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RELAY

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FIG. 1

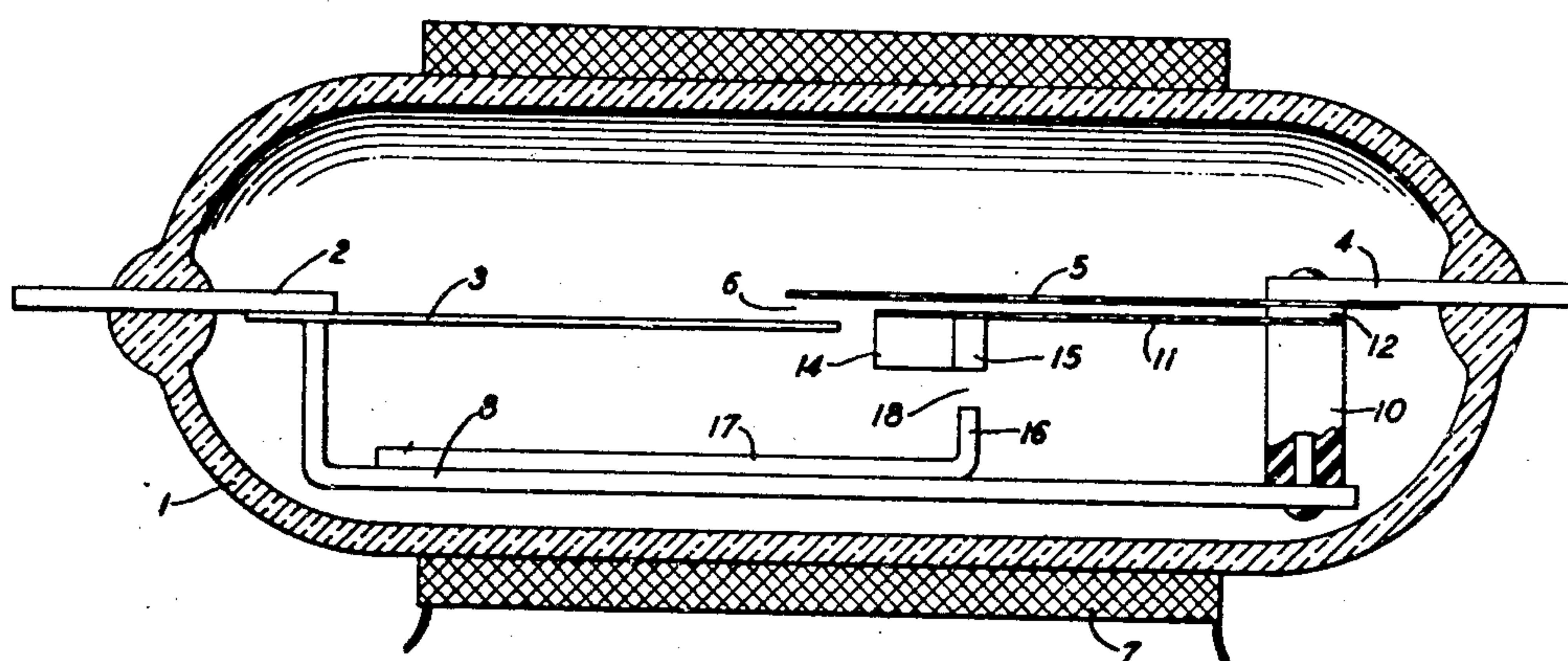
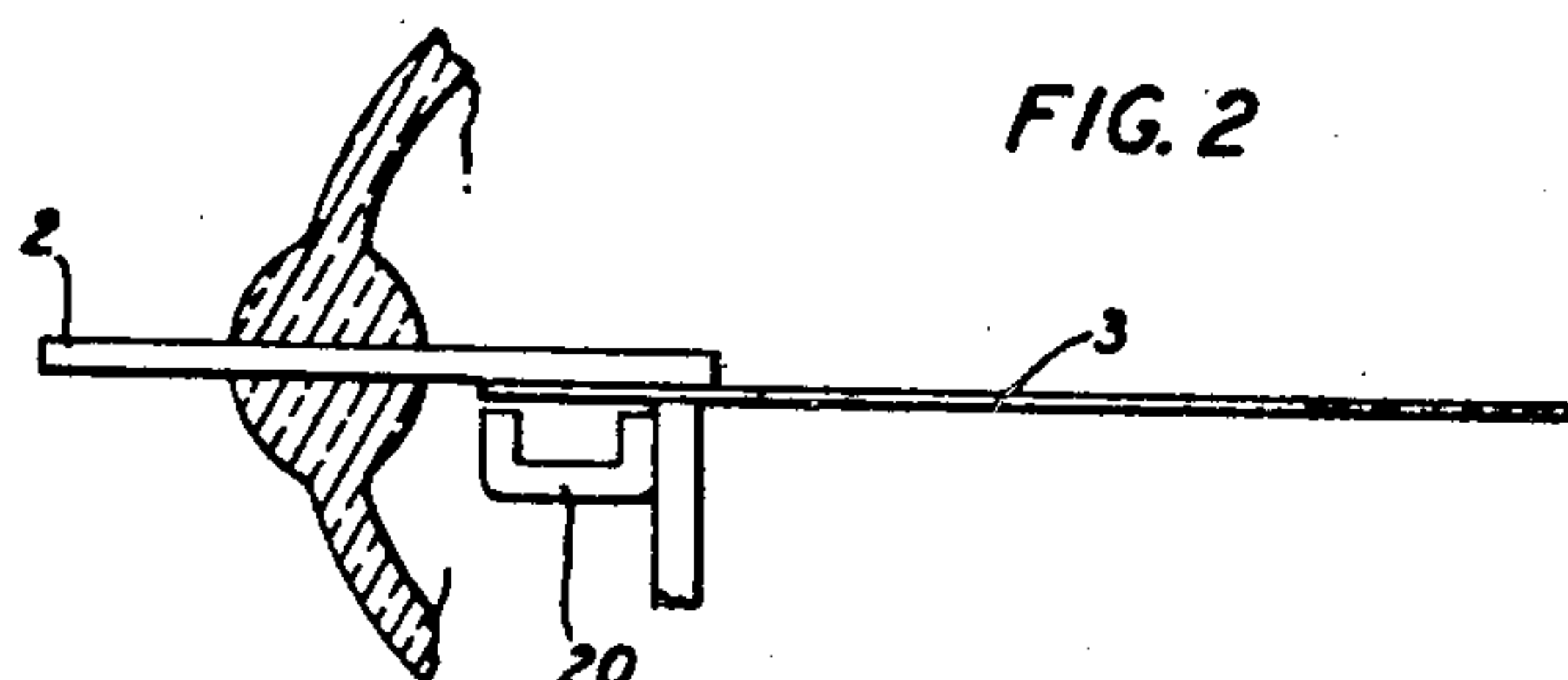


