Nov. 11, 1941. H. L. VAN VALKENBURG 2,262,071

ELECTRIC SWITCH

Filed Jan. 21, 1937 2 Sheets-Sheet 1

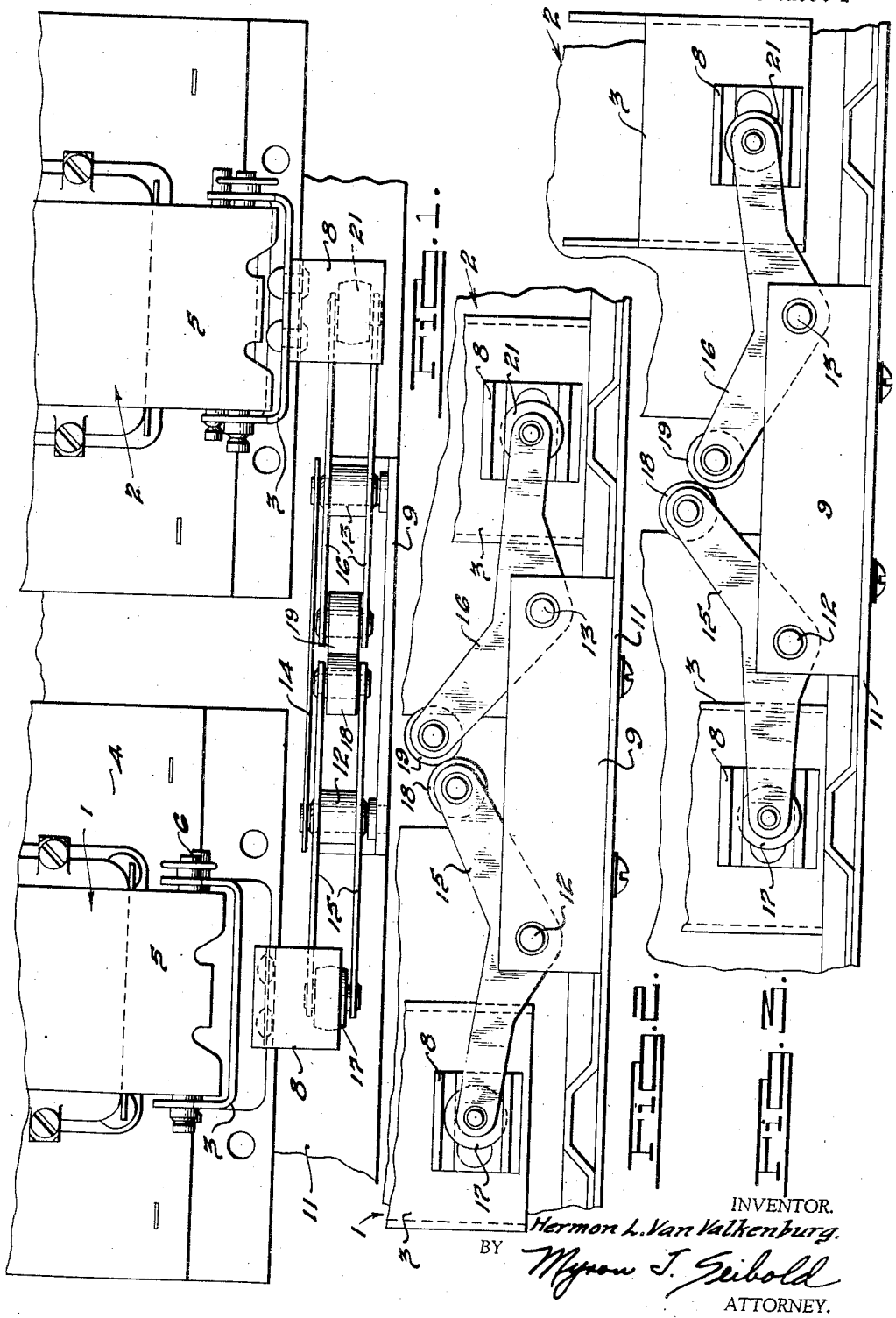


Fig. 1.

Fig. 2.

Fig. 3.

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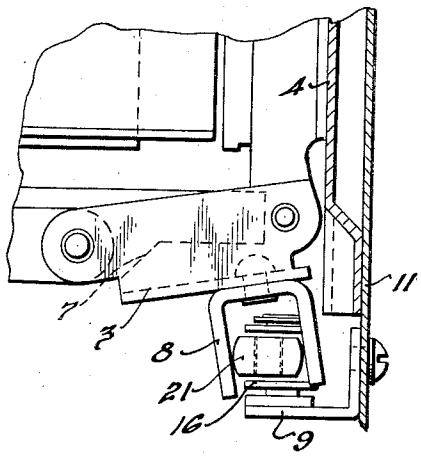


FIG. 4.

FIG. 5.

