

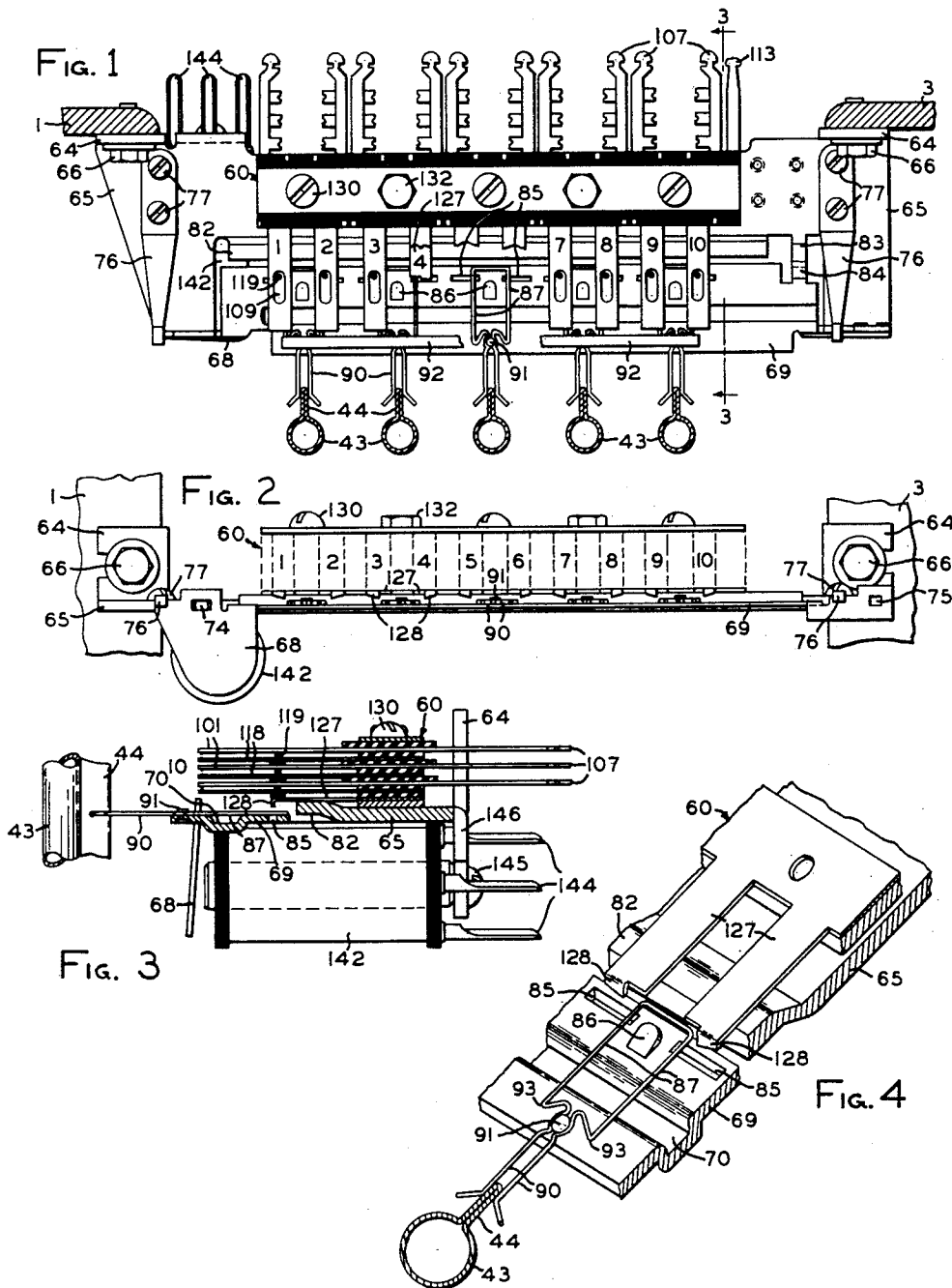
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J. I. BELLAMY

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SELECTING AND ACTUATING MECHANISM FOR CROSSBAR SWITCHES

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INVENTOR:
JOHN I. BELLAMY
BY *[Signature]*
ATTORNEY

