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L. JOHNSTON

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CONTACT SPRING

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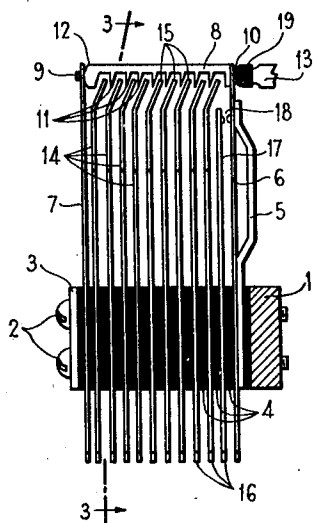


FIG. 1

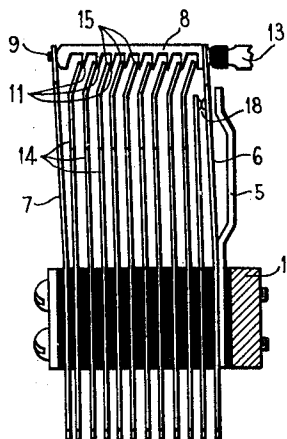


FIG. 2

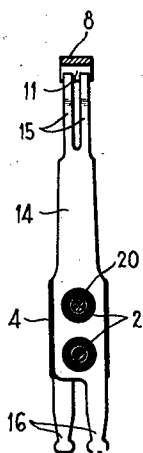


FIG. 3

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CONTACT SPRING

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8 Claims. (Cl. 200—1)

The present invention relates in general to electrical contact spring sets but more particularly to an assembly of a plurality of contact springs which are operated simultaneously by a common operating member.

The main object of the invention is to provide an improved and efficient contact spring set wherein a plurality of electrical circuits are simultaneously closed from a common current source by a single operating member contacting with each contact spring. Other objects attained by the present invention are the provision of improved electrical contacting means by providing a better rubbing action between the contact springs and the operating member; conservation of mounting space by providing a single common operating member for all the contact springs instead of a separate one for each spring, an improved back-stop for limiting the return or restoration movement of the contact spring set; and an improved design of contact spring to render it extremely flexible yet positive in operation in establishing electrical contact.

An embodiment of the invention is illustrated in the accompanying drawing in which;

Fig. 1 illustrates a side view of the contact spring set in its normal position;

Fig. 2 shows the contact spring set in its operated condition, while

Fig. 3 is a cross-sectional side view showing one of the contact springs in elevation.

The contact spring set may be mounted in any desired manner depending upon the particular use to which the spring set is put. In certain instances a plurality of spring sets are closely mounted side by side and due to the particular arrangement according to the invention the space occupied by them is considerably smaller than is usually required.

In the drawing the reference character 1 indicates a mounting bar or plate serving as a support for the spring set. A pair of screws 2 are threaded into bar 1 and through the medium of the metal plate 3 clamp the whole assembly as a unit to the bar 1. In order to electrically insulate each contact spring from the adjacent ones the insulation plates 4 are provided between the contact springs, while the insulated bushings 20 (Fig. 3) insulate the screws 2 from the contact springs. A relatively stiff thick member or spring 5 which is bent outward for a portion of its length engages the supporting spring 6 near its end. Spring 5 which is positioned on the bottom of the spring pile-up serves as a back-stop to limit the return movement of the contact set and due

to its relative stiffness prevents rebound and absorbs the shock of the return movement of the spring set.

At the top of the spring pile-up is the supporting spring 7 which has a small opening near its end. The operating bar 8 which is square in cross section has a round pin 9 at one end of it which engages the hole near the end of supporting spring 7. The other end of the bar 8 is rigidly secured at 10 as by riveting or soldering to the end of the spring 6 so that the bar cannot rotate or twist when operated. At the point where the pin 9 protrudes from the end of bar 8 the bar is slightly rounded as indicated at 12 so that as it moves longitudinally against the end of spring 7 the spring will tend to roll slightly at the pivot point and in addition provide a loose connection between the spring 7 and bar 8. The springs 6 and 7 being attached to the ends of bar 8 are moved with it when it is actuated and serve to provide the necessary restoring force when the actuating force is removed. These springs also extend the current path to the bar 8. Projecting from the bottom of bar 8 are a plurality of spaced tapered projections or contact surfaces 11.

