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W. R. WALKER ET AL

2,970,200

CONTACT PILEUP

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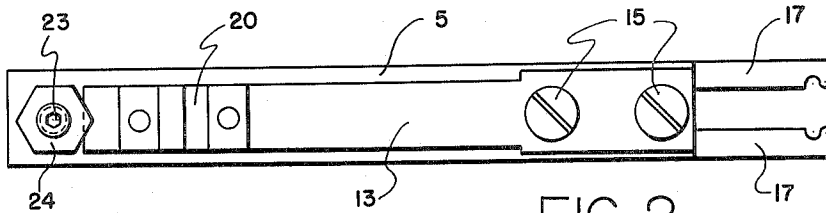


FIG. 2

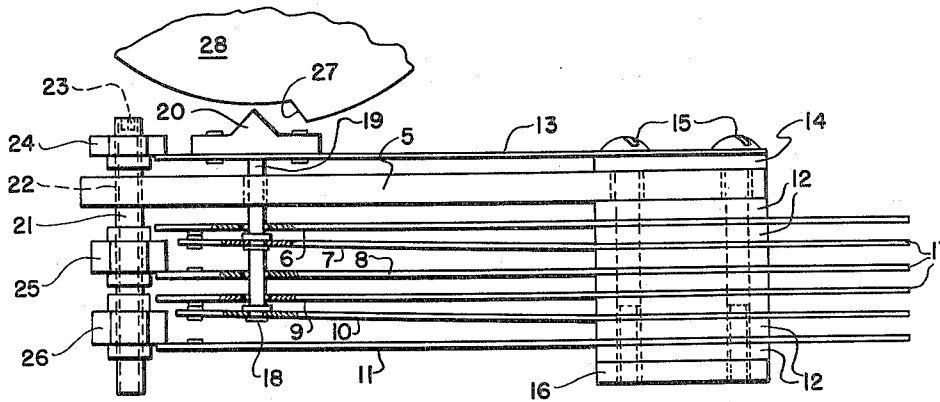


FIG. 1

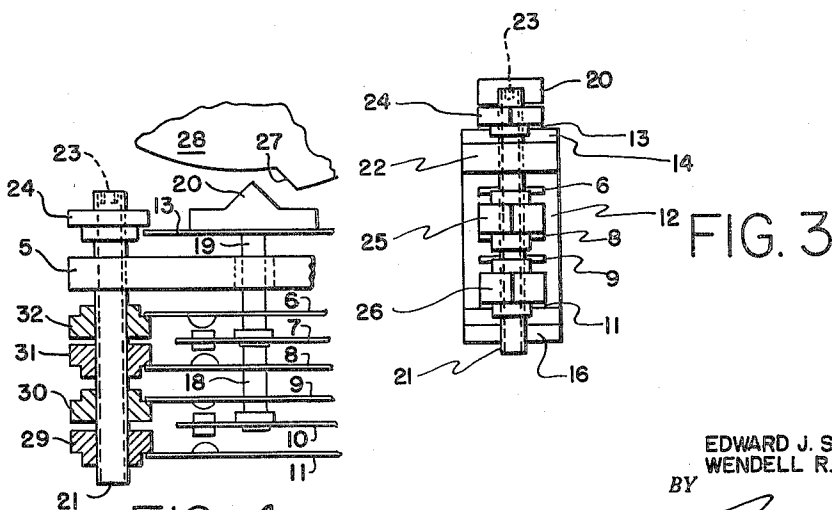


FIG. 3

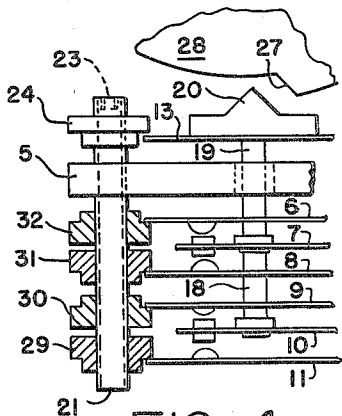


FIG. 4

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CONTACT PILEUP

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This invention relates in general to electrical contact means and more specifically to a contact pileup arrangement provided with means for adjusting contact spacings independently or for adjusting the positions of an entire group or set of contacts in unison with respect to some coacting member, such as a camming surface for example.