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SELECTING AND ACTUATING MECHANISM
FOR CROSSBAR SWITCHES

John I. Bellamy, Wheaton, Ill., assignor, by
mesne assignments, to Kellogg Switchboard
and Supply Company, a corporation of Dela-
ware

Original application March 1, 1944, Serial No.
524,816, now Patent No. 2,490,665, dated De-
cember 6, 1949. Divided and this application
April 19, 1949, Serial No. 88,274

6 Claims. (Cl. 179—27.54)

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This invention relates to selecting and actu-
ating mechanism for a crossbar switch. The
main object of the invention is to provide new
and improved selecting and actuating mechanism
for the stackups of contact members of a cross-
bar switch which is more reliable in operation
and is more economical to manufacture.

This application constitutes a division of my
prior application, Serial No. 524,816, filed March
1, 1944, now Patent No. 2,490,665, issued Decem-
ber 6, 1949.

A crossbar switch as disclosed in the above-
noted prior application includes a succession of
similar individual switch assemblies, each com-
prising a cross row of selectively operable stack-
ups of contact members, and common selecting
shafts arranged to select a stackup of contacts of
any such assembly.

Features of the invention covered in this ap-
plication relate to a simplified select-finger con-
struction and a simplified arrangement for
mounting and controlling the several selecting
fingers of an individual switch assembly of the
crossbar switch. Each such simplified select fin-
ger comprises a pivoted hairpin-like loop of
spring material of which the front portion serves
as a selecting and actuating portion; an inter-
mediate portion cooperates with the pivot; and
the rear portion serves as flexible arms through
which the associated selecting shaft positions the
finger.

Other objects and features of the invention,
largely subordinate to the foregoing, will appear
hereinafter.

The accompanying drawings, comprising Figs.
1 to 4, show a preferred embodiment of the in-
vention:

Fig. 1 is a top view of one individual switch
assembly in mounted position, with certain parts
broken away;

Fig. 2 is a front view of the switch assembly of
Fig. 1, with retaining strip;

Fig. 3 is a sectional view taken along line 3—3
of Fig. 1; and

Fig. 4 is a perspective view showing more clearly
the manner of selection of stackups of contacts
for operation.

The illustrated individual switch assembly com-
prises structure mounted on switch frame 65,
which has a pair of upturned ear portions 64
through which it is secured to the upright mount-
ing rails 1 and 3 by bolts 66.

Other similar individual switch assemblies are
similarly mounted above or below the illustrated
one in vertical alignment therewith for common
selection control by the illustrated select shafts

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43 which extend in front of all the individual
switch assemblies of the complete crossbar switch.
The select shafts 43 are pivotally mounted at
their ends and are individually controlled to
rotate a few degrees in either desired direction
from normal position as fully disclosed in the
previously identified parent application.

A contact bank 60 may comprise parts held in
assembled condition by three screws 139, and is
secured to frame 65 by two bolts 132. Contact
bank 60 has similar stackups of contacts 1 to
10 extending therefrom, of which the tenth stack-
up is shown in side view in Fig. 3. This stack-
up includes three contact pairs, each of which
includes a relatively rigid overlying member 101
and a relatively flexible underlying member 113
permanently paired therewith and arranged to
contact the overlying member when the assembly
of insulating studs 91 is raised through the me-
dium of depending actuating tab 128 on the un-
derlying actuating spring 127.

The flexible members 118 in any level of the
several stackups 1 to 10 are preferably electrically
connected together as by being formed as in-
dividual flexible teeth of a comb-like structure
whose back portion is clamped within contact
bank 60 and is provided with a rearwardly ex-
tending terminal portion 113, as fully disclosed
in the noted parent application.

The relatively rigid contact members 101 have
respective rear terminal portions 107 which have
the illustrated side lugs through which vertically
extending wires may be attached to interconnect
these contact members with respectively corre-
sponding ones in the stackups of the other in-
dividual switch assemblies in the manner com-
mon to crossbar switch construction. Member
101 of any stackup has openings 109 there-
through accommodating the alignment of con-
trol studs 91 which operate freely therethrough.