The contact springs 14 are all constructed identically, each having a pair of holes at the bottom end through which screws 2 pass and support them, and a soldering tag 16 to which the connecting wires are attached. The contact springs 14 are tapered slightly toward their top ends where they are split into two extending finger portions 15 in order to provide increased flexibility and to insure good contact by having two contact surfaces for each spring instead of one. The two fingers 15 are each bent at an angle near their ends and project to a point between a pair of the tapered projections 11. In order to operate the contact spring set the operating member 13 is provided and it has an insulated bushing 19 in engagement with the end of spring 6 and one end of bar 8. The operating member 13 may be actuated by any suitable means such as the armature of an electromagnet, a cam actuated by mechanical means or a manual key. An example of the use and manner of operating the contact spring set of the invention is disclosed in Nelson and Johnston Serial Number 716,980, filed March 23, 1934. Upon actuation of the operating member 13 the bar 8 is moved to the left, storing tension in the holding springs 6 and 7 and moving each of the contact projections 11 into engagement with the corresponding contact springs 14. As the bar 8 is moved still further the relatively

sharp edges of contact springs 14, which as noted are bent at an angle from the vertical, make sliding contact with the vertical left hand sides of the tapered contact projections 11, thereby ensuring a good clean and bright electrical contact surface at all times. The right hand side of each of the tapered projections 11 conforms to the angle at which the ends of contact springs 14 are bent so that a more compact assembly of the unit is provided and more contact springs in the same amount of space can be accommodated. Because of the two flexible fingers 15 on each contact spring 14 two separate contact connections are made with the side of each of the contact projections 11 thereby ensuring that electrical connection will be certain. The operated condition of the contact spring set is clearly seen in Fig. 2 and shows the tapered projections 11 all in engagement with the contact springs 14 and closing the common circuit connections through to them.

The contact springs 14 and the bar 8 including the tapered projections 11 are preferably made of phosphor bronze material because of its flexibility, non-magnetic qualities and good contact characteristics.

Under certain conditions it is required that special circuits are to be closed by the contact springs, these circuits being of a higher voltage or of such a nature that the contacts will be badly corroded or pitted. To provide for this contingency if required special precious metal contact points 18 are attached to contact springs 6 and 17. These contacts may also be arranged to close or open at a slightly different time than the contact springs 14 in order to prepare certain circuit paths, for example.

It is seen that with a contact spring structure as described only a single operating or movable member is provided for closing a large number of multiple circuit paths thereby eliminating the necessity of providing a separate operating spring for each stationary spring and the consequent use of insulating bushings between the ends of the springs. A considerable saving of space is thereby effected in addition to a reduction in the number of parts needed in the unit.

What is claimed is:

1. In a contact spring set, contact springs supported in spaced relationship near one of their ends, a common operating electrical conducting bar supported opposite the other ends of said contact springs, and a projection on said bar for each contact spring extending from said common bar into engageable relationship with its corresponding contact spring for simultaneously connecting all of said contact springs to said conducting bar.

2. In a contact spring set, a plurality of contact springs supported at one end in insulated and spaced relationship, said springs being split and bent at their other ends to render them more flexible, a common operating bar extending across the flexible ends of said contact springs, a supporting spring attached to each end of said common bar to hold the bar in movable position opposite the ends of the contact springs, projections on said common bar extending between the flexible ends of said contact springs, there being one projection engageable with each one of said contact springs, and a stop spring engaging one

of said bar supporting springs to maintain said common bar in its normal position.

3. In a contact spring set, a plurality of similar shaped contact springs supported in insulated spaced relationship at one of their ends and in a row, each of said springs being split and bent at the contact end, a common operating bar, a pair of supporting springs for said operating bar, one of said supporting springs held at one end adjacent the first one of the row of contact springs and the other supporting spring adjacent the last contact spring of the row, the other ends of said supporting springs engaging opposite ends of said operating bar, projections extending from said operating bar into position opposite the contact ends of said contact springs, each projection extending opposite one of said contact springs and engageable therewith by operation of said operating bar, and a stop spring supported in the contact spring row and engaging one of said supporting springs to maintain said operating bar in its normal position.

4. In a contact spring arrangement as claimed in claim 1 in which one of the supporting springs is rigidly attached to one end of the operating bar to prevent its axial rotation while the other supporting spring is loosely attached to the other end of the operating bar as a pivot.

5. In a contact spring arrangement as claimed in claim 1 in which an additional contact spring and one of said support springs are provided with precious metal contact points and which additional contacts are arranged to close at a time prior to that in which the regular contact springs are closed.

6. In a contact spring set, a plurality of identical formed contact springs insulatively clamped together at one of their ends to form a compact unit, a supporting spring at each end of the contact spring unit, an operating bar extending across the free ends of said contact springs and engaging the ends of said supporting springs so as to be supported thereby, a projection for each of said contact springs extending from said operating bar into engageable position with the free end of said contact springs, and actuating means engaging the end of said operating bar and the end of one of said supporting springs for actuating said bar to close the projections with the ends of said contact springs.

7. In a contact spring arrangement as claimed in claim 5, a stop spring held at one end with the contact spring unit and having the other end in engagement with one of the supporting springs, said stop spring limiting the return movement of said operating bar and said supporting springs and absorbing the restoration bound of said bar after the actuating means for the bar has been released.

8. In a spring assembly, a contact spring pile-up having one end of each contact spring held in fixed position, an elongated electrical conducting bar having a plurality of projections formed as an integral part thereof, and a supporting spring at each end of said contact spring pile-up for supporting said conducting bar in a position with the end of each contact spring adjacent a corresponding projection for engagement therewith.

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