Heretofore it has generally been necessary in order to adjust contact spacings in pileups, to laboriously and skillfully adjust each spring by stroking it with a "duck bill" pliers or similar instrument. Furthermore, to adjust movement of the entire stack of contacts for timing purposes, with respect to a camming surface for example, even greater difficulty was encountered, particularly in maintaining individual contact spacings. These procedures are made the more difficult when adjustments are required in the field or after the pileup has been assembled into other confining apparatus and connected in circuit.

Applicants have overcome these disadvantages by providing a built-in adjustment means whereby individual spacings of associated contacts may be adjusted simply yet dependably on an independent basis. Means have also been provided for adjusting an entire stack of contacts in unison without interfering with individual contact spacings.

It is accordingly the principal object of this invention to provide a new and improved contact pileup having means for simply and dependably adjusting contact spacings individually and for adjusting the positions of an entire stack of contacts with respect to a coacting member without disturbing individual contact spacings.

Additional advantages and features of the invention will become more apparent as the following description proceeds, taken in conjunction with the accompanying drawings in which:

Fig. 1 is a side elevation of the new and improved contact pileup of this invention provided with adjusting means.

Fig. 2 is a top plan view of the pileup of Fig. 1.

Fig. 3 is an end view of the pileup of Fig. 1, taken from the end thereof having the adjustment means.

Fig. 4 is a partial side elevation similar to that of Fig. 1, illustrating another embodiment of the invention.

Referring now to the drawings, and more particularly to Fig. 1, there is illustrated a contact pileup or stack having a support arm 5 which is preferably rigid and which may be of any suitable material such as metal or plastic. Secured together, preferably adjacent one end of the arm 5, are a number of conducting springs or leaves, such as springs 6, 7, 8, 9, 10 and 11, insulated one from another by intervening insulating and spacer elements 12. Also secured together with the springs 6—11 and arm 5 is an operating spring or leaf 13, suitably spaced from the arm 5 by a spacing member 14. All of these members are secured tightly together in longitudinal overlaying fashion by any suitable binding means which conveniently may take the form of bolts 15 threaded into a tapped binding plate 16. The various contact springs

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6—11 are provided with apertures large enough to permit the bolts 15 to freely pass therethrough without making contact so that together with the insulating spacers 12, the leaves are maintained insulated one from another. Each of the contact springs or leaves 6—11 are provided with tag ends 17 to which conductors may be secured in any suitable manner and to facilitate which, the tag ends 17 may each be provided with a notch.

Adjacent the other ends of the leaves or springs 6—11, mating electrical contacts are provided, and these may be of any suitable electrical contact material such as German silver or the like. To one side of the contacts, the springs 6—11 and the arm 5 are preferably provided with registering apertures through which may extend operator or plunger elements which in the embodiment illustrated take the form of plungers 18 and 19. These may be of any suitable material and in the embodiment illustrated are of nylon plastic insulating material. As illustrated the plunger 18 is mechanically connected to the spring 10 and the plunger 19 to the spring 7 while slidably passing through arm 5 and springs 6, 8 and 9. The plungers 18 and 19 at rest abut one another and plunger 19 abuts the operating leaf or spring 13 preferably opposite a cam rider member 20, which may be of any suitable material, preferably plastic and secured to the spring 13 as by rivets. The cam rider 20 is engaged by any mechanism for imparting motion thereto, such as an armature actuated lever or arm of an electromagnet, or a cam surface 27 on a rotating cam 28.

Beyond the contact ends of the contact springs 6—11 and operator leaf 13, the support arm 5 is provided with means for adjustably engaging a common adjustment member or shaft 21. In the embodiment illustrated this adjustment member takes the form of a screw threadedly engaging the support arm 5 at 22. One or both ends of the member 21 may be provided with tool engaging means such as the inset 23 for engaging the end of an Allen key.

