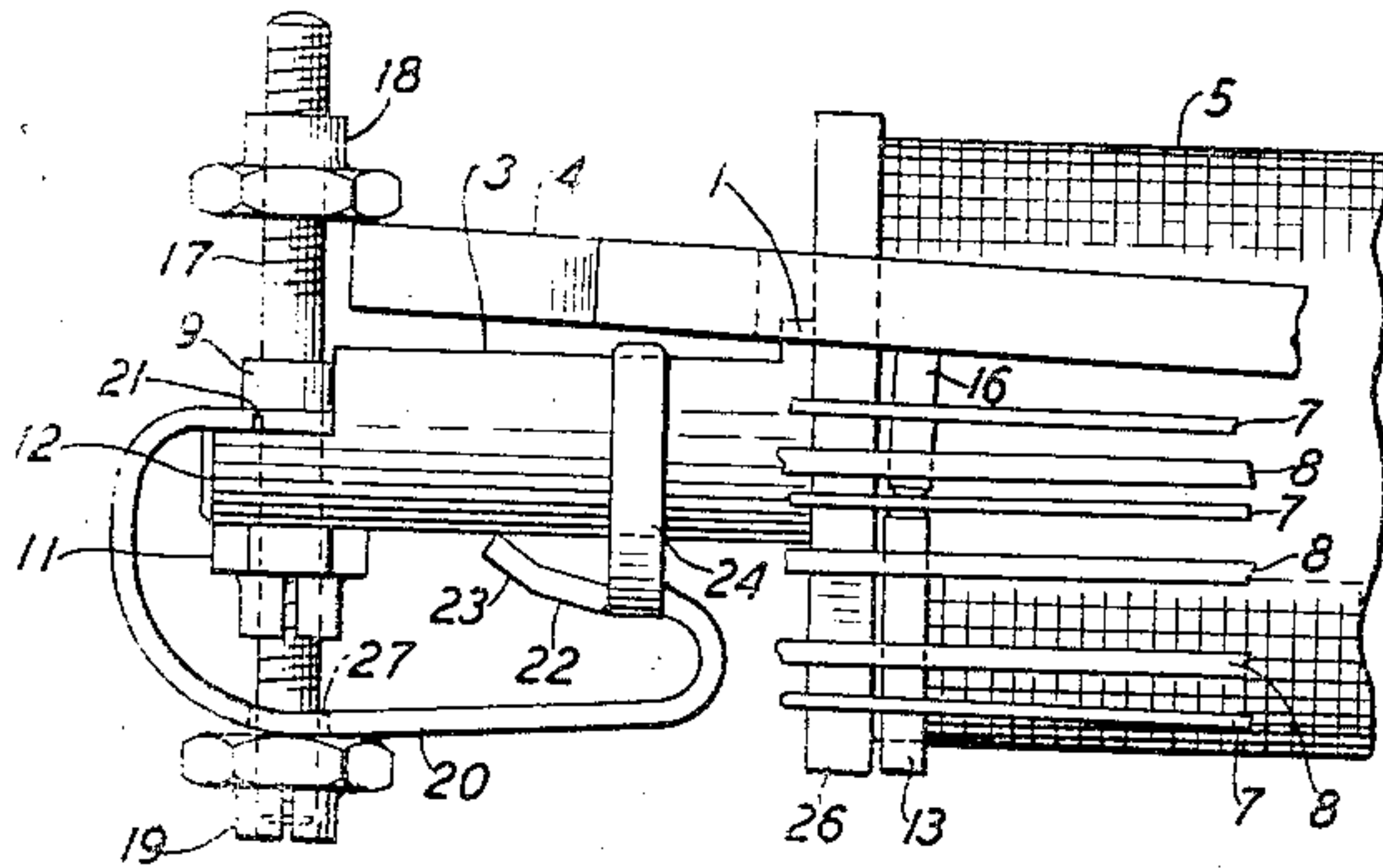


