Dec. 28, 1954 A. M. DAILY ET AL 2,698,369

BRIDGING CONTACTOR FOR ELECTRIC SWITCHES

Filed June 8, 1953

Fig. 1.

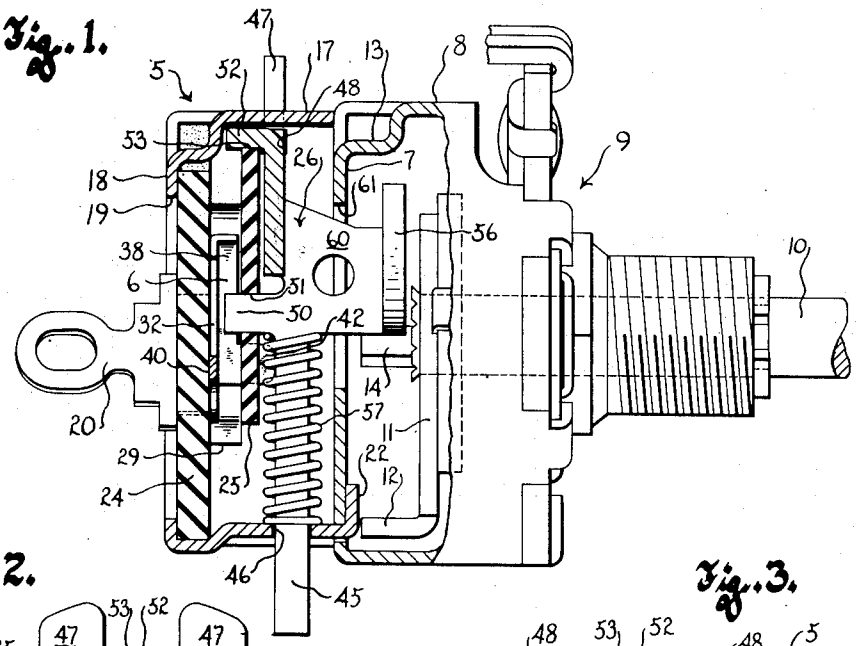


Fig. 2.

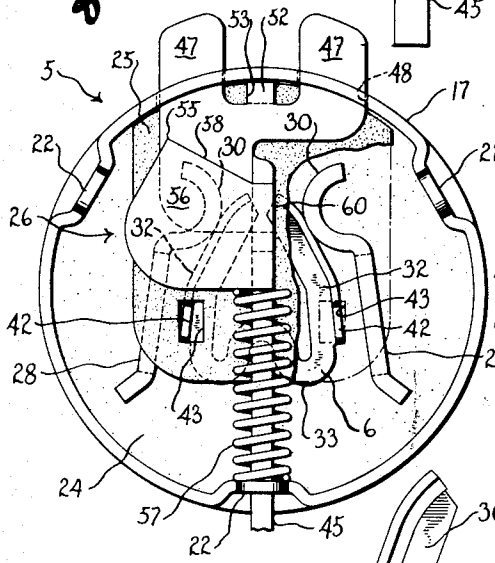


Fig. 3.

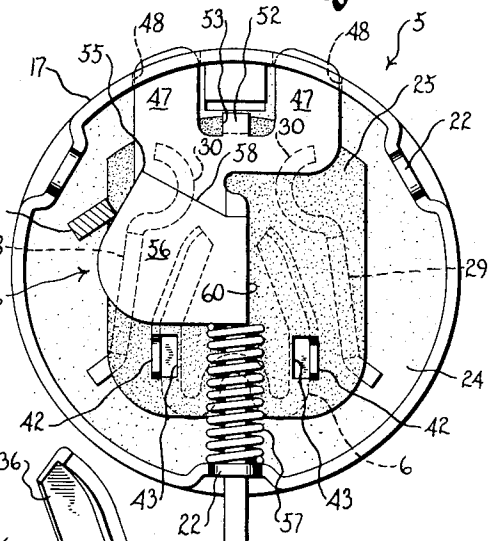
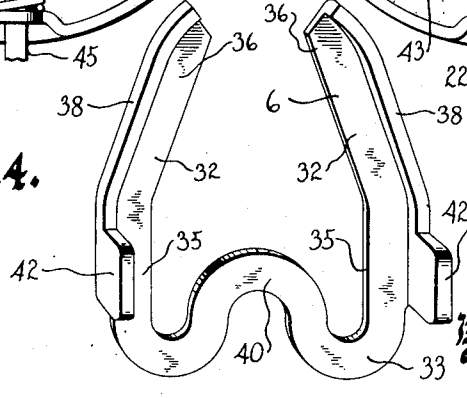