Threadedly engaging the screw 21 are also provided one or more members 24, 25, 26 which may be of any suitable insulating material and in the embodiment illustrated take the form of nylon plastic nuts having hexagonal sides.

It will be noted that the operating leaf 13 and certain of the contact springs are longer than others of the contact springs for engagement with one or more surfaces of the nuts 24, 25 and 26. The selection of the springs which engage the nuts and which are driven by the plungers 18 and 19 will depend on the particular functions desired to be performed by the particular contacts and associated electrical circuits, and may be varied to suit any particular requirement. Distances between various adjacent contacts may be varied individually by moving the respective associated nut relative to the screw 21.

It will be noted that in particular applications, the height of the whole nuts such as 25 and 26, that is, the distance between the nut surfaces for engagement with contact springs, may be correlated to the thickness of the contacts themselves. Thus, the nut height and contact thickness may be such that if nut 25 by way of example, is adjusted on the screw 21 until it is just in contact with spring 6, only a .015 inch gap will remain between the contacts of springs 7 and 8. The normal bias of spring 8 will of course cause it to follow the adjustment of nut 25. Obviously a similar correlation and adjustment will achieve similar spacings with respect to other nuts and contacts such as 26 and 10, 11.

In this manner individual contact adjustments may be readily achieved without the necessity of laborious and skilled manipulation of individual contact springs to change their tensions or positions. In prior art contact pileup arrangements, this is usually done by stroking the spring with "duck bill" pliers which is an exacting job

requiring utmost skill even when the pileup can be placed in a vise or holder, and is most difficult after the pileup is situated in functional apparatus and connected in circuit.

The pileup as illustrated in the drawing is shown at rest. All springs are initially biased upward as viewed in Fig. 1. After individual contact spacing adjustments have been made as noted above, the position of all contacts in the pileup may be adjusted in unison, with respect for example to a camming surface 27 on a cammed wheel 28 (see Fig. 1) which is associated with the cam rider 20 of the pileup and driven by a source not shown. This is readily accomplished by turning of the member 21 with respect to the support arm 5 by insertion of a tool such as an Allen key at 23. Thus the timing of the operation of all the contacts can be adjusted in unison to a particular position of engagement of the cam rider 20 on the camming surface 27 of the cam wheel 28.

It will be apparent after the adjustment has been made with respect to the cam position, that when the cam rider 20 and operating spring 13 are depressed, the plungers 18 and 19 will cause "make" contacts on springs 6, 7 and 9, 10 respectively to "break," followed by "making" of the break contacts between springs 7, 8 and 10, 11. If for example it is desired that the contact between spring 10 and 11 make before the contact of spring 7 and 8, the nut 26 may be threaded slightly upwardly as viewed in Figs. 1 and 3 relative to the screw 21. Again by way of example, either of the nuts 25 or 26 may be threaded upwardly relative to the screw 21 until at rest the contacts of springs 6, 7 and 9, 10 become "break" contacts and the contacts of springs 7, 8 and 10, 11 become make contacts. The variety of adjustments and versatility of associated circuits thus made possible will be readily appreciated. It should also be noted that any desired number of such nuts may be provided on the member 21 so that if desired, any number or all of the springs may be adjusted independently.

Referring now to Fig. 4, there is illustrated another embodiment of contact pileup similar to that illustrated in Fig. 1 except that pairs of partial or half insulating nuts 29, 30, 31 and 32 are used in place of nuts 25 and 26. It will be apparent that this affords adjustments individual to each of springs 6, 8, 9 and 11. In this arrangement no correlation between contact thickness and the nut height need be had in manufacture as an individual adjustment is available for each operating contact. Thus contact thickness need not be critical in this embodiment.

After the individual contact spacing adjustments have been made, as before, the whole contact set can be adjusted in position relative to the cam surface 27 without disturbing individual contact spacings.

