

Jan. 28, 1947.

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2,414,836

TIMING UNIT FOR CENTRIFUGAL SWITCHES

Filed July 20, 1944

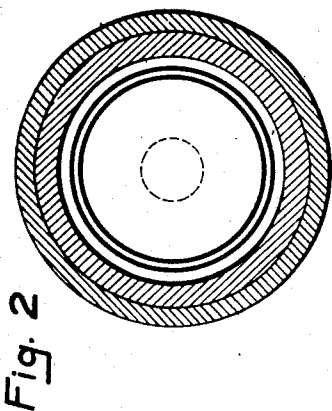


Fig. 2

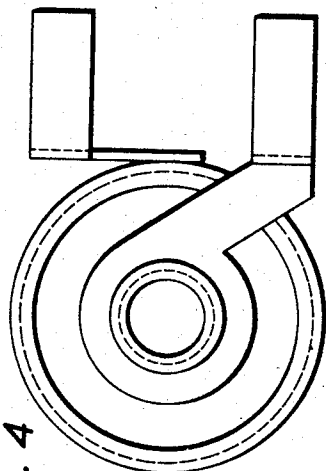


Fig. 4

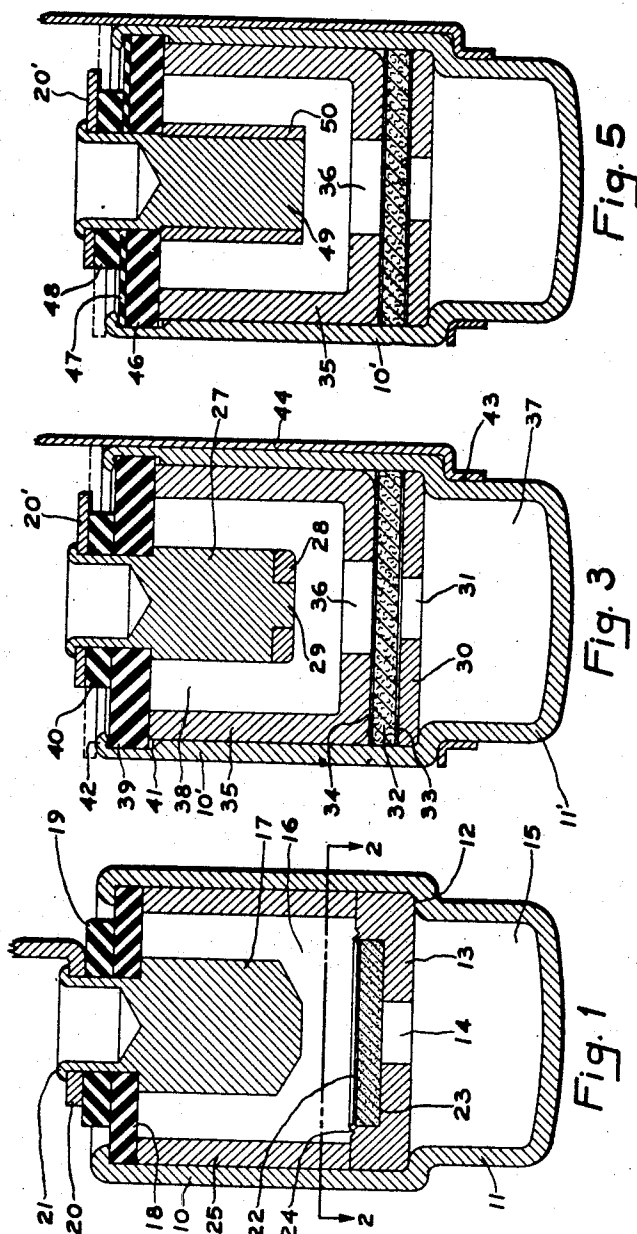


Fig. 5

Fig. 3

Fig. 1

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UNITED STATES PATENT OFFICE

2,414,836

TIMING UNIT FOR CENTRIFUGAL SWITCHES

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Application July 20, 1944, Serial No. 545,747

