June 26, 1951 C. W. McWILLIAMS 2,558,188

CONTACT ACTUATING MECHANISM

Filed March 12, 1947

FIG. 1

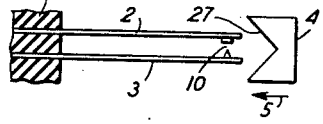


FIG. 2

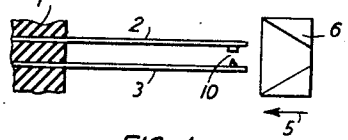


FIG. 3

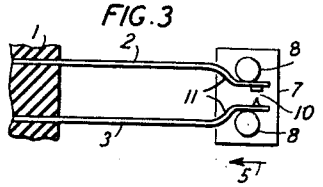


FIG. 4

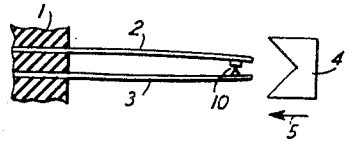


FIG. 5

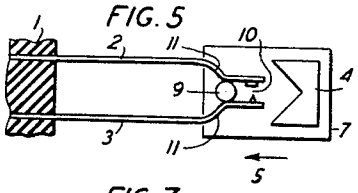


FIG. 6

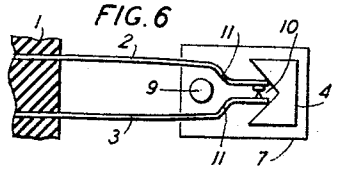


FIG. 7

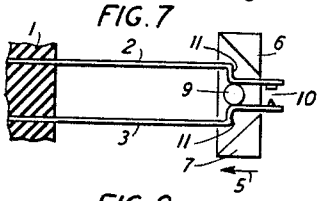


FIG. 8

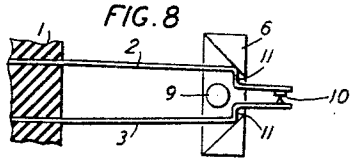


FIG. 9

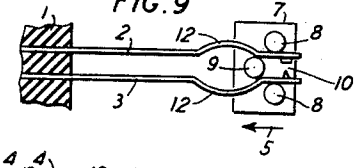


FIG. 10

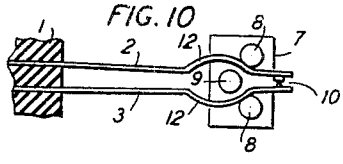


FIG. 11

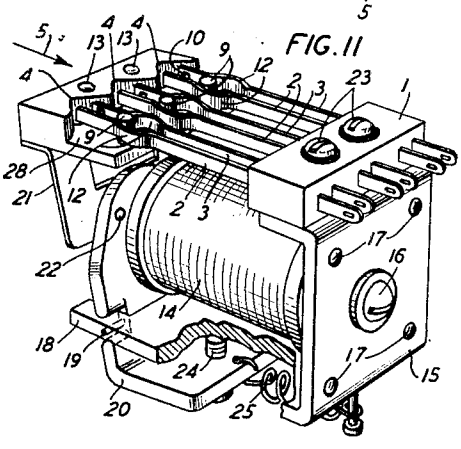
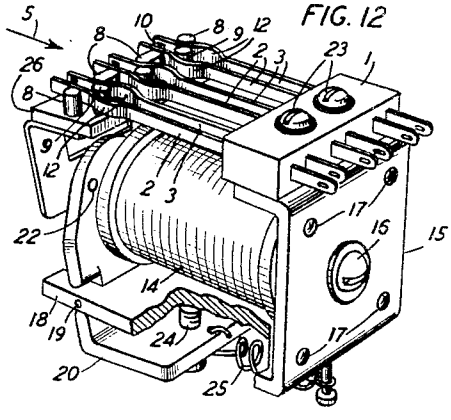


FIG. 12



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# UNITED STATES PATENT OFFICE

2,558,188

## CONTACT ACTUATING MECHANISM

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Application March 12, 1947, Serial No. 734,151

7 Claims. (Cl. 200—153)

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This invention relates to controlling mechanisms for contacting elements and more specifically to that class of such mechanisms which are particularly adapted to prevent spurious or undesired chatter and false or untimely makes or breaks between cooperating pairs of such contacting elements.

