

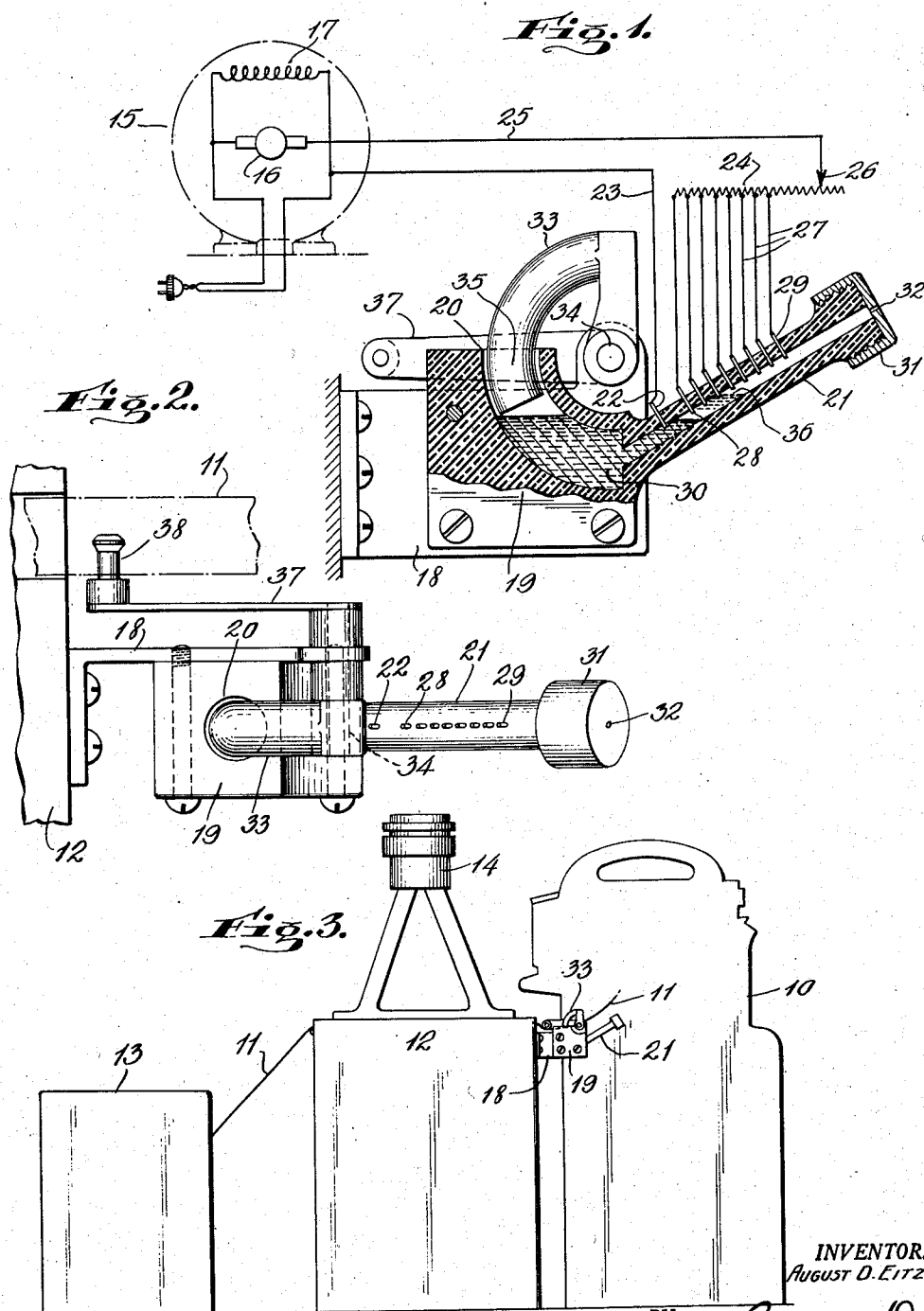
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ELECTRIC SWITCH

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ELECTRIC SWITCH

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9 Claims. (Cl. 200—52)

My present invention relates generally to an improved electric switch and more particularly to an improved electric switch employing a conductive liquid as the contact effecting means and the present application is a division of my Patent No. 1,944,173 dated January 23, 1934.

