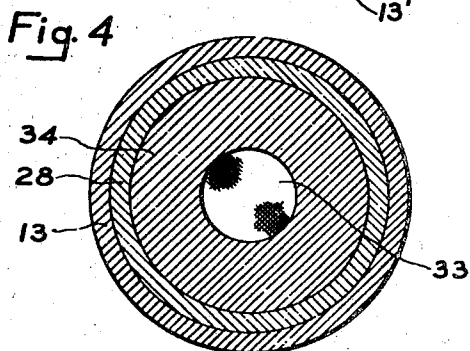
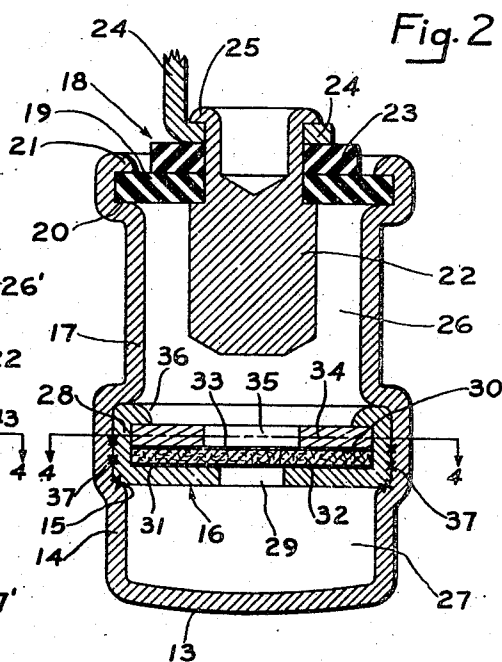
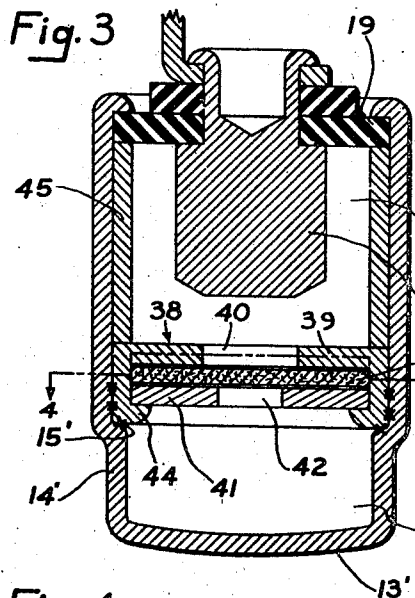
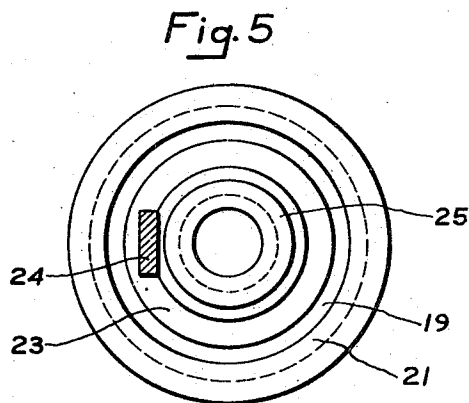
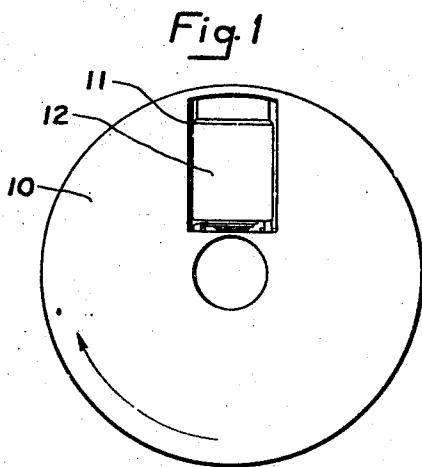


Feb. 10, 1948.

E. W. RICKMEYER
TIMING UNIT FOR SWITCHES

2,435,603

Filed April 8, 1944



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UNITED STATES PATENT OFFICE

2,435,603

TIMING UNIT FOR SWITCHES

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Application April 8, 1944, Serial No. 530,124

3 Claims. (Cl. 200—80)

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The present invention relates to switches and more particularly to centrifugal switches wherein a conducting fluid (mercury) is moved by centrifugal force to control the flow of current in a circuit. In such devices the conducting fluid is confined in a shell which may serve as one terminal contact. The other terminal contact may comprise a contact member that opens into the shell at one end thereof and is insulated from the shell.

The switch functions to time the circuit change in response to the centrifugal force set up in the shell by the rotation of the carrier for the shell. The timing is accomplished by utilizing a restricted passage or a plurality of restricted passages through which the conducting fluid must flow under the pressure developed by the centrifugal force.

In my application, Serial No. 530,123, filed April 8, 1944, I have disclosed a switch of the general character to which this invention applies. According to the present invention however I provide a novel construction whereby a restricted passage is provided in a separate wafer that can be made and tested before it is placed within the tubular shell of the switch.