Frame 65 includes an upwardly offset portion
82 which supports the free end of actuating
blades 1 to 7, which in turn support the respec-
tive alignments of control studs 91.

Actuation of a desired stackup is accomplished
by the common actuating plate 69 which under-
lies the actuating tabs 128 within a cutout por-
tion of frame 65. Plate 69 is provided at its
ends with angularly disposed portions having suit-
able openings through which it is suspended on
lugs 74 and 75 extending forward from frame 65.
The assembly is retained pivotally in place on
these lugs by angularly disposed end portions
of retaining spring 76, secured to frame 65 by
screws 77.

The actuating plate 69 is of magnetic mate-

rial to enable its left-hand angular portion 68 to serve as an actuating armature, which is disposed in front of the free end of the actuating electromagnet 142. This electromagnet is secured to depending tab 146 of frame 65 by screw 145, and has winding terminal 144.

Plate 69 is supported in its illustrated normal position against the force of gravity by lug 83 on the frame 65 which underlies stop lug 84 carried by plate 69. Preferably plate 69 is stiffened as by a downward embossing operation, creating a longitudinal channel 70.

Stackups 1 to 10 comprise five pairs of adjacent stackups, and each such pair is provided with a select finger 87, a separate one for each of the select shafts 43. The select fingers are pivotally related to actuating plate 69 through respective pivots 91 which may be formed on the actuating plate by raising cylindrical portions by a semi-perforating operation. Plate-like retaining strip 92 may be assembled with actuating plate 69 as by spot welding it to the upper end of each of the pivots 91.

Each select finger 87 may be constructed of a single piece of round wire, for example, formed into the illustrated modified hairpin shape. The portion at the forward end, where the two arms or shanks are joined, is the selecting portion. This portion is comparatively wide in the illustrated embodiment to give the finger more stability against a tendency to warp in installed position, as well as to conform to the comparatively wide separation between stackups. The generally rectangular configuration of the finger 87, followed by the illustrated nearly semi-circular pivot-engaging portion in each side arm, provides corner portions just underneath retaining strip 92 which serves to limit tilting of the finger. The two side arms of any select finger are preferably inwardly tensioned sufficiently to provide a light gripping action at its pivot 91 which is useful in limiting return overthrow and in damping vibrational action of the finger incident to its operation or its release from operated position.

Arms 90 of any finger 87 extend rearwardly from the vicinity of its pivot 91 to lie on opposite sides of the front portion of web 44 formed with the associated shaft 43. The rotational location of the finger is thereby placed under control of the select shaft. Each such select shaft normally stands in its illustrated normal position, and is capable of rotation by alternative electromagnets a few degrees in either direction from normal position, according to which one of the two associated stackups of an individual switch assembly is to be selected. Such rotation carries the free end of any associated finger 87 beneath the depending tab 128 of the concerned stackup. If electromagnet 142 is then energized to raise actuating plate 69, the concerned forward side portion of the operated select finger 87 then bridges the underlying opening 85 in plate 69 to raise the overlying actuating tab 128. The selected stackup is thereby actuated through the resulting raising of its column of studs 119. Each flexible member 118 in the stackup is thereby brought into firm electrical engagement with its overlying contact member 101.

At any stackup where a select finger has not been placed underneath its actuating tab 128 when armature 69 is raised, no contact is made with the concerned actuating tab 128. Such tab thus freely enters the underlying window 85 in actuating plate 69.

Finger stops 86 are provided on actuating plate 69 for the respective fingers 87. Stops 86 may be provided by a shear-forming operation which raises them a suitable distance above the surrounding upper face of part 69. Any such stop terminates the movement of its finger 87 toward select position at the desired point in its travel, when it has reached a location coinciding substantially with the center line of the overlying actuating blade 127 and studs 119. Additional movement of the rotating select shaft 43 is permitted by an outward flexing of the concerned arm 90 to insure that each finger controlled thereby has reached its desired select position.