Previously, controlling mechanisms of the class described have been generally of the type wherein an insulated cam or card or separator stud has been adapted to perform numerous operations on cooperating contacting elements such as, separating initially closed pairs, closing an open pair by engaging and moving only one of said pair, engaging and moving two separate elements to break their respective initially closed condition with other different and separate elements, engaging and moving two separate elements to effect contact closure between same and two other separate elements and engaging and moving two separate elements to effect contact closure therebetween. In all of the foregoing conditions there has been and still is the existence of possible undesirable chatter of contact elements due to vibration, shock, etc., with attendant false or untimely makes and breaks between cooperating pairs.

It is the main object of this invention to provide a controlling means for cooperating pairs of contacting elements which will provide positive locking conditions for both open and closed pairs of elements and yet which is capable of readily performing the necessary opening of closed pairs and the closing of open pairs. The invention provides a means for positively eliminating the possibility of false opens or closures at undesired times.

Another object of the invention is to provide a controlling mechanism of the class described which is adapted normally to separate two cooperating elements and when actuated to mechanically engage both of said contacting elements to force each into contact closure with other and to mechanically hold same closed.

Another object of the invention is to provide a controlling mechanism for actuating contacting elements, which mechanism when moved in translatory motion will engage each of two cooperating contacting elements and force each into positive contact closure with the other.

Still another object of the invention is provision on an electromagnetic relay of a controlling mechanism of the class described whereby said relay will be absolutely free of the previously ever present disadvantage of contact chatter due to vibration or shock or other movement of the

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relay or of the framework to which said relay may be attached.

According to the invention a controlling mechanism for controlling contacting elements is provided comprising a plate or frame adapted to be moved by whatever means is to initiate the controlling action, said plate or frame is provided with cam surfaces, which may be pins, knobs, notches, wedges, etc., said cam surfaces, etc. capable of being so positioned with reference to the elements to be controlled thereby that at least one of said cams may be interposed between two normally open or two normally closed contact springs to prevent same from making mutual contact, others of said cams are adapted, when said plate or frame is moved, to engage each of the springs to force it to make contact with the other spring, the said one cam having been withdrawn from its separating position between said springs to permit said springs to contact each other.

The particular embodiment of the invention chosen as a preferred disclosure thereof is part of an electromagnetic relay having a core, a winding, an armature, pairs of cooperating contact springs and a mechanism actuated by said armature and adapted to control the said springs. This mechanism, according to one disclosed specie of the invention, comprises a plate which may be attached to the armature of the relay, several insulator pins mounted upon said plate and several dihedral angle insulated notch blocks or a single block composed of a plurality of dihedral angle insulated notches. In the unoperated position of the armature the insulator pins are so positioned with reference to the contact spring pairs that each pin forcibly separates at least one pair to thereby prevent accidental closure therebetween. The notches, in this unoperated position of the armature, are entirely free of said springs. When the armature is actuated the plate attached thereto moves, thereby to remove said pins from their separating positions and to move said notches such that the free ends of each pair of springs are engaged in the respective notches and are forced positively to contact closure and are held positively closed until the armature is released, whereupon, the normal positions of pins and notches are resumed as above stated.

Other objects of the invention and other species thereof will be understood from the following detailed description of the invention. The drawings forming a part of this specification are described generally as follows:

Figs. 1, 2, 3, 4, 5, 7 and 9 illustrate a few differ-

ent embodiments of the invention in normal position relative to contacting elements controlled thereby;

Figs. 6, 8 and 10 illustrate respectively the actuated positions of the mechanisms illustrated in Figs. 5, 7 and 9;

Figs. 11 and 12 show two forms of the invention as applied to the contact spring controlling structure of electromagnetic relays.