Among the main objects of the present invention, it is aimed to provide a construction which employs an electric motor and which resorts to the control of speed of the motor by means of a rheostat, the present construction, however, being devoid of frictionally-made electric contacts. I have found that by the employment of a rheostat with a series of contacts over which a complementary contact travels and makes frictional engagement, difficulties are encountered by virtue of the wear and tear upon the contacts, the constant exposure thereof, and the problems of sparking which arise. In accordance with my present invention, a plurality of contacts are employed, but frictional engagement is entirely dispensed with.

Briefly, my invention makes use of a conductive liquid such as mercury, and a particular feature of my construction resides in the provision of a stationary well or reservoir with which a set of rheostat contacts are associated.

It is a particular feature of my invention to provide a construction which involves only one moving part, this part being a pivoted member. All the advantages of automatic and variable speed control, and of the employment of a liquid such as mercury for purposes of contact making, are achieved by my present construction, despite the fact, as mentioned, that only a single element is subject to movement.

The stationary well which I employ is substantially U-shaped and I provide a supply of conductive liquid therein normally at a relatively low level. A set of contacts are arranged in association with the well, and the method of bringing the liquid into predetermined association with these contacts relies upon the principles of liquid displacement, a displacement member being so constructed and arranged as to enter the liquid and cause a change in level thereof, accordingly.

Another object of my invention is to provide an automatic rheostat device of the foregoing character wherein sparking is reduced to a minimum. I accomplish this by means of a non-conductive liquid suitably associated with the conductive liquid so as to quench as quickly as possible sparks formed.

It is still another object of the present invention to provide an improved switch which is es-

entially adapted for use with a stock quotation projection machine.

A general object of my invention is to provide a construction which is extremely simple, compact, inexpensive to manufacture, easy to install, and efficient and reliable in operation.

It is still another object of the present invention to provide a rheostat which is sensitive to a minimum change in actuating force.

For the attainment of the foregoing objects and such other objects as may hereinafter appear or be pointed out, I have constructed a device embodying the feature of my invention and illustrated in the accompanying drawing wherein—

Figure 1 is an enlarged elevational view, partly in section, illustrating the details of the improved switch, and showing the electrical connections diagrammatically;

Fig. 2 is a plan view of Figure 1, all electrical leads having been omitted for the sake of clearness; and

Fig. 3 is an elevational view, mainly diagrammatic, showing a stock ticker projecting machine provided with this improvement.

It is well known that a stock ticker, adapted to discharge marked tape, functions periodically or intermittently depending upon the variable transactions which it records. Where a tape of this character is passed through a projecting device, so that the markings thereon may be cast upon a suitable screen or screens, it has frequently been the custom to provide a tape-pulling mechanism which draws the tape through the projecting device as long as the ticker discharges the same, and ceases to draw the tape whenever the ticker ceases to operate. With tickers which operate at relatively great speeds, a constant transmission of tape through the projecting device at a corresponding speed, interrupted by periods of rest of the tape, is somewhat objectionable because of the strain upon the eyes of the observers. It is far preferable to draw the tape through the projecting device at varying rates of speed conforming to the rates at which the ticker is operating so that periods of absolute rest occur only at those times when the ticker has ceased to function for a sustained period of time.

In view of the foregoing, the present improved electric switch is particularly adapted for use with a stock quotation projection machine. In Figure 3, I have shown a stock ticker which is adapted to discharge a marked tape, the latter entering and passing through a suitable projecting device and being thereupon directed toward a rewind-

ing or tape-drawing mechanism 13. Within the projecting device 12 is a source of light and other suitable mechanism for projecting a beam of light upwardly through the marked tape and through a suitable objective 14 or the like, thence onto a screen. The interior mechanism of the projecting device 12 has not been shown. The rewinding mechanism designated by the reference numeral 13 in Figure 3 includes an electric motor which has not been shown in this figure but which is diagrammatically represented in Figure 1 by the reference numeral 15. This motor has an armature 16 and a field 17.