Fig. 4.



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BRIDGING CONTACTOR FOR ELECTRIC SWITCHES

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7 Claims. (Cl. 200—166)

This invention relates to electric switches and has more particular reference to improvements in bridging contactors for single pole single throw switches of the type disclosed in the copending application of Arthur M. Daily and Mervin B. Arisman, Serial No. 301,116 filed July 26, 1952 now Patent No. 2,660,651, issued November 24, 1953.

As disclosed in said copending application, switches of this type feature compactness; and are used extensively in radio and television apparatus, being generally mounted upon the back of a variable resistance device to be actuated by the rotatable control shaft thereof.

It has been customary to provide such switches with a bridging contactor bent flatwise to substantially U-shape so as to provide flatwise flexible arms which are engageable between spaced stationary contacts on the switch base in the closed position of the switch. During closure of the switch, the yieldable outer end portions of the arms are forcefully driven or wedged between the stationary contacts so as to engage them with a desirable wiping action and to be so tensioned thereby as to maintain good contact pressure between their contact portions and the stationary contacts in the switch closed position.

Heretofore in switches of this type, especially in the smaller sizes thereof considerable difficulty has been experienced in maintaining the proper wiping action between the contacts as well as engagement of the necessarily shorter arms of the bridging contactor with the stationary contacts under the proper degree of tension throughout the life of the switch. The flatwise flexible contactor arms have been observed to lose tension after the switch has been in operation for some time, and this phenomenon is believed to result from the over travel of the contactor due to wearing of the cooperating stops defining the switch closed position. The wearing of these stops, of course, allows the bridging contactor to be forcefully driven or wedged progressively farther into the space between the stationary contacts, and eventually results in flexure of the arms beyond their elastic limit. When this occurs, the desirable wiping action between the bridging and stationary contacts is largely destroyed, and contact pressure may even be diminished to a value far below that ordinarily considered essential.

In addition, it is extremely difficult to form such contactors with consistent accuracy and uniformity by production methods of manufacture when they are bent flatwise to the desired U-shape. This means, of course, that there is apt to be considerable variation in such characteristics as contact pressure and wiping action in switches otherwise identical.

With these objections in mind it is the main purpose of this invention to provide a contactor for single pole single throw switches of the character described in which wearing of the cooperating stops defining the closed position of the switch will have no ill effect upon the flexing characteristics of the contactor arms or upon their wiping engagement with the stationary contacts under proper spring tension.

More specifically it is the purpose of this invention to provide a bridging contactor for single pole single throw switches of the type herein concerned in which the shape of the contactor may be controlled more accurately than was heretofore possible by reason of the fact that the major portion of the contactor is a flat stamping of substantially U-shape, providing contact arms which flex edgewise rather than flatwise as was the case in the past.

In this connection it is a further object of this invention to provide a bridging contactor having edgewise flexible arms for engagement with a pair of spaced stationary contacts, and wherein the desired degree of flexure of the arms is obtained through the expedient of so shaping the generally U-shaped bridging contactor that its arms will have a maximum effective length and spring range while occupying a minimum amount of space within the switch housing.

Still another object of this invention resides in the provision of a bridging contactor for an electric switch having a generally U-shaped configuration, the major portion of the contactor including its bight and the opposing arms extending therefrom lying in a single plane and having flanges turned up along their remote edges to not only provide contact portions having surfaces normal to the plane of the contactor but to also provide driving lugs on the arms intermediate their ends by which switch opening and closing motion may be imparted to the contactor by a suitable contact carrier.