10 Claims. (Cl. 200—80)

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This invention relates to switches of the character described in my previously filed applications, Serial No. 530,123, filed April 8, 1944, and Serial No. 534,446, filed May 6, 1944. In these devices, particularly where the switch is used to open a circuit, it is often essential that a very low resistance path exist between the shell and the center contact. One purpose of this invention is to improve the switch construction whereby to insure a good low resistance connection through the mercury by utilizing a surface material engaging the mercury that will amalgamate somewhat with the mercury. This amalgamation should be at such a rate as not to adversely affect the flow characteristics of the mercury. It must also be confined to the interior of the switch so that the sealing of the switch will not be destroyed.

It is also an object of the present invention to provide an improved switch construction whereby the necessity of welding the orifice containing element in place in order to prevent leakage from one chamber of the switch to the other is avoided.

Other and more detailed objects and advantages of the invention will appear more fully as the description proceeds, reference being had to the accompanying drawing wherein a preferred form of the invention is shown. It is to be understood however that the drawing and description are illustrative only and are not to be taken as limiting the invention except insofar as it is limited by the claims.

Fig. 1 is a longitudinal sectional view through a switch embodying my invention;

Fig. 2 is a sectional view taken on the line 2—2 of Fig. 1;

Fig. 3 is a sectional view similar to Fig. 1 showing a modified form of the switch and illustrating the mounting of the wiring terminals thereon;

Fig. 4 is an end view of the construction shown in Fig. 3; and

Fig. 5 is a longitudinal sectional view through a switch embodying further modifications of the invention.

Referring now in detail to the drawing, the present invention is embodied in a switch of the character generally described in the previous applications above referred to. In certain forms of the invention a sintered metal type of restriction member is shown, while in other forms of the invention the type of restriction member is a fibrous one. In all cases an orifice containing disk is utilized to support the restriction member. The switch constructions shown herein are

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of the type wherein a shell is divided by the orifice containing disk and the restriction member into two chambers, one of which contains a center contact member. The switch is intended to be used on a rotating device whereby centrifugal force will force a body of mercury that is contained in one of the chambers into the other chamber to either make or break a circuit connection between the shell and the center contact.

In Fig. 1 of the drawing a shell 10 is formed of steel or other suitable material. The shell has a restricted end portion 11 which provides a seat at 12 for an orifice containing disk 13. The disk 13 has an orifice 14 of predetermined cross section area therein. The disk 13 provides a partition separating the interior of the shell into two chambers 15 and 16. The shell also has a center contact 17 extending into it from one end thereof, the center contact being mounted upon an insulating washer assembly consisting of two washers 18 and 19. A terminal 20 is secured with the insulating washers to the center contact by spinning over the outer end 21 of the center contact.

In this form of the invention I utilize a powdered sintered metal wafer 22 as a restriction member to limit the flow of mercury from the chamber 16 to the chamber 15 when pressure is applied by setting up a centrifugal force axially of the shell due to rotation of the shell in the manner described in my previous applications. The sintered metal wafer 22 is seated in a recess 23 provided in the disk 13 and is held in this recess by turning over a portion of the metal around the periphery of the recess as indicated at 24.

It is well known that steel alone is a poor electrical contact. Likewise mercury in contacting steel does not make a very good electrical connection. In order to overcome this difficulty I provide a sleeve 25 of copper within the shell 10. This copper sleeve serves as a supporting means for the insulating washer 18 and furthermore as a spacer between the disk 13 and the washer 18 to determine the spacing between the contact 17 and the restriction member 22. The copper of the sleeve 25 will amalgamate slowly with the mercury but the rate of amalgamation is such that it will not affect the characteristics of the mercury adversely during the time the switch must be in use. This construction is particularly applicable to a one-time operation switch which will be operated within a reasonable time after it is produced. In order further to establish a

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means of producing better contact between the shell and the sleeve 25 the sleeve 25 is driven into the shell and before being driven into the shell is coated with mercury on its surface, thus providing a copper mercury amalgam surface that will provide an extremely uniform condition of engagement between the copper sleeve and the steel shell. The center contact 17 is desirably of a material having good conducting characteristics. In the form shown in Figs. 1 and 2 the center contact 17 is of stainless steel. However in the other forms of the invention a center contact is provided that has better characteristics of conductivity and of contact with the mercury so as to get a lower contact resistance.