Between the stock ticker 10 and the projecting device 12, I provide the apparatus hereinafter to be more fully described, and in the illustrated embodiment I have shown this apparatus attached to a side of the projecting device 12 as by means of a bracket 18. It consists of a well 19 which is substantially U-shaped in that it embodies two upwardly extending arms. As viewed in Figure 1 the left arm 20 conforms to an arcuate portion of a torus ring. The extent of this arc is approximately 90°, as illustrated. The other arm of the well 21 is substantially straight, of smaller bore than the arm 20 and inclined upwardly at a slight angle (shown at approximately 30°) to the horizontal. In the illustrated embodiment, the entire well is constructed of insulating material such as bakelite, hard rubber, or the like, although it will be obvious after this specification has been read that the well itself need not necessarily be of insulating material.

Mounted in association with the arm 21 so as to project into the interior of the latter are a set of electrical contacts. One contact 22 is positioned at the lower end of the arm 21 and is electrically connected as by means of a lead 23 to one side of the line or current source. The other contacts constitute a group and are all electrically connected through a rheostat or resistance 24 to the armature in which circuit, this switch element has been intercepted. More particularly, it is to be noted that the field winding 17 is arranged in parallel with the armature 16, in the case of a shunt motor, as shown in the drawing. While the field remains on the line its current does not pass through the switch. It is of course understood that the present invention will work equally as well with a series motor or any variable speed type motor. A lead 25 leads from the armature 16 to a terminal 26 which is preferably adjustable for purposes of installation and manufacture, but which is stationary once the device has been set into operation. The terminal 26 establishes electrical contact with one end of the resistance 24, and a number of leads 27 extend from spaced portions of the resistance 24 to the contacts above referred to as a group. These contacts are arranged in sequence longitudinally along the arm 21 and for illustrative purposes I will point out that the first contact 28, connected with the end of the resistance 24 opposite the terminal 26, is positioned slightly and next above the contact 22; whereas the last contact 29, connected to the resistance 24 at the point nearest the terminal 26, is positioned at the greatest distance from the contact 22.

Within the well I provide a supply of conductive liquid such as the mercury 30, and this supply is just sufficient in quantity so that the level thereof is normally too low to touch and submerge all of the contacts. More particularly, this level is of such a height that normally it submerges only predetermined certain of the contacts. In

the illustrated form, the level of the mercury is normally at a point where it submerges the contact 22 to establish electrical connection therewith.

Before describing the other features of my invention, it will be obvious that under normal circumstances the motor will not be running for although one side of the line or current source is electrically connected with the mercury 30, through the contact 22, the other side of the armature is out of contact with the mercury 30. It will also be obvious that a rise in level of the mercury in the arm 21 will successively establish contact with the remaining contacts. That is, a rise in level will initially cause the mercury to touch and submerge the contact 28, and a continued rise will successively establish connection with the remaining contacts, until finally all the contacts, including the last contact 29, will be submerged in the mercury. As the contacts from 28 to 29 are touched by the mercury, the motor will not only start at a slow rate of speed, but will speed up gradually, the rise of mercury cutting out successive portions of the resistance 24. Similarly, when the mercury level falls, successive portions of the resistance 24 will be reinserted in the circuit of the motor and will cause a slowing of the latter.

The manner in which I cause the mercury level to rise and fall is a particular feature of my invention. It is to be noted that the upper ends of the U-shaped well 19 are open to the atmosphere. Although I prefer to provide a cap 31 upon the outer end of the arm 21, nevertheless it is to be noted that a small aperture 32 is provided. This exposure of the well simplifies the device and allows me to dispense entirely with the use of any gaseous pressures or the like.