It is the purpose of this invention to provide a restriction wafer wherein a member containing an opening of a definite cross section is securely bound up with a layer of porous material covering the opening.

It is also a purpose of my invention to provide in a switch of the character described a restriction wafer wherein a cup-shaped mounting member has sealed therein the necessary parts to provide an orifice of fixed cross section with a covering of porous material, the cup-shaped member having its open end turned in so as to permanently bind the porous material in place over the fixed orifice.

It is also a purpose of my invention to provide a novel switch construction wherein a restriction wafer is interposed in the path of a conducting fluid, such as mercury, that is transferred by pressure from one side to the other of the restriction wafer to control an electrical circuit, the construction being such that the wafer can be preformed, pretested and then mounted in the switch body without in any way affecting the capacity of the wafer to pass a given amount of mercury in a given time under a given pressure.

Other detailed objects and advantages of the invention will appear as the description proceeds, reference being had to the accompanying draw-

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ings wherein a preferred form of the invention is shown. It is to be understood however that the drawings and description are illustrative only and are not to be taken as limiting the invention except insofar as it is limited by the claims.

In the drawings:

Fig. 1 is a plan view of a rotating or spinning device wherein a circuit controlling switch of the type embodying my invention is mounted;

Fig. 2 is a longitudinal sectional view through a switch embodying my invention;

Fig. 3 is a view like Fig. 2 showing a slightly modified construction embodying my invention;

Fig. 4 is a sectional view taken on the line 4—4 of Fig. 2; and

Fig. 5 is a plan view of the device shown in Fig. 2.

Referring now in detail to the drawings, I show in Fig. 1 a rotating element 10 which may be mounted upon any suitable means such as a motor shaft and caused to rotate at high speed. The member 10 is shown with a pocket 11 therein, which pocket is adapted to seat a switch element 12. The switch element 12 is shown in longitudinal section in Fig. 2 of the drawings. It comprises a shell indicated generally by the numeral 13. This shell is constructed of any suitable conducting metal since it is adapted to form one terminal of the switch. Of course, where it is desired to have the shell constructed of insulating material a separate terminal would have to be provided. Normally for the shell 13 I utilize a deep drawing steel and form the shell into the tubular shape. One end 14 of the shell is restricted in diameter to provide a shoulder at 15 against which a restriction wafer indicated generally by the numeral 16 rests. The wafer is pressed against the shoulder 15 by rolling the body of the shell inwardly to provide a reduced portion 17. Likewise at the open end of the shell I mount a central contact assembly 18 by securing an insulating washer 19 into the open end of the shell against a shoulder 20 provided by the rolling operation.

The open end of the shell is spun over as indicated at 21 to seal the washer 19 in place. The contact assembly 18 comprises a center contact member 22 which may be of any suitable conducting material such as steel, stainless steel, copper or the like. It is secured to the insulating washer 19 by passing it through this washer and a supporting washer 23 and then through a terminal element 24, the end of the center contact being spun over as indicated at 25 to secure the parts together.

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The restriction wafer 16 forms a partition dividing the shell into a chamber 26 about the contact 22 and a receiving chamber 27. It is important in devices of this character that the restriction wafers be made with such accuracy and care that the timing of the switch under a given pressure tending to force a conducting fluid such as mercury from the chamber 26 to the chamber 27 or vice versa may be depended upon. It is therefore quite important that the restriction wafer be capable of testing before it is placed in the switch assembly. My invention concerns itself with a novel construction whereby the restriction wafer can be made and tested before it is placed in a switch assembly, and can be placed in the switch assembly and sealed so that possibility of leakage about the wafer between the two chambers and the switch can be avoided.

The restriction wafer 16 is made up of a cup 28 having an opening 29 of predetermined cross section in the bottom thereof. The cup 28 preferably is constructed of steel. In the bottom of the cup I place a layer 30 of porous material. This layer is a composite layer made up of fibrous materials. For example, there is a bottom layer 31 of linen, then an intermediate thick layer 32 of paper pulp, such as blotting paper, the fibers of which are relatively long so that the fiber length exceeds the diameter of the opening 29. On top of the layer 32 another layer 33 of a suitable fabric such as linen is provided. The fabric layers 31 and 33 are to hold the fibrous material or pulp in place although of course they do effect a certain amount of restriction too and they are composed of fibers of such length as to bridge the opening 29. In order to secure the layer 30 of porous material in the bottom of the cup 28 I provide an annular clamping member 34 in the form of a flat disk having a central aperture 35 slightly larger than the aperture 29 and axially aligned therewith. I then turn the free edge 36 of the cup 28 inwardly and roll it down over the annular clamp 34 so as to press the parts together and make the complete unit which I have termed hereinbefore the "restriction wafer." This unit can be tested after it is made and before it is placed within the shell 13. Furthermore it lends itself readily to fastening within a shell because of the protection afforded the critical part, namely, the porous material 30 over the orifice 29.