FIG. 3

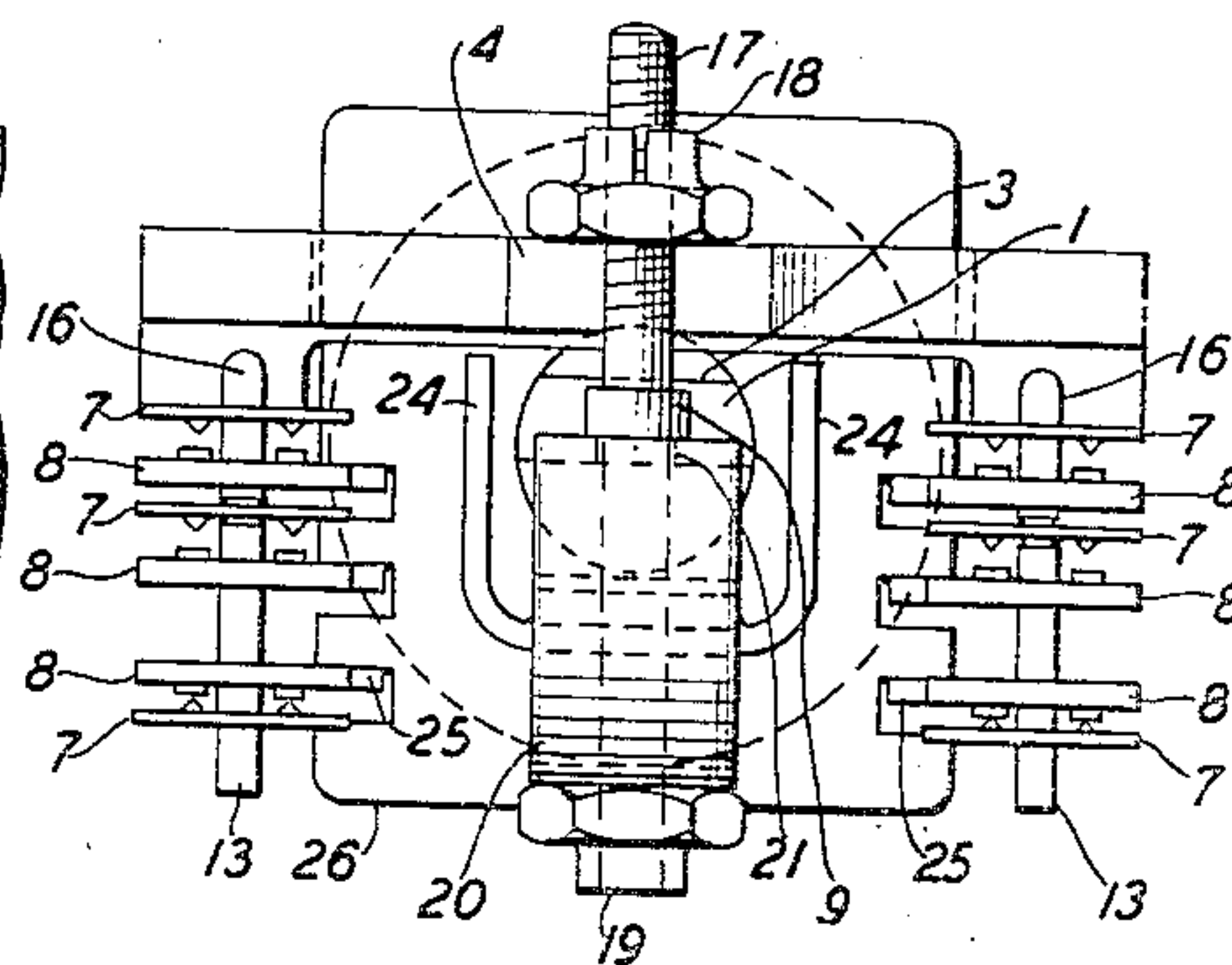