Briefly, I achieve the desired rise and fall of the mercury level by a principle of displacement of liquid, a displacement member being so constructed and mounted that it is adapted to enter the mercury in the torus ring 20 of the well, thereby causing the mercury level to rise accordingly in both arms of the well. I have illustratively shown a displacement member 33 which is pivoted at 34, the axis of this pivot being coincident with the center of curvature of the torus ring previously mentioned. The member 33 carries a head 35 which is arcuate and concentric with the axis of the pivot 34. The head 35 is adapted to swing in an arc within the arm 21. In Figure 1, it has been shown out of contact with the mercury 30, but it is obvious that when the member is swung in a counterclockwise direction, as viewed in this figure, the head 35 will enter the mercury 30 and displace corresponding amounts thereof.

It is particularly to be noted that the head 35 is entirely out of contact with the walls of the well, and it is not to be confused with a plunger or piston which would necessitate a tight fit and corresponding difficulty in manufacture and operation.

In order to reduce the ill effects of sparking to a minimum, it is a feature of my invention to provide a small mass of non-conductive liquid such as the oil 36 upon the level of the mercury 30 in the arm 21. This oil is unreactive both physically and electrically toward the contacts touched thereby and serves the valuable purpose of quenching any spark which might be induced as the level of mercury advances or recedes. It also prevents oxidation of the mercury.

To render the rheostat device responsive to the operation of the ticker 10, I provide a lever 37 75.

upon the pivot 34, this lever being provided with a finger 38 adapted to rest gravitationally upon the tape 11 as the latter approaches the projecting device 12.

5 The operation of my apparatus will be apparent from the foregoing description. Under normal circumstances the displacement member 33 is in the position shown in Figure 1 and the motor is not operating. As the ticker commences to discharge marked tape, the finger 38 bears down upon the latter and rests within the loop or festoon which forms between the discharge opening of the ticker 10 and the entrance opening of the projecting device 12. If the rate of discharge of the ticker 10 is not very great, this loop or festoon will not be very deep, and the motor will operate at the slow rate of speed which corresponds to electrical contact established between the contacts 22 and 28. Should the ticker 10 speed up and commence to discharge tape at a greater rate of speed, the loop of tape will increase in depth and the lever 37 will drop to a greater extent. This will cause the head 35 to displace a greater amount of mercury and the level of the latter will accordingly rise to a greater height, successively submerging certain additional contacts in the arm 21. As each contact is submerged, the motor will speed up by a corresponding amount. The resistance 24 is so constructed and arranged with respect to the bores of the well and the size of the displacement member 33 that when the ticker 10 is discharging tape at its maximum rate of speed, the mercury will be submerging all of the contacts in the arm 21 and the motor will operate at a correspondingly rapid rate of speed sufficient to take care of the tape being discharged. Similarly, should the ticker thereafter operate at a slower rate of speed, the advancement of the tape will not cease entirely, but a rise of the lever 37 will lower the level of the mercury by a slight degree and the motor will thereby be caused to operate at a slightly reduced speed. Eventually, when the ticker ceases to operate entirely, the pull upon the tape will cause the lever 37 to rise into the normal position of Figure 1, at which time electrical connection to the motor will be entirely discontinued.

The extreme simplicity of my construction will be apparent to those skilled in the art. The only moving part is the displacement member 33, and since this is pivoted, as at 34, no difficulty whatsoever is encountered in properly mounting the same and in keeping the same properly lubricated and smoothly operating. No parts of my construction need be replaced since there is nothing to wear out. Furthermore, my construction operates entirely noiselessly and requires no attention whatsoever.

It will of course be understood that this invention is not limited to employment with projecting machines of the character illustrated, and it is, of course, not intended to limit this invention to the specific use herein illustrated and described.

In general, it will be obvious that changes in the details herein described and illustrated and described for the purpose of explaining the nature of this invention may be made by those skilled in the art without departing from the spirit and scope of the invention as expressed in the appended claims. It is therefore intended that these details be interpreted as illustrative and not in a limiting sense.