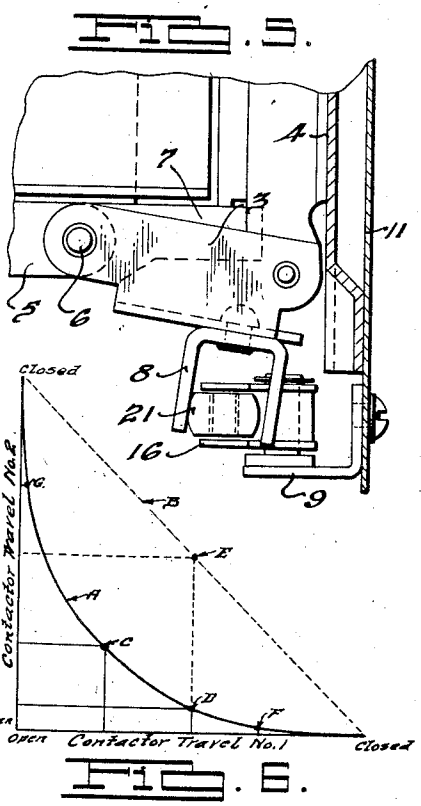


FIG. 6.

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ELECTRIC SWITCH

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Application January 21, 1937, Serial No. 121,456

5 Claims. (Cl. 200—50)

This invention relates to electric circuit controlling instrumentalities and more particularly to mechanical interlocks between electromagnetically operated switches.

In the operation of electric translating devices controlled by electric switches it often becomes desirable to arrange some kind of mechanical interlock which will positively prevent undesirable relative operation of the switches and more particularly to prevent operation of two switches to closed circuit position at the same time. The mechanical interlocks which have been used in the past have been open to various objections inasmuch as some are inoperative unless the switch contacts open rather widely and others have given trouble due to jamming when the second switch is energized before the first one opens.

It is the object of the present invention to provide a mechanical interlock particularly adaptable for use with electromagnetically operated switches which will operate satisfactorily upon a relatively short contact movement and which will not jam if one switch starts to close before the other opens.

Another object of the invention is to provide a mechanical interlock for electromagnetic switches in which in a reversal of positions the opening switch must move at a relatively higher rate of speed than the closing switch.

Another object of the invention is to provide a mechanical interlock for electromagnetic switches in which in a reversal of positions the opening switch must move the major portion of its travel to open position while the closing switch is moving only a minor portion of its travel to closed position.

Another object of the invention is to provide a mechanical interlock for electromagnetic switches having interfering roller members for positively preventing undesired sequential operation of the switches.

Other objects and features of the invention will be readily apparent to those skilled in the art from the following specification and the appended drawings illustrating certain preferred embodiments of the invention in which:

Figure 1 is a front elevational view of a mechanical interlock according to the present invention applied to horizontally spaced electromagnetically operated switches.

Figure 2 is a bottom plan view of the device shown in Figure 1 with the switch at the left in the closed circuit position.

Figure 3 is a view similar to Figure 2 with the switch at the right in the closed circuit position.

Figure 4 is a side elevational view with the switch in the open circuit position.

Figure 5 is a view similar to Figure 4 with the switch in the closed circuit position.

Figure 6 is a diagram illustrating the relative travel of the switches or contactors in moving to closed and open positions.

The interlock according to Figures 1 to 5 inclusive is shown as applied to vertically operable electromagnetic switches or contactors indicated generally at 1 and 2 which may be of the form disclosed and claimed in the co-pending application of Josef Bierenfeld and Lawrence G. Maechtlen, Serial No. 97,532, filed August 24, 1936, for Electric switches. The operating parts for these switches include a lever 3 pivoted to the switch mounting plate 4 at one end and pivotally connected at its opposite end to a generally vertically movable member 5 through a pivot pin 6 on which is mounted the actuating armature 7. Attached to the pivoted members 3 are U-shaped brackets 8 transmitting the movement of the levers 3 in response to energization of the armatures to the interlock. The interlock construction includes a supporting angle bracket 9 mounted on a supporting plate 11 which also carries the switch mounting plates 4. On the lower leg of the angle 9 is mounted a pair of shoulder pins 12 and 13 having their upper ends connected by a plate 14 and pivotally carrying two pairs of spaced bell crank lever arms 15 and 16. At the ends of the pairs of bell crank levers 15 and 16 are pivoted rollers 17, 18, 19 and 21. The rollers 18 and 19 are disposed in interfering relation as shown and the rollers 17 and 21 are disposed between the legs of the U-shaped brackets 8 mounted on the pivoted levers 3. The operation of this interlock will be readily apparent from an inspection of Figures 1 to 5 inclusive. As shown in Figures 1 and 2 the left hand switch is in the closed circuit position corresponding also to the position shown in Figure 5. Movement to this position has moved the corresponding bracket 8 outwardly from the supporting plate and through the bell crank lever 15 has moved the roller 18 toward the base as shown in Figure 2. In this position it is obviously impossible to close switch 2 as it is positively mechanically blocked by the interfering rollers 18 and 19 since the roller 18 is now in such position as to prevent rotation of the bell crank and hence rotation of the lever 3 on the switch 2 and hence upward movement of the associated mem-

ber 5 and closing of the corresponding contacts. Should the switch 2 become energized, no operation of the switching parts would result. When switch 1 is de-energized the lever 3 will move downwardly, thus moving the roller 18 away from the back plate through the bell crank 15. With both rollers 18 and 19 in their outward position away from the back plate either of the two switches may close. Figure 3 represents the position of the parts when switch 2 is closed and here roller 19 now interferes with roller 18 to positively prevent closing of switch 1 while switch 2 remains closed.