Referring now to Figs. 3 and 4, in this form of the invention a center contact 27, also of stainless steel, is provided with a copper ring 28 that is pressed onto a reduced extension 29 of the center contact. In this form of the invention added advantages of the copper in establishing a low resistance contact with the mercury are obtained.

In this form of the device the orifice is provided by utilizing an orifice disk 30 having an orifice 31 therein. Over this orifice is placed a filter assembly which comprises a layer 32 of blotting paper between two layers 33 and 34 of linen. A copper cup 35 is seated on the filter assembly. This cup has an aperture 36 in the bottom thereof, which is somewhat larger than the orifice 31. The shell construction is essentially the same as in Fig. 1 but it will be noted that in Fig. 3 one chamber 37 is like the chamber 15 of Fig. 1 while the other chamber 38 is entirely within the cap 35.

The center contact 27 may be secured in the same fashion as in Fig. 1, utilizing two insulating washers 39 and 40. As shown, the shell 10' is shouldered at 41 by reducing the thickness of the shell wall and the insulating washer 39 is secured in place by spinning over the outer edge 42 of the cup.

A terminal 20' just like the terminal 20 is provided for the center contact. Also, Fig. 3 shows the shell terminal comprising a ring 43 spot welded onto the reduced portion 11' of the shell and provided with an extending strip 44 which is offset at 45 and then extended beyond the end of the shell so as to be properly positioned with respect to the terminal 20'. Fig. 4 shows the position of the terminals with respect to each other and with respect to the shell.

It has been found that polystyrene washers are not satisfactory under certain conditions of extreme temperatures. At extremely low temperatures they shrink so much as to destroy the seal. In order to overcome this difficulty the type of seal shown in Fig. 5 is employed. This type of seal utilizes a phenolic resin washer 46 and faces the outer surface of the washer with a layer 47 of neoprene. A smaller washer 48 of phenolic resin is then placed between the neoprene facing and the terminal 20'.

In the form of the invention shown in Fig. 5 the orifice assembly is the same as in Fig. 3. However, the center contact construction is changed to provide a center contact 49 for getting better contact with the mercury. The center contact 49 comprises a Monel metal core with a copper sleeve 50 pressed thereon. It was found that we could not unite the copper sleeve with stainless steel but it can be united with a Monel metal core in such fashion as to have a very low resistance. In this type of contact the copper

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surface is entirely within the shell. The insulating washer 46 has a center opening that is smaller than the diameter of the copper sleeve. The Monel body of the center contact has a shoulder at the end of the copper sleeve against which the washer is clamped. Thus it is not possible for amalgamation of the copper to affect the seal.

From the foregoing description it is believed that the nature and advantages of my invention will be apparent to those skilled in this art.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In a switch of the character described, a tubular shell, a center contact extending into said shell at one end thereof, means mounting said contact on said end of the shell and insulating the contact from the shell, a partition spaced from said contact in said shell, said partition including means providing a restricted orifice which passes mercury under high pressure but prevents passage of mercury at atmospheric pressure under jolts, impacts, etc., incident to handling, a cup having an inner surface of high affinity for the mercury, said cup being seated in the shell around the center contact, and mercury in the cup.

2. In a switch of the character described, a tubular shell, mercury in the shell, a center contact extending into said shell at one end thereof, means mounting said contact on said end of the shell and insulating the contact from the shell, a partition spaced from said contact in said shell, said partition including means providing a restricted orifice which passes mercury under high pressure but prevents passage of mercury at atmospheric pressure under jolts, impacts, etc., incident to handling, said center contact comprising a body of metal having a low affinity for mercury, and a metal having a strong tendency to amalgamate with mercury covering a portion of said body of metal.