In Fig. 1 is shown an insulator support 1 to which two cooperating contact springs 2 and 3 are fixed by molding or otherwise. These springs 2 and 3 may be normally separated to provide a normally open or make pair or they may be normally in contact with each other, as shown by springs 2 and 3 of Fig. 4, to provide a normally closed or break pair. An insulator block 4 is provided and adapted to be actuated from its normal position as shown in Figs. 1 and 4 by translatory motion to its operated position in the direction of arrows 5. The simple motion required for this moving block enables it to be adapted to innumerable standard or well-known relay or switch structures. The block 4 has cut therefrom a dihedral angle notch 27, which should be less than 180 degrees in angle. The block 4, when actuated in the direction of arrow 5, is adapted to engage the free ends of springs 2 and 3 in the notch 27 thereof to force these springs 2 and 3 to contact closure at respective contacts 10. The block 4 is further adapted to positively hold said springs 2 and 3 in a closed position until said block 4 is released to normal. Thus the block 4 will positively prevent chatter of springs 2 and 3 in the closed position. The block 4 of Fig. 4 may be used merely to lock the normally closed or break pair of springs 2 and 3 in their normal position against vibration or shock conditions, etc.

The block 6 of Fig. 2 is similar to block 4 of Figs. 1 or 4 except that the construction of the notch is varied somewhat, as shown. In Fig. 3, a plate 7 carrying insulator pins 8 is provided instead of the aforementioned block 4. The positive operating ability of this plate and pin arrangement is recognized as similar to that of the block 6 of Fig. 2.

In Fig. 5, block 4 is mounted on plate 7, which also supports or has integral therewith an insulator pin 9. The normal position of plate 7, as shown, enables pin 9 to separate springs 2 and 3 and also permits block 4 to be free from the ends of said springs. When the plate 7 is actuated in the direction of arrow 5, the condition of the springs and of the plate 7 is shown in Fig. 6. Plate 7 has moved pin 9 from its separating position to thereby permit the notch in block 4 to force the springs 2 and 3 to closure similarly to the functioning of the structure of Fig. 1. Pin 9 has no effect upon springs 2 and 3 in the position of the mechanism as shown in Fig. 6 since the curved end portions 11 of said springs permit pin 9 to move to a position where the separation of portions of springs 2 and 3 adjacent said pin 9 is greater than the diameter or width of pin 9. The combination of pin 9 and block 4 on plate 7 permits contact springs 2 and 3 to be positively locked in both open and closed positions and permits ready operation of these contacts at the will of whatever force actuates plate 7.

Figs. 7, 8, 9 and 10 are modifications of the structure of Figs. 5 and 6, the operation of which should be obvious at this point in the description of the disclosures.

In Fig. 11 is shown an electromagnetic relay provided with the form of the invention similar to that disclosed in Figs. 5 and 6. A winding 14 surrounds a core (not shown), the core being attached to a heel piece 15 by means of screw 16. Mounting holes 17 are provided in heel piece 15 for frame mounting of said relay. An armature 20 is pivoted by pins 19 to forward extensions 18 of heel piece 15 and said armature 20 is biased to the normal position shown by means of coiled spring 25. Mounted on the rear top of heelpiece 15 is a molded set of contact springs comprising springs such as 2 and 3 molded in insulator block 1 which is held to heel piece 15 by means of screws 23. Attached to armature 20, by means of rivets 22 or otherwise, is an L-shaped extension 21 to the top of which a plate or block assembly 28 is attached by rivets or bolts 13 or by other well-known means. Block assembly 28 may comprise a separate plate 28 to which are fixed notched block 4 and insulator pins 9, previously illustrated in Figs. 5 and 6, or said plate 28, notched block 4 and pins 9 may comprise one solid molding. The configuration of the springs, such as 2 and 3, is similar to those of Figs. 9 and 10. In the normal condition of the relay of Fig. 11 the pins 9 are interposed between cooperating pairs of contact springs, such as 2 and 3 to prevent said springs from making contact closure with each other. These springs may be normally biased open, per Fig. 1, or normally biased closed, per Fig. 4, but pins 9 if provided, will still effect separation of same as shown in Figs. 9 or 11. When the winding 14 is energized, armature 20 will be attracted to the core (not shown) whereupon the block assembly 28 will move in the direction of arrow 5. The notches in the block 4 will engage cooperating pairs of contact springs therein to force same to contact closure and to hold same positively closed as long as armature 20 is actuated. The pins 9, when said armature 20 is actuated, will have been moved into the clearance space between springs, such as 2 and 3, provided by bowed portions, such as 12 of Fig. 9. Thus pins 9 have no effect upon springs, such as 2 and 3, in the actuated position of the relay parts.