With the above and other objects in view, which will appear as the description proceeds, this invention resides in the novel construction, combination and arrangement of parts substantially as hereinafter described, and more particularly defined by the appended claims, it being understood that such changes in the precise embodiment of the hereindisclosed invention may be made as come within the scope of the claims.

The accompanying drawing illustrates one complete example of the physical embodiment of the invention constructed in accordance with the best mode so far devised for the practical application of the principles thereof, and in which:

Figure 1 is a view partly in side elevation and partly in longitudinal section showing an electric switch embodying the contactor of this invention in place on the back of a variable resistor;

Figure 2 is a view looking into the front end of the switch housing, with the switch removed from the variable resistor, and depicting the switch closed position of the bridging contactor;

Figure 3 is a view similar to Figure 2 but illustrating the switch open position of the bridging contactor; and

Figure 4 is a perspective view of the bridging contactor of this invention.

Referring now more particularly to the accompanying drawing in which like reference characters indicate like parts throughout the several views, the number **5** generally designates an electric switch having the novel contactor **6** of this invention incorporated therein. The switch is shown mounted upon the back wall **7** of the housing **8** of a variable resistor **9** to be controlled by the rotatable operating shaft **10** of the variable resistor.

The shaft projects into the interior of the housing of the variable resistor to terminate a distance ahead of its rear wall **7**, and has a lever **11** fixed to its inner end. A rearwardly bent lug **12** on the lever is engageable with one side or the other of an indentation **13** in the housing to limit back and forth rotation of the operating shaft. The lever also has a driving lug **14** formed thereon to provide for actuation of the switch **5** in a manner to be described later.

The switch **5**, as stated, is mounted on the back of the variable resistor and is enclosed within a housing having a side wall comprised of a cylindrical metal shell **17**, and a back wall **18** joined to the rear of the shell and having a large central opening **19** therein to allow the switch terminals **20** to project from the housing and to be accessible at the rear thereof. At its front, the shell **17** abuts the back wall **7** of the variable resistor housing, and the switch housing is secured thereto in a conventional manner as by a series of tangs **22** projecting forwardly from the shell through suitable slits in the end wall **7** and bent over upon the inner face thereof.

The switch includes a circular relatively flat switch base of insulating material **24** fixed in and closing the rear of the switch case, a contact carrier **25** comprising a flat disc of insulating material flatwise overlying and spaced from the inner face of the base a distance sufficient to accommodate the bridging contactor **6** therebe-

tween, the carrier being confined between the base and an actuating member generally designated **26**. The actuating member is of the sliding pitman type disclosed in the copending application of Wilkie L. Bush and Arthur M. Daily, Serial No. 255,270 filed November 7, 1951, now Patent No. 2,660,634 issued November 24, 1953.

There are two stationary contacts **28** and **29** on the base, fixed thereto in spaced relation to one another and at opposite sides of the center of the base, and these stationary contacts are preferably provided by the inner ends of combined stationary contact and terminal members clinched or riveted to the base in the manner disclosed in Patent No. 2,524,784 issued October 10, 1950 to A. E. Franks et al.

The stationary contacts **28** and **29** have relatively flat portions opposite and nearly parallel to one another and lying in zones at opposite sides of and equidistant from the center of the switch base. At one end thereof, shown as uppermost in Figures 2 and 3, the stationary contacts have contact portions **30** formed thereon. These contact portions are of substantially semi-cylindrical shape and have their convex sides normal to the base and facing toward one another, and the space between them is considerably less than that between the relatively flat portions of the stationary contacts. These contact portions **30** are substantially rigid, and are arranged to lie opposite one another along a line spaced above the center of the base. The edges of the stationary contacts which face the underside of the contact carrier **25** lie in a common plane parallel to the inner face of the base, and cooperate with the actuating member **26** to constrain the contact carrier **25** therebetween to edgewise motion in a plane parallel to the inner face of the base.