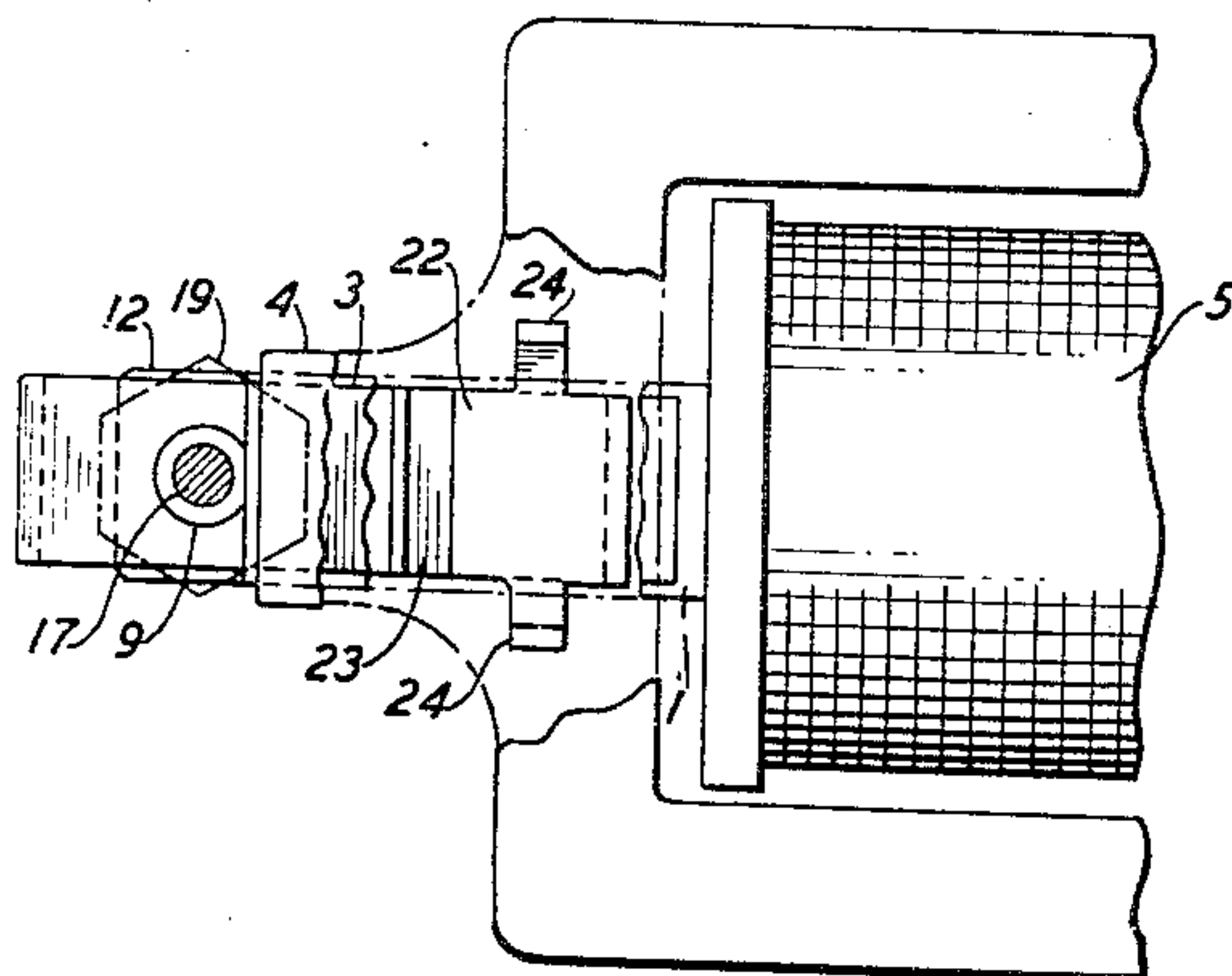