The interlock disclosed is quite simple and sure in operation and is seen to require only a relatively slight movement of the contact carrying parts to effectuate the interlocking action. Further, it is noticed that the rollers 18 and 19 prevent jamming of the interlock parts if the contactors are energized at the same time so that the interlock is relatively foolproof in operation.

Figure 6 is a diagram illustrating the relative travel of the contactors or switches under the control of the interlock arrangement previously described. The ordinates indicate the travel of contactor #2 while the abscissae indicate the travel of contactor #1. The curve A represents the relative movement of the contactors using the interlock as herein described. The dotted line B represents the motion of similar contactors under the influence of an interlock of the ordinary rocker type. The point C represents the travel which both contactors may have simultaneously from their open positions. The point D shows the position where contactor #1 is about half-way closed at which point it is seen that contactor #2 cannot be more than about 10% closed. The points F and G indicate the position at which the contacts just close and the distance from point F to the closed position indicates a follow-up or wear allowance of the contacts. It is noted that at point F and thereafter contactor #2 must be practically in its extreme open position. As distinguished from this, the dotted line characteristic of the rocker type interlock indicates at point E that both contactors can travel a full half of their total stroke simultaneously and while this would prevent the contacts from actually closing it can be readily seen that it does not provide a very large break distance by the one contactor before the other is closed. This is extremely important, particularly where the contacts do not have a very large travel between open and closed position and the interlock of the present invention constitutes an obvious improvement as it provides that the one contactor must be very widely open before the other can close. When one contactor is closed and the other open the deenergization of the closed contactor and the energization of the open contactor will necessarily result in the speed of opening of the closed contactor being greater than the speed of closing of the open contactor as is readily substantiated by the diagram which shows at point D that the contactor #1 must move a full 50% of its travel to its open position while contactor #2 is moving only about 10% of its travel toward closed position.

While certain preferred embodiments of the invention have been specifically disclosed, it is understood that the invention is not limited thereto as many variations will be readily apparent to those skilled in the art and the invention is to be given its broadest possible interpretation within the terms of the following claims.

What is claimed is:

1. In combination, a pair of electromagnetically operated electric switches mounted in horizontally spaced relation and adapted for independent operation to circuit controlling positions, a pair of bell crank levers pivotally mounted on horizontally spaced, vertical axes, means connecting the remote ends of the bell cranks to movable parts on the switches, the adjacent ends of the bell cranks being arranged to interfere to positively prevent undesired concurrent operation of said switches to certain circuit controlling positions.

2. In combination, a pair of electromagnetically operated electric switches mounted in horizontally spaced relation and adapted for independent operation to circuit controlling positions, a pair of bell crank levers pivotally mounted on horizontally spaced, vertical axes, means connecting the remote ends of the bell cranks to movable parts on the switches, and rollers on the adjacent ends of the bell crank levers interfering in certain relative movements of said switches to positively prevent undesired concurrent operation of said switches to certain circuit controlling positions.

3. In combination, a pair of electromagnetically operated electric switches mounted in horizontally spaced relation and adapted for independent operation to circuit controlling positions, a pair of bell crank levers pivotally mounted on horizontally spaced, vertical axes, a roller pivotally mounted at each end of each of the bell crank levers, abutment portions on movable parts of said switches engaging the remote rollers to cause movement of said levers in response to movement of said switches, the adjacent rollers interfering in certain positions of said switches to positively prevent undesired concurrent operation of the switches to certain circuit controlling positions.

4. In combination, a pair of electromagnetically operated electric switches mounted in horizontally spaced relation and adapted for independent operation to circuit controlling positions, a pair of bell crank levers pivotally mounted on horizontally spaced, vertical axes, a roller pivotally mounted at each end of each of the bell cranks, U-shaped brackets mounted on movable parts of said switches and having their legs engaging the remote rollers on said levers to cause movement of a lever in response to movement of its associated switch, the adjacent rollers on said levers interfering to positively prevent undesired concurrent operation of the switches to certain circuit controlling positions.

5. In combination, a pair of electromagnetically operated electric switches mounted in horizontally spaced relation upon a supporting plate and adapted for independent operation to circuit controlling positions, an angle bracket mounted on said plate beneath said switches, a pair of bell crank levers pivotally mounted on said bracket on horizontally spaced, vertical axes, means connecting each of said bell crank levers to a switch to provide for rotation of the lever in a horizontal plane in response to movement of its associated switch to open and closed positions, the adjacent ends of the bell cranks being provided with interfering portions cooperating to positively prevent undesired concurrent operation of said switches to certain circuit controlling positions.

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