3. In a switch of the character described, a tubular shell, mercury in the shell, a center contact extending into said shell at one end thereof, means mounting said contact on said end of the shell and insulating the contact from the shell, a partition spaced from said contact in said shell, said partition including means providing a restricted orifice which passes mercury under high pressure but prevents passage of mercury at atmospheric pressure under jolts, impacts, etc., incident to handling, said center contact comprising a body of Monel metal at least partially covered with a metal having a strong tendency to amalgamate with mercury.

4. In a switch of the character described, a tubular shell, mercury in the shell, a center contact extending into said shell at one end thereof, means mounting said contact on said end of the shell and insulating the contact from the shell, a partition spaced from said contact in said shell, said partition including means providing a restricted orifice which passes mercury under high pressure but prevents passage of mercury at atmospheric pressure under jolts, impacts, etc., incident to handling, said center contact comprising a body of Monel metal and a sleeve of copper encircling the Monel body and united therewith.

5. In a switch of the character described, a tubular shell, mercury in the shell, a center contact extending into said shell at one end thereof, means mounting said contact on said end of the

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shell and insulating the contact from the shell, a partition spaced from said contact in said shell, said partition including means providing a restricted orifice which passes mercury under high pressure but prevents passage of mercury at atmospheric pressure under jolts, impacts, etc., incident to handling, and a cup having an inner surface of high affinity for the mercury, said cup being seated in the shell around the center contact, said center contact comprising a body of metal having a low affinity for mercury, and a metal having a strong tendency to amalgamate with mercury covering a portion of said body of metal.

6. In a switch of the character described, a tubular shell, mercury in the shell, a center contact extending into said shell at one end thereof, means mounting said contact on said end of the shell and insulating the contact from the shell, a partition spaced from said contact in said shell, said partition including means providing a restricted orifice which passes mercury under high pressure but prevents passage of mercury at atmospheric pressure under jolts, impacts, etc., incident to handling, said center contact comprising a body of Monel metal and a sleeve of copper encircling the Monel body and united therewith, and a cup having an inner surface of high affinity for the mercury, said cup being seated in the shell around the center contact.

7. In a switch of the character described, a tubular shell, mercury in the shell, a center contact extending into said shell at one end thereof, means mounting said contact on said end of the shell and insulating the contact from the shell, a partition spaced from said contact in said shell, said partition including means providing a restricted orifice which passes mercury under high pressure but prevents passage of mercury at atmospheric pressure under jolts, impacts, etc., incident to handling, and a cup having an inner surface of high affinity for the mercury, said cup being seated in the shell around the center contact, said center contact having a copper band thereon.

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8. In a switch of the character described, a tubular shell, mercury in the shell, a center contact extending into said shell at one end thereof, means mounting said contact on said end of the shell and insulating the contact from the shell, a partition spaced from said contact in said shell, said partition including means providing a restricted orifice which passes mercury under high pressure but prevents passage of mercury at atmospheric pressure under jolts, impacts, etc., incident to handling, said mounting and insulating means comprising phenolic resin insulation washers and a layer of rubber, the rubber being on the outer surface of the innermost washer.

9. In a switch of the character described, a tubular shell, mercury in the shell, a center contact extending into said shell at one end thereof, means mounting said contact on said end of the shell and insulating the contact from the shell, a partition spaced from said contact in said shell, said partition including means providing a restricted orifice which passes mercury under high pressure but prevents passage of mercury at atmospheric pressure under jolts, impacts, etc., incident to handling, and a cup having an inner surface of high affinity for the mercury, said cup being seated in the shell around the center contact, the outer surface of said cup being mercury coated whereby to establish a low resistance joint with the shell.

10. In a switch of the character described, a tubular shell, mercury in the shell, a center contact extending into said shell at one end thereof, means mounting said contact on said end of the shell and insulating the contact from the shell, a partition spaced from said contact in said shell, said partition including means providing a restricted orifice which passes mercury under high pressure but prevents passage of mercury at atmospheric pressure under jolts, impacts, etc., incident to handling, a copper lining in the shell and a copper sleeve on the center contact.

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