The bridging contactor **6** of this invention is a flat blanked piece of sheet metal having a generally U-shape. Hence, the major portion of the contactor including its opposite arms **32** and bight **33** are flat and coplanar; and being stamped from a flat piece of metal can be formed with great accuracy as to its U-shape.

The bridging contactor flatwise overlies and slides upon the inner face of the base **24**, and operates in a central zone thereof between the two stationary contacts **28** and **29**, with the extremities of its arms **32** adjacent the contact portions **30** on the stationary contacts and its bight portion **33** adjacent to the opposite ends of the fixed contacts, remote from the contact portions **30** thereof.

The inner end portions **35** of the arms, adjacent to the bight **33** are substantially parallel, while their outer end portions **36** converge toward their extremities. Flanges **38** bent up from the remote side edges of the arms, at right angles thereto, extend from the extremities of the arms inwardly to points near the bight end of the contactor. These flanges provide contact portions on the arms, near their outer ends, which engage between and bridge the stationary contacts **30** during sliding of the contactor substantially lengthwise of its arms, toward the switch closed position as seen in Figure 2.

The arms **32** are flexible edgewise as distinguished from the flatwise flexure of the arms of conventionally formed contactors, and of course, are flexed toward one another when wedged between the stationary contact portions **30** during closure of the switch. During such closure of the switch, the flanges **38** on the outer end portions of the arms have good wiping engagement with the convex surfaces of the stationary contact portions **30** by reason of the flexure of the arms.

In order to enhance the edgewise flexibility of the arms **32** and thus increase their spring range, the bight **33** of the contactor has its center portion **40** bent edgewise inwardly into the space between the arms, in the plane thereof, so that the closed or bight end of the contactor may be said to have substantially sinusoidal curvature. This increases the effective length of the arms **32** and assures that they will have the proper flexing characteristics during the life of the switch. When so constructed, the contactor is not subject to loss of tension as was experienced in the past when the arms of the U-shaped contactor were flexible in a flatwise direction.

Moreover, the increase in the length of the arms **32** is achieved without addition to the overall dimensions of the contactor or having it take up more room than necessary inside the switch housing.

Near the junctions of the arms with the bight **33** of the contactor, the upstanding flanges **38** on the remote side edges of the arms are widened, or extended away from the flat plane of the contactor, to provide lugs **42** substantially parallel to one another. These lugs project forwardly through rectangular openings **43** in the contact carrier so as to drivingly connect the bridging contactor therewith.

As stated previously, the actuating member **26** is of the sliding pitman type. At one end the pitman has a stem **45** slidably projecting through a slot **46** in the side wall **17** of the switch housing and cooperating with a pair of lobes **47** at the other end of the pitman slidably projecting through other slots **48** in the side wall **17** of the housing opposite the stem slot to constrain the pitman to reciprocatory motion substantially diametrically across the housing with its stem portion **45** lying in a plane containing the axis of the housing and passing midway between the stationary contacts **28** and **29**. The actuating member or pitman overlies the front face of the contact carrier **25** and thus confines the same to edgewise motion in a plane parallel to the inner face of the base **24**, in the space between the pitman and the adjacent edges of the stationary contacts **28** and **29**.

The pitman has a driving lug **50** on its stem **45** projecting rearwardly through a relatively close fitting aperture **51** in the central portion of the contact carrier to constrain the latter to reciprocate with the pitman. At the upper end of the pitman a stop lug **52** formed thereon between the lobes **47** is bent rearwardly out of the plane of the lobes, and is engageable with the adjacent inner surface of the side wall **17** of the switch housing to define the switch closed position seen in Figure 2. An additional function of the stop lug **52** is that since it is engaged in a shallow notch **53** in the periphery of the contact carrier, it prevents rotary movement of the carrier about the driving lug **50** on the pitman.