FIG. 2



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RELAY

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8 Claims. (Cl. 200—87)

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This invention relates to electrical switches and particularly to contact making and breaking switches used in telephone and other switching systems.

An object is to improve the operating characteristics of such switches.

Heretofore electrical switches have been used in which, when an operating force is applied to the switch, circuit-making contacts were separated and in some instances arrangements have been provided for delivering a hammer blow to the contacts to cause them to separate quickly when said operative force was applied.

The present invention relates in general to switching devices of this kind and a feature thereof is an arrangement whereby, when an energizing current is applied to said switch, circuit-making contacts are magnetically effected to close and then remain closed independent of said magnetic effect and whereby when said energizing current is removed a hammer blow is delivered to said contacts to separate them quickly.

Another feature resides in the construction of the hammer blow arrangement whereby when the circuit-making contacts are separated thereby they are prevented from reclosing due to vibration to eliminate destructive arcing between them.

This invention has been illustrated in the accompanying drawing in which:

Fig. 1 shows an evacuated vessel in which an operating mechanism in accordance with the applicant's invention has been disclosed; and

Fig. 2 shows a modified form of the arrangement shown in Fig. 1.

Referring now to the drawing, an evacuated vessel 1 is shown having an inlet wire 2 connected to a magnetic reed or spring 3 and a similar inlet wire 4 connected to a magnetic reed or spring 5. The springs 3 and 5 at their free ends are arranged in close proximity to each other to establish a connection at the air-gap 6 when an outside coil 7 is energized. Connected to the inlet wire 2 and spring 3 is a non-magnetic member 8, the other end of which is connected to an insulating member 10. This member 10 is connected to the spring 5 and the outlet wire 4 and an intermediate spring or reed 11 which is magnetically connected to reed 5 by washer 12. To the free end of reed 11 is connected a heavy head comprising a comparatively large non-magnetic member 14 and a comparatively small magnetic member 15. The magnetic member 15 is located some distance from the upturned end 16 of a magnetic member 17 to form an air-gap 18. This air-gap 18 is slightly larger than the air-gap 6

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between the springs 3 and 5. The spring 11 is so located in relation to spring 5 that when springs 5 and 3 are flexed to establish a connection, spring 5 would come in contact with spring 11 in its unoperated position.

The operation of this mechanism is as follows: When current is supplied to the winding 7, the members 3 and 5 are magnetized to attract each other and close a connection at the air-gap 6. These members 3 and 5 may be so designed and of such magnetic material that a sufficient amount of residual magnetism will remain in these springs to maintain them connected at the air-gap 6 independent of the magnetic flux produced by the winding 7 but not sufficiently to attract each other without the aid of this magnetic flux through the winding 7. The energization of the winding 7 also causes the magnetic head 15 to be attracted by the end piece 16 of the magnetic member 17 and thereby bend the spring 11 a corresponding distance as determined by the air-gap 18. Now, when the winding 7 is deenergized, the magnetic flux produced by the winding 7 will die out and permit the magnetic head 15 to separate from the end 16 and thus release the spring 11. The tension in spring 11 will, therefore, cause the heads 14 and 15 to strike spring 5 with a hammer blow and due to their large mass cause spring 5 to quickly separate from spring 3. In order to secure the most beneficial results from this hammer blow the heads 14 and 15 are as close to the air-gap 6 as possible. On the other hand, in order to preserve these beneficial results and at the same time not interfere with the sensitivity of the springs 3 and 5 in responding to the energization of the coil 7, the magnetic head 15 has only been made large enough to insure its attraction by the ends 16. The magnetic shunting action on air-gap 6 might have been considerable had both heads 14 and 15 been made of magnetic material. By this quick opening of the connection between springs 3 and 5, less time is allowed for the building up of a voltage liable to cause arcing between these contacts before they are moved apart to a safe distance. Due to the large mass of the heads 14 and 15 the period of oscillation of spring 11 is lower than that of spring 5. Hence the heads will reduce the vibrations of this spring which might otherwise result in reclosures of the air-gap 6 and cause destructive arcing. The blow delivered by these heads is also sufficient to separate the springs 3 and 5 in case there should have been developed enough of an arc on closure to

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produce a sticking weld between them at the air-gap 6.

Fig. 2 shows a modified means for developing a normal magnetic attraction between the springs 3 and 5 to maintain the springs connected at air-gap 6 when once attracted but not sufficient to close this connection without the aid of the magnetic force produced by the energization of winding 7. This may take the form of a small permanent magnet 20 attached to the supporting member 8 which magnetizes reed 3 sufficiently for this purpose. A similar result could be secured by mounting a small piece of permanent magnetic material external to the sealed structure to the inlet wire 2, for example.

What is claimed is:

1. In a switch, a sealed vessel, a coil surrounding said vessel, contact-making springs sealed in said vessel magnetically operative to establish a connection between them on the energization of said coil and to maintain said connection independent of said energization, and independently operative means in said vessel for opening said connection on the deenergization of said coil.