FIG. 4



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2,412,968

RELAY

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6 Claims. (Cl. 175—336)

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This invention relates to electric switching devices and particularly to electromagnetic relays for use in the circuits of telephone systems.

In electric circuits generally, and in telephone circuits particularly, electromagnetic relays are employed in large numbers for performing numerous and varied circuit switching functions. Certain of these functions require the use of slow-release relays which can be depended upon to release between predetermined time limits. The ideal relay for this purpose is one which, when adjusted to given mechanical and electrical requirements will meet the required release time without further adjustment and when so adjusted will retain this adjustment for a reasonable service period.

A relay which meets this requirement to a certain degree is disclosed and claimed in Patent 2,178,656, granted November 7, 1939, to P. W. Swenson.

In this type of relay, however, owing to variations in spring thickness, thickness of finish on the armature and on the core and in the quality of the iron employed, the tensions which can be built up in the contact springs when the relay operates are frequently insufficient to permit meeting the release requirement. It has been previously suggested that buffer springs be added to the spring combinations to supplement the tension of the contact springs. These buffer springs took the form of straight springs added to the outside of the spring pile-up and were acted on by studs carried by the armature. In addition these buffer springs had to be tensioned against the relay spool-head. Therefore, the efficacy of such buffer springs varied due to wear and to atmospheric conditions and were not completely dependable. Furthermore, since the release condition for a relay may be affected by magnetic apparatus immediately surrounding it, buffer springs of this type could only be adjusted when the adjacent circuits were idle.

In accordance with the present invention, a buffer spring is provided which is free from these undesirable features being independent of atmospheric conditions, substantially free from wear and adjustable within a magnetic shield.

More specifically, this buffer spring comprises a C-shaped strip of spring metal, one arm anchoring the spring to an extension on the relay core and the other arm pressing against the back of the core, the latter arm carrying two lateral prongs which embrace the core and extend slightly above it where they are engaged by the armature at the end of its stroke. A screw mounted on the end of the core passes through a slot in the buffer spring and carries a nut by means of which the tension exerted on the armature may be adjusted.

The invention will be more readily understood

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from the following description taken in connection with the accompanying drawing in which:

Fig. 1 is a bottom plan view of a relay embodying the device of the invention;

Fig. 2 is a partial side elevation of the relay showing the buffer spring;

Fig. 3 is a front end elevational view of the relay disclosed in Fig. 1; and

Fig. 4 is a partial top view of the relay of Fig. 1.

The relay is in general of the type disclosed in the above-identified Swenson patent and has a core 1 secured at its rear end to a mounting bracket or heel-piece 2 and having a pole-piece 3 upon its forward end with which the forward end of the armature 4 cooperates. An energizing coil 5 surrounds the core 1, the terminals of which are connected to lead-in wires 6. A spring pile-up is positioned on each side of the coil 5. Each spring pile-up comprises any desired combination of contact springs. By way of illustration each spring pile-up has been disclosed as comprising three active or movable springs 7 each having a mate or passive spring 8, two of which are shown as front contacts and the other as a back or normally closed contact. The armature 4 is supported by means of hinge pins on an armature bracket (not shown). The contact springs 7 and 8 are clamped to the bracket 2 by screws 10 which are threaded into holes in the clamping strips 15, the springs being insulated from each other and from the bracket and clamping strips by insulating strips such as strips 14. At the forward end, the passive springs 8 have tabs 25 which engage in notches in the spool head 26.

For moving the armature springs 7 into or out of engagement with their mate springs 8, upon the attraction of the armature 4 towards the core 1 in response to the energization of coil 5, the armature is provided with operating studs 16 of insulating material which engage the upper two armature springs 7. The studs 16 in turn act upon studs 13 which control the outer armature springs.

To limit the releasing movement of the armature, away from the core and to adjust the normal air-gap between the armature and the pole-piece 3 of the core, a backstop screw 17 having a backstop nut 18 thereon is attached to a shoulder 12 on the end of the core 1. This screw passes through the shoulder 12 and is held in place thereon by means of a collar 9 and a lock-nut 11, the lower end of the screw carrying a second nut 19 the purpose of which will appear hereinafter. It is, of course, obvious that two screws might be used, which could be fastened to the shoulder 12 by any desirable means, for example, by welding.

Anchored between the collar 9 and the shoulder 12 is a buffer spring 20. This spring is formed of a rectangular strip of spring metal, the two

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ends of which are recurved to form an open loop or C. One of the recurved arms serves to fasten the buffer spring in place, bearing on the face of the shoulder 12 and having a slot 21 which passes around the screw 17 and under the collar 9 to permit secure anchorage. The other arm 22 is more sharply recurved and presses against the underside of the core 1 by means of a tab 23 bent at an angle to the arm 22. Formed integrally with the arm 22 are two prongs 24 which are bent at right-angles to the surface of arm 22 and partially encircle the core 1. These prongs extend slightly above the pole-piece 3 and the precise location is fixed when the relay is assembled by varying the angle that the tab 23 makes with the arm 22. In the base of the spring 20 is a slot 27 through which the lower end of screw 17 passes. Nut 19 threaded on the end of screw 17 acts upon the buffer spring 20 to control the tension of the spring and the position of the prongs 24.