In both embodiments illustrated, the half nuts 24 are merely stops for the operator leaf 13 and need not be utilized as an individual adjustment means.

Having described our invention in detail, it will be apparent to those skilled in the art that numerous modifications may be made without departing from the spirit of the invention. It is intended that all such modifications are within its scope as best defined in the appended claims.

We claim:

1. A contact pileup comprising at least two resilient leaves each provided with registering electrical contacts, means for moving said leaves relative to one another and said contacts into and out of engagement one with another, a support arm rigidly connected to a portion of said leaves and spaced from other portions of said leaves, means adjustably connected to said support arm comprising a single threaded screw externally adjacent said leaves, and means adjustable with respect to said threaded screw comprising at least one threaded nut of insulating material positioned adjacent at least one of said leaves for independently adjusting the position of at least one of

said leaves and its associated contact relative to another of said leaves and its associated contact.

2. A contact pileup comprising a plurality of resilient leaves each provided with at least one registering electrical contact, means for moving said leaves relative to one another and said contacts into and out of engagement one with another, a support arm, means comprising a single rod adjustably and threadedly connected to said support arm and extending therefrom externally adjacent said resilient leaves, and means adjustably carried by said means connected to and extending from said support arm, positioned contiguous with more than one of said leaves for independently adjusting the positions of more than one of said leaves and their associated contacts relative to others of said leaves and their associated contacts.

3. A contact pileup comprising a plurality of resilient leaves insulated and spaced one from another and in such fashion rigidly connected adjacent one end each to another, each of said leaves being provided with at least one registering electrical contact intermediate its said connected end and its other end, means for moving the free ends of said leaves relative to one another and said contacts into and out of engagement one with another, a support arm rigidly connected to and spaced from said connected ends of said leaves, a single screw threadedly engaged with said support arm and extending therefrom externally adjacent the free ends of said leaves, a plurality of nuts threadedly engaging said screw and positioned contiguous the ends of certain of said leaves for independent adjustment of the positions of their respectively contiguous leaves and associated contacts one to another, and means for adjusting simultaneously the position of said screw and said nuts relative to said support arm and thereby the positions of all of said leaves and associated contacts with respect to another reference without changing the positions of leaves and associated contacts with respect to contiguous leaves and associated contacts.

4. A contact pileup comprising a plurality of resilient leaves and an operating spring insulated and spaced one from another and in such fashion rigidly connected adjacent one end each to another, each of said leaves being provided with at least one registering electrical contact intermediate its said connected end and its other end, means including said operating spring and a plurality of plungers for moving the free ends of said leaves relative to one another and said contacts into and out of engagement one with another, a support arm rigidly connected to and spaced from said connected ends of said leaves, a single screw threadedly engaged with said support arm and extending therefrom externally adjacent the free ends of said leaves and said operating spring, a plurality of nuts threadedly engaging said screw and positioned contiguous the ends of certain of said leaves and said operating spring for independent adjustment of the positions of their respectively contiguous leaves and associated contacts one to another, and means for adjusting simultaneously the position of said screw and said nuts relative to said support arm and thereby the positions of all of said leaves and associated contacts with respect to another reference without changing the positions of the leaves and associated contacts with respect to adjacent leaves and associated contacts.

5. A contact pileup comprising a plurality of resilient leaves and an operating spring insulated and spaced one from another and in such fashion rigidly connected adjacent one end each to another, each of said leaves being provided with at least one registering electrical contact intermediate its said connected end and its other end, means including said operating spring and a plurality of plungers for moving the free ends of said leaves relative to one another and said contacts into and out of engagement one with another, a support arm rigidly connected to and spaced from said connected ends of said leaves, a screw threadedly engaged with said support

arm and extending therefrom adjacent the free ends of said leaves and said operating spring, a plurality of nuts threadedly engaging said screw and positioned contiguous the ends of certain of said leaves and said operating spring for independent adjustment of the positions of their respectively contiguous leaves and associated contacts one to another, means for adjusting simultaneously the position of said screw and said nuts relative to said support arm and thereby the positions of all of said leaves and associated contacts with respect to another reference without changing the positions of the leaves and associated contacts with respect to adjacent leaves and associated contacts, certain of said leaves and said operating spring being longer than others of said leaves, said plungers being mechanically connected to the shorter ones of said leaves and slidably associated with respect to the longer of said leaves, and said nuts being in engagement with the free ends of said longer of said leaves and the free end of said operating spring.