2. In a switch, a sealed vessel, a coil surrounding said vessel, contact-making springs sealed in said vessel magnetically operative to establish a connection between them in response to the energization of said coil and to maintain said connection independent of said energization, and means in said vessel for forcibly engaging one of said springs to separate it from the other on the deenergization of said coil.

3. In a switch, a sealed vessel, a coil surrounding said vessel, two contact-making springs sealed in said vessel operative to establish a connection between them in response to the energization of said coil and to maintain said connection independent of said energization, a spring in said vessel having a partially magnetic and partially non-magnetic head, and means for attracting said head in response to the energization of said coil to tension said spring so that when the coil is deenergized to release said head said tension in the spring causes said head to forcibly strike one of said contact-making springs to separate it from the other.

4. In a switch, a sealed vessel, a coil surrounding said vessel, two contact-making springs of magnetic material sealed in said vessel operative to flex towards each other and establish a connection between them in response to the energization of said coil, and separate means in said vessel operative to disengage said springs from each other on the deenergization of said coil.

5. In a switch, a sealed vessel, a coil surrounding said vessel, two contact-making springs of magnetic material sealed in said vessel magnetized to establish an electric connection between them in response to the energization of said coil, means associated with said springs to magnetize them sufficiently to maintain said connection only when once established and independent of the magnetization from said coil, a flexible spring attached at one end to one of said contact-making springs and having a comparatively heavy head partially of magnetic material at the free end of said spring, a bar of magnetic material, a non-magnetic member for connecting said bar to the other contact-making spring, said partially magnetic head being in position to be attracted by said bar to deflect said spring in response to the energization of said coil, said head being further in such a position in relation to the

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contact-making spring to which its associated spring is attached as to strike said contact-making spring with a heavy blow as controlled by the release of said head and its spring from the tensioned position operative when the coil is deenergized.

6. In a switch, a sealed vessel, a coil surrounding said vessel, two opposite flexible magnetic members sealed in said vessel having their free ends in close proximity to each other to close a connection between said ends when attracted to each other by the energization of said coil, said members being sufficiently magnetic to maintain said connection after said coil is deenergized but not sufficiently magnetic to attract each other when separated, a reed connected at one end in said vessel to one of said members, a comparatively heavy non-magnetic head and a comparatively light magnetic head at the opposite free end of said reed and located near the contacting end of said one member and with their upper surfaces in position to touch the underside of said one member when in attracted position to contact with the other member, a magnetic bar in close proximity to the under surface of said magnetic head to form an air-gap therebetween slightly wider than the normal air-gap between the contact surfaces of said magnetic members, a non-magnetic member connecting said magnetic bar to said other member, said magnetic head being in position to be attracted by said magnetic bar when said coil is energized and released therefrom when the coil is deenergized to vibrate said reed to engage with a hammer blow the associated magnetic member to free it from the other magnetic member.

7. In a switch, a sealed vessel, a coil surrounding said vessel, two contact-making springs of magnetic material sealed in said vessel operative to flex towards each other and establish a connection between them in response to the energization of said coil, said springs having inherent magnetism to maintain said connection closed independent of the magnetism produced by the energized coil but not sufficient to normally attract each other to close said connection, and means operative on the deenergization of said coil for engaging one of said springs to separate it from the other and prevent vibrations of said springs for momentarily reclosure of the connection.

8. In a switch, a sealed vessel, a coil surrounding said vessel, two contact-making springs of magnetic material sealed in said vessel magnetized to establish an electrical connection between them in response to the energization of said coil, said connection being established at the contact point at the extreme free ends of the two springs, means associated with said springs to magnetize them sufficiently to maintain said connections only when once established and independent of the magnetization from said coil, a flexible spring having a comparatively heavy head located near the contact point of said contact-making springs, means responsive to the energization of said coil for flexing said spring, said head being further so located that when the coil is deenergized said head due to the release of the tension in said spring strikes one of said contact-making springs near the contact-making point to separate it from the other and prevent the vibration of said two contact-making springs from establishing momentary closures of the connection.

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