I claim:

1. An electric switch comprising a well having

two arms with an intermediate depressed portion and a pair of spaced mutually insulated contacts projecting into one of said arms, a supply of conductive liquid in the well normally at a level too low to touch both of said contacts, and a movable displacement member pivotally mounted for submersion into the liquid of said other arm to raise the level of the liquid.

2. An electric switch comprising a well of insulating material having two arms with an intermediate depressed portion and a pair of spaced contacts projecting into one of said arms, a supply of conductive liquid in the well normally too low to touch both of said contacts, and a movable displacement member consisting of a bent arm pivotally connected at one end with its other end positioned for movement into the liquid to raise the level of the latter.

3. An electric switch comprising a U-shaped well having two arms with an intermediate depressed portion and a pair of spaced mutually insulated contacts projecting into one of said arms, a supply of conductive liquid in the well normally at a level too low to touch both of said contacts, a fixed fulcrum outside of said well, and a movable displacement member consisting of a bent arm pivotally connected at one end to said fixed fulcrum and having its free end positioned for submersion into the liquid to raise the level of the latter.

4. An electric switch comprising a U-shaped well having two arms with an intermediate depressed portion and a pair of spaced mutually insulated contacts projecting into one of said arms, a supply of conductive liquid in the well normally at a level too low to touch both of said contacts, a fixed fulcrum intermediate said arms, and a movable displacement member consisting of an arm pivotally connected at one end to said fulcrum and bent with its other end positioned for submersion into the liquid in the other of said arms of the well for raising the level of the liquid in both arms.

5. An electric switch comprising a U-shaped well of insulating material having two arms with an intermediate depressed portion and a pair of spaced contacts projecting into one of said arms, a supply of conductive liquid in the well normally too low to touch both of said contacts, a fixed fulcrum intermediate said arms, and a movable displacement member consisting of a bent arm with the end of one portion pivotally connected to said fulcrum and the other portion extending downwardly into said other well arm for movement into the liquid to raise the level of the latter.

6. An electric switch comprising a U-shaped well having two arms with an intermediate depressed portion, one arm of which is a section of a torus ring, a pair of spaced mutually insulated contacts projecting into the other arm, a conductive liquid in the well normally at a level too low to touch both contacts, and a movable displacement member having an arcuate portion substantially concentric with said torus-ring and another portion pivotally mounted for movement of said arcuate portion along its longitudinal axis into said torus ring arm for raising the level of the liquid.

7. An electric switch comprising a U-shaped well one arm of which conforms to a torus ring and the other arm of which is straight and only slightly inclined to the horizontal, a set of spaced mutually insulated contacts projecting into said straight arm, a conductive liquid in the well normally at a level too low to submerge all of said

contacts, a fixed fulcrum intermediate said arms, and a movable displacement member, having an arcuate portion conforming to and disposed within said torus-ring arm and another portion pivotally mounted for submersion of said arcuate portion into the liquid in said torus-ring arm for raising the level of the liquid in said straight arm.

8. An electric switch comprising a U-shaped well of insulating material, one arm of which is an arcuate portion of a torus ring and the other arm of which is straight and inclined slightly upwardly, a set of spaced contacts in said straight arm, a conductive liquid in the well normally at a level too low to touch all of said contacts, a fixed fulcrum disposed at the center of curvature of said torus ring arm, and a displacement member having a portion pivoted to said fulcrum and provided with an arcuate head movable within

said arm when said member is pivoted, said head serving to displace said liquid by varying amounts to raise the level of the liquid accordingly.

9. An electric switch comprising a U-shaped well one arm of which conforms to a torus ring and the other arm of which is straight and only slightly inclined to the horizontal, a set of spaced mutually insulated contacts projecting into said straight arm, a supply of mercury in the well normally at a level too low to touch all of said contacts, a movable displacement member conforming to said torus ring-arm and submersible into the mercury in said arm for raising the level of the mercury in the straight arm, and a supply of oil resting on the surface of the mercury in said straight arm.

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