In this way the bridging contactor **6** on the contact carrier may be driven back and forth along a perfectly straight path toward and from a switch closed position at which the flanges **38** on the outer end portions of the contactor arms are wedged between the contact portions **30** of the stationary contacts with substantially equal contact pressure between the arms and their stationary contacts, and with substantially balanced wiping action assured during closure of the switch.

In the switch open position seen in Figure 3 the driving lug **14** on the lever **11** fixed to the operating shaft of the variable resistor has been carried over the high point **55** of a cam **56** on the pitman, and engages the cam to hold the pitman as well as the contact carrier and the bridging contactor **6** thereon in the switch open position, against the expansive force of a compression spring **57** encircling the stem **45** of the pitman and confined between the cam **56** thereon and the side wall **17** of the switch housing.

When it is desired to actuate the switch to the closed position, the operating shaft **10** is rotated in a direction to carry the driving lug **14** clockwise as seen in Figure 3 and as it passes over the high point **55** of the cam, it suddenly releases the pitman and effects spring propulsion of the contactor to the switch closed position seen in Figure 2, thus effecting bridging of the contacts with a snap action. Opening of the switch is accomplished by rotation of the operating shaft in the opposite direction (counterclockwise) causing the driving lug **14** to engage and "ride up" the inclined surface **58** of the cam and thus effect rapid opening of the switch during a relatively short angle of rotation of the operating shaft.

It will be understood, of course, that the cam **56** is bent from the forward end portion of a flange **60** extending rearwardly from the upper end portion of the stem **45** and projecting forwardly through a hole **61** in the back wall **7** of the housing **8** of the variable resistor, so that the cam **56** is positioned flatwise adjacent to and behind the lever **11** on the operating shaft.

From the foregoing description taken together with the accompanying drawing it will be readily apparent to those skilled in the art that the bridging contactor of this invention, being flat stamped to provide edgewise flexible arms with contact flanges bent up therefrom, can be produced in numbers much more accurately than in the past; that the contactor arms will retain proper flexing characteristics throughout the life of the switch, regardless of wear on the cooperating stops defining the switch closed position; that the effective length of the arms is materially increased to assure their de-

sired flexing characteristics, through the particular design of the U-shaped contactor, without increasing its overall dimensions; and that the extra metal in the neighborhood of the contact portions on the contactor arms results in an additional safety factor for heat dissipation.

What we claim as our invention is:

1. A substantially U-shaped bridging contactor for an electric switch: characterized by the fact that the major portion of the U-shaped contactor, including its bight and the opposite arms extending therefrom, lies in a single plane, said arms being edgewise flexible toward and from one another; and further characterized by the fact that flanges struck up from the remote edges of the arms provide contact portions on the arms near their outer ends having surfaces substantially normal to said plane and extending lengthwise of the arms for engagement with stationary contacts to be bridged.

2. A substantially U-shaped bridging contactor for an electric switch: characterized by the fact that the major portion of the contactor, including its bight and the spaced arms extending therefrom, lies in a single plane, said arms being edgewise flexible toward and from one another; and further characterized by the provision of means on the arms providing contact portions thereon near the outer ends of the arms and having surfaces substantially normal to said plane and extending lengthwise of the arms for engagement with stationary contacts to be bridged.

3. The contactor set forth in claim 2 wherein the intermediate portion of the bight is curved edgewise inwardly into the space between the arms to give the same a greater effective length and spring range.

4. The bridging contactor set forth in claim 2 further characterized by the provision of flanges struck up from said arms at locations intermediate said contact portions on the arms and the bight of the contactor, said flanges providing driving lugs by which switch opening and closing motion may be imparted to the contactor.

5. The contactor set forth in claim 4 wherein the flanges which provide the driving lugs are struck up from the remote edges of the arms and have continuations of reduced height extending along said remote edges of the arms to their outer ends and providing said contact portions on the arms.

6. The contactor set forth in claim 5 further characterized by the fact that the bight of the contactor is curved edgewise inwardly into the space between the arms to give the latter a greater effective length and spring range.

7. The contactor set forth in claim 6 wherein said arms converge toward their outer ends.

References Cited in the file of this patent

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