The parts of the restriction wafer 16 obviously are of such nature that they can be made individually, then assembled in high speed production with no difficulty, and the individual wafers can be subjected to the necessary tests to determine the rate of flow of mercury through them before going to the trouble of assembling them in the shell 13.

I have already described how the wafer 16 is placed within the shell against the shoulder 15 and then permanently secured against this shoulder by rolling the portion 17 of the shell inwardly. This however is not sufficient assurance against leakage of the mercury between the chambers 26 and 27 around the wafer 16. Under the extreme pressures developed at high speed rotation of the shell in the member 10 the mercury may find its way around the wafer 16 and that of course would destroy the timing accuracy of the device. In order to prevent any such leakage I weld the wafer 16 to the shell around the circumference of the shell along the line indicated at 37, that is, along the line of the shoulder

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15 and upwardly along the larger portion of the shell above the shoulder.

Referring now to the construction shown in Fig. 3, in this construction the device is slightly modified in order to obtain a more accurate control of the distance between the center contact 22 and the restriction wafer opening. In this form of device the shell 13' has a reduced end 14' providing a shoulder at 15' precisely as in the first form of the invention. However, a different restriction wafer 38 is employed. Fundamentally the wafer is of the same general construction but in this instance a cup-shaped member 39 is provided with an aperture 40 while a disk 41 is provided with the control opening 42 of a predetermined cross section. A layer 43 of porous material is interposed in the bottom of the cup 39 and clamped in place by the disk 41, the end of the cup 39 being rolled inward as indicated at 44 to clamp the parts together. The thickness of the wall of the cup 39 being known, it is then a definite distance from the outer surface of the cup to the porous material 43 where the restricted passage begins. In order to accurately space the contact element 22 with respect to the restricted passage I provide a spacing sleeve 45 inside the shell 13' and seat the washer 19 of the contact assembly on this spacing ring. The wall thickness of the spacing ring can be varied to give the desired volume in the chamber 26'.

The restriction wafer 38 is welded after being placed within the shell 13' but in this instance it is a little more easy to get at the welding because the welding can be done before inserting the sleeve 45, and there is no danger of subsequently damaging the joint between the wafer and the shell as there would be if the welding was done first in the form shown in Fig. 2 and the rolling of the part 17 was done later. The fact that the wafer cup 39 is turned so that its open end faces the chamber 27' gives a smooth seat for the spacing sleeve 45 regardless of the thickness of the sleeve.

It is believed to be evident from the foregoing description and the drawings that I have provided a novel restriction wafer construction together with means for mounting the same in a shell that materially improves the production of the device. The prime advantage lies in the fact that the preformed restriction wafers can be tested for timing and for all sorts of flaws before any assembly into the shell is undertaken. The construction of the wafer is such that it is possible to weld the cup wall to the shell wall and thus eliminate all danger of leakage around the wafer itself. Also in the form of the invention shown in Fig. 3 of the drawings the preformed wafer is rounded for seating against the shoulder 15'. The flat face of the wafer provides with the sleeve 45 an accurate control of the distance from the face of the center contact 22 to the restricted passage regardless of variation in shell length.

From the foregoing description it is believed that the nature and advantages of my invention will be readily 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 device of the character described, a tubular metal shell having an annular shoulder intermediate its ends, a restriction wafer comprising a shallow, flat bottomed metal cup member provided with an opening the bottom, said

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cup member resting on said shoulder and welded, liquid tight, to the shoulder, a layer of porous material in the bottom of said cup covering said opening, means including an inturned lip at the open end of the cup holding the layer of porous material in place, the cup member serving to divide the shell into two chambers, an electrical contact disposed in one of the chambers and mercury disposed in the shell.

2. In a device of the character described, a tubular metal shell having an annular shoulder intermediate its ends, a restriction wafer comprising a shallow, flat bottomed metal cup member provided with an opening in the bottom, said cup member resting on said shoulder and welded, liquid tight, to the shoulder, a layer of porous material in the bottom of said cup covering said opening, an annular clamp fixed in said cup and holding the outer portion of the porous material against the bottom of the cup but leaving the porous material over said opening uncovered, the open end of said cup being turned in to secure said clamp, the cup member serving to divide the shell into two chambers, an electrical contact disposed in one of the chambers and mercury disposed in the shell.

3. In a device of the character described, a tubular metal shell having an annular shoulder

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intermediate its ends, a restriction wafer comprising a shallow, flat bottomed metal cup member provided with an opening in the bottom, said cup member resting on said shoulder and welded, liquid tight, to the shoulder, a layer of porous material in the bottom of said cup covering said opening, an annular clamp fixed in said cup and holding the outer portion of the porous material against the bottom of the cup, the aperture in said annular clamp being centered with respect to said opening but of a different size, the cup member serving to divide the shell into two chambers, an electrical contact disposed in one of the chambers and mercury disposed in the shell.

ERNST WALTER RICKMEYER.

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