Fig. 12 illustrates the same relay of Fig. 11 but provided with a modified form of the invention somewhat similar to that shown in Figs. 9 and 10. When plate 26 is moved in the direction of arrow 5 by energization of the winding 14, the separating pins 9 are moved into the clearance space as before and pins or cams such as 8 are moved to engage respective springs of each pair, such as 2 and 3, to force same to contact closure and to hold same positively closed as long as said relay is energized. Upon deenergization of said relay, pins or cams 8 will be moved free of said contact springs and pins 9 will separate said springs, if normally closed, or will be positioned to prevent undesired closure of said springs if normally open.

No attempt has been made to show other obvious embodiments or applications thereof since this invention is adapted for wide use in diversified fields. It is apparent that keys, hand switches, relays, buttons, thermal switch elements, etc. may readily be adapted with this invention in various forms and combinations of such forms to realize the benefit of a positive chatter-free contacting element controlling mechanism which may prove indispensable in fields where considerable vibration or shock is encountered and where such mechanisms must

be made operationally independent of said conditions.

Since it is not intended that the scope of this invention be limited to the particular embodiments disclosed, claims are appended which alone define the scope of the invention.

What is claimed is:

1. A contacting element actuating mechanism for unequivocally controlling said elements and adapted to positively prevent undesired chatter of said elements, said mechanism comprising mechanical means for positively preventing an open pair of cooperating elements from making accidental closure with each other in the normal position of said mechanism and for positively forcing each of said pair to closure with the other in the actuated position of said mechanism and for positively holding same closed in the actuated position of said mechanism.

2. A contacting element actuating mechanism for unequivocally controlling said elements and adapted to positively prevent undesired chatter of said elements, said mechanism comprising mechanical means for positively preventing an open pair of cooperating elements from making accidental closure with each other in the normal position of said mechanism and mechanical means for positively forcing each of said pair to closure with the other and for positively holding same closed in the actuated position of said mechanism.

3. A contacting element actuating mechanism for unequivocally controlling said elements and adapted to positively prevent undesired chatter of said elements, said mechanism comprising mechanical means for positively preventing an open pair of cooperating elements from making accidental closure with each other in the normal position of said mechanism and movable to permit said pair to make closure with each other in the actuated position of said mechanism and mechanical means free of said pair in the normal position of said mechanism and movable to force positively each of said pair to closure with the other and positively to hold same closed in the actuated position of said mechanism.

4. Controlling means for contact springs comprising a movable plate provided with cams, at least one of said cams located between two cooperating springs when said plate is in its normal position to positively prevent contact closure between said two springs, others of said cams adapted when said plate is moved to engage mechanically each of said two springs to positively force same together to make contact closure therebetween and to hold same closed positively.

5. Controlling means for contact springs comprising a movable plate provided with at least one insulator pin and an insulator block, the said block having cut therein at least one dihedral angle of less than 180 degrees, said plate when in normal position enabling said pin to be located between two cooperating springs to positively prevent same from making contact closure with each other and enabling said block to be free from said springs, said plate when moved enabling said pin to be removed from its separating position between said springs and enabling the said block to engage by means of said dihedral angle cut therein the two said springs to positively force same together to make closure therebetween and to hold same closed positively.



6. Controlling means for contact springs comprising a movable plate provided with at least one insulator pin and at least two separate insulator blocks, the said blocks so disposed in relation to each other as to form therebetween a dihedral angle of less than 180 degrees, said plate when in normal position enabling said pin to be located between two cooperating springs to positively prevent same from making contact closure with each other and enabling said blocks to be free from said springs, said plate when moved enabling said pin to be removed from its separating position between said springs and enabling the said blocks to engage in said dihedral angle therebetween the two said springs to positively force same together to make closure therebetween and to hold same closed positively.

7. Controlling means for contact springs comprising a movable plate provided with insulator pins, at least one of said pins located between two cooperating springs to positively prevent accidental closure of same with each other and others of said pins free from said springs in the normal position of said plate, the plate when moved adapted to remove said one pin from its separating position between said two springs and adapted to move others of said pins into engagement with each of said springs to positively force each into contact closure with the other and to hold same closed positively.

CHARLES W. McWILLIAMS.

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