When the coil 5 is energized, attracting the armature 4, the armature first performs its contact controlling functions and then, at the end of the stroke, makes contact with the prongs 24 which exert a pressure thereon to assist in starting the restoration of the armature under the proper circuit conditions.

Since this buffer spring is attached directly to the core of the relay, it is not subject to positional changes due to atmospheric conditions. Prongs 24 act directly on the armature 4 thus obviating the intervention of studs of insulating material, and consequent wear. Therefore the point in the circuit where the armature 4 engages the prongs 24 and the initial tension may be readily and accurately set and require little readjustment during the life of the relay due to wear of parts.

A further advantage of this type of buffer spring lies in the fact that, since the tension may be adjusted very accurately from the front by means of the nut 19, it is possible to make the adjustment while the relay is covered by a magnetic shield, rendering the operation independent of the circuit conditions of the adjacent apparatus.

What is claimed is:

1. In an electromagnetic structure comprising a cylindrical core having the forward end of its cylindrical face flattened to form a pole face, an armature cooperating with said pole face and an energizing coil on said core, an extension on said pole face and a buffer spring, said buffer spring recurved at each end to form a C having two arms, one arm engaging the top of said extension and the other arm pressing against the bottom of said core, said other arm having two lateral prongs bent to form a U embracing said core in position to be engaged by said armature near the end of its stroke.

2. In an electromagnetic structure comprising a cylindrical core having the forward end of its cylindrical face flattened to form a pole face, an armature cooperating with said pole face and an energizing coil on said core, an extension on said pole face, a buffer spring, said buffer spring recurved at each end to form a C having two arms, one arm engaging the top of said extension and the other arm pressing against the bottom of said core, said other arm having two lateral prongs bent to form a U embracing said core in position to be engaged by said armature near

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the end of its stroke, and means to vary the tension placed on said prongs.

3. In an electromagnetic structure comprising a cylindrical core having the forward end of its cylindrical face flattened to form a pole face, an armature cooperating with said pole face and an energizing coil on said core, an extension on said core, a buffer spring, said buffer spring recurved at each end to form two arms, one arm engaging said extension and the other arm pressing against the bottom of said core, said other arm having two lateral prongs bent to form a U embracing said core in position to be engaged by said armature near the end of its stroke, and means to vary the tension placed on said prongs, comprising a slot in said buffer spring, a screw fastened to said core and extending through said extension and said slot and a nut on said screw acting on said buffer spring.

4. In an electromagnetic structure comprising a cylindrical core having the forward end of its cylindrical face flattened to form a pole face, an armature cooperating with said pole face and an energizing coil on said core, an extension on said core, a screw passing through said extension, a backstop for said armature threaded on one end of said screw, a collar fastened to said screw, a buffer spring, said buffer spring recurved at each end to form two arms, one arm clamped between said collar and the face of said extension and the other arm pressing against the bottom of said core, said other arm having two lateral prongs bent to form a U embracing said core in position to be engaged by said armature near the end of its stroke, and means to vary the tension placed on said prongs.

5. In an electromagnetic structure comprising a cylindrical core having the forward end of its cylindrical face flattened to form a pole face, an armature cooperating with said pole face and an energizing coil on said core, an extension on said core, a screw passing through said extension, a backstop for said armature threaded on one end of said screw, a collar fastened to said screw, a buffer spring, said buffer spring recurved at each end to form two arms, one arm clamped between said collar and the face of said extension and the other arm pressing against the bottom of said core, said other arm having two lateral prongs bent to form a U embracing said core in position to be engaged by said armature near the end of its stroke, and means to vary the tension placed on said prongs, comprising a slot in said buffer spring, said screw passing through said slot, and a nut on said screw acting on said buffer spring.

6. In an electromagnetic structure comprising a cylindrical core having the forward end of its cylindrical face flattened to form a pole face, an armature cooperating with said pole face and an energizing coil on said core, an extension on said core, and a buffer spring, said buffer spring recurved at each end to form two arms, one arm engaging said extension and the other arm pressing against the bottom of said core, said other arm having two lateral prongs bent to form a U embracing said core in position to be engaged by said armature near the end of its stroke, said other arm also bent to form a tab, the angle between said tab and said arm determining the position of said prongs.

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