6. A contact pileup comprising a plurality of resilient leaves and an operating spring insulated and spaced one from another and in such fashion rigidly connected adjacent one end each to another, each of said leaves being provided with at least one registering electrical contact intermediate its said connected end and its other end, means including said operating spring and a plurality of plungers for moving the free ends of said leaves relative to one another and said contacts into and out of engagement one with another, a support arm rigidly connected to and spaced from said connected ends of said leaves, a screw threadedly engaged with said support arm and extending therefrom adjacent the free ends of said leaves and said operating spring, a plurality of nuts threadedly engaging said screw and positioned contiguous the ends of certain of said leaves and said operating spring for independent adjustment of the positions of their respectively contiguous leaves and associated contacts one to another, means for adjusting simultaneously the position of said screw and said nuts relative to said support arm and thereby the positions of all of said leaves and associated contacts with respect to another reference without changing the positions of the leaves and associated contacts with respect to adjacent leaves and associated contacts, certain of said leaves and said operating spring being longer than others of said leaves, said plungers being mechanically connected to the shorter ones of said leaves and slidably associated with respect to the longer of said leaves, and said nuts being in engagement with the free ends of said longer of said leaves and the free end of said operating spring, said screw being provided on at least one end with an insert for receiving an Allen key.

7. A contact pileup comprising at least two resilient leaves each provided with registering contacts of discrete thickness, means for moving said leaves relative to one another and said contacts into and out of engagement one with another, and movable means intermediate the free ends of at least one pair of said leaves comprising a single nut individual to each said pair of leaves but not connected thereto, the height of said means being correlated to the thickness of said contacts and a preselected spacing for said contacts for automatically providing said preselected contact spacing.

8. A contact pileup comprising at least two resilient

leaves each provided with registering contacts of discrete thickness, means for moving said leaves relative to one another and said contacts into and out of engagement one with another, means intermediate at least one pair of said leaves comprising a nut of insulating material positioned so that opposite surfaces of said nut are not connected to said leaves but may engage the associated leaves of a pair thereof, the height of said nut being correlated to the thickness of said contacts and a preselected spacing for said contacts for automatically providing said preselected contact spacing, and means for adjusting the position of said nut with respect to an independent reference.

9. A contact pileup comprising pairs of resilient leaves each provided with registering contacts of discrete thickness, means for moving said leaves relative to one another and said contacts into and out of engagement one with another, and an insulating nut individual to each pair of said leaves and associated contacts positioned intermediate the ends of each pair of contacts but not connected to said leaves, the height of said nuts being correlated to the thickness of said contacts and a preselected spacing for said contacts for automatically providing said preselected contact spacing.

10. A contact pileup as claimed in claim 9, including a screw on which said nuts are threaded, and means for adjusting the position of said screw and thereby the nuts and said contacts relative to a reference separate from said leaves and associated contacts without changing the positions of the leaves and associated contacts with respect to adjacent leaves and associated contacts.

11. A contact pileup comprising pairs of resilient leaves each provided with registering contacts, means for moving said leaves relative to one another and said contacts into and out of engagement one with another, and a pair of insulating nuts individual to each pair of said leaves and associated contacts and positioned intermediate the ends of each pair of contacts, a single screw externally adjacent said leaves on which said nuts are threaded, said nuts being individually adjustable with respect to said screw to adjust the spacing between their respectively associated contacts, and means for adjusting the position of said screw and thereby the nuts and said contacts relative to a reference separate from said leaves and associated contacts without changing the positions of the leaves and associated contacts with respect to adjacent leaves and associated contacts.

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