Ordinarily, when a stackup has been actuated as above set forth, the electromagnet 142 is maintained energized for some time to hold armature 69 and the stackup in operated position. During this time, the forward end of the concerned finger 87 is trapped comparatively firmly between plate 69 and the slightly sloped lower face of the concerned actuating tab 128. The off-normal select shaft 43 is ordinarily returned to its illustrated normal position as soon as the selecting operation is followed by the desired stackup closure. When this occurs the opposite rear arm 90 of the trapped select finger 87 is moved outwardly until the entire shank of the finger moves out of contact with pivot 91. Because of the comparatively great length of flexible material then involved, the necessary flexing can occur without requiring more than a small return force to be exerted on the select shaft. If the same select shaft is then moved in the opposite direction to select the paired stackup in another individual switch assembly, the trapped select finger 87 is flexed an additional amount to permit the movement.

When the connection through the actuating stackup is no longer desired, deenergization of electromagnet 142 releases the associated armature 69 to permit the actuating plate 69 to fall by gravity to its illustrated normal position, permitting the contact elements in the previously closed stackup to return to their illustrated normal open condition, and releasing the trapped finger 87. Such finger thereupon springs back into the position corresponding to the rotational position currently occupied by its associated select shaft 43.

An additional function of the flexibility of finger 87 arises when plate 69 has been actuated to close a stackup thereof associated with a given select shaft, following which another select shaft is rotated to select a stackup of another individual switch assembly. When this occurs the forward side of the rotating finger 87 of the last-mentioned shaft cannot pass underneath its associated actuating tab 128, which is then extending into the underlying opening 85. Consequently the movement of forward end of the finger is blocked at a point very near the normal position thereof. The entire remaining travel of the control web 44 of the concerned shaft 43 is readily permitted by the flexing of the driven rear arm 90 of the blocked finger away from the trailing one, and away from pivot 91.

The flexible split construction of any finger 87 enables it to be slid longitudinally into place around its pivot 91 after retaining strip 92 has been welded to pivots 91, spreading to include the pivot and snapping closed when assembled position is reached. The finger may be removed by pulling it longitudinally in the opposite direction.

Functionally, the forward part of any finger

87, extending from the pivot location to the closed end of the finger structure, may conveniently be termed the pointer portion, while the remaining rear part, comprising drive arms 90, may be termed the drive portion, as the noted parts are respectively termed in certain of the claims.

I claim:

1. In combination, contact members comprising separately actuatable stackups mounted side by side in a row, an actuating member underlying the stackups and means for moving it toward and away from them between a released position and an actuated position, pivots disposed along the actuating member in association with the stackups respectively and having their axes generally parallel to the path of said movement of the actuating member, select fingers supported on said actuating member for rotation about said pivots respectively, each said finger comprising a single hairpin-like member of generally uniform cross section, portions of the shanks of any finger remotely located from the closed end thereof being formed to complement each other in retaining the finger on its said pivot for rotation back and forth about it laterally of its associated stackup between an ineffective position and an effective position, movement of the actuating member into its said actuated position leaving unactuated the stackup associated with any finger which is currently in its said ineffective position, a portion at the closed end of any finger in its said effective position engaging its associated stackup to transmit the last said movement of the actuating member thereto to actuate it.

2. In combination, contact members comprising a pair of separately actuatable stackups mounted side by side, an actuating member underlying the stackups and means for moving it toward and away from them between a released position and an actuated position, a pivot carried on the actuating member with its axis generally parallel to the path of said movement of the actuating member, a select finger supported on said actuating member for rotation about said pivot, said finger comprising a single hairpin-like member of generally uniform cross section, portions of the shanks of the finger remotely located from the closed end thereof being formed to complement each other in retaining the finger on its said pivot for rotation back and forth about it laterally of the stackups between an intermediate position and alternative effective positions corresponding respectively to said stackups, movement of the actuating member into its said actuated position leaving both stackups unactuated when the select finger is currently in its said intermediate position, the shanks of the finger corresponding to the stackups respectively, a portion of the concerned shank at the closed end of the finger in either said effective position engaging its corresponding stackup to transmit the last said movement of the actuating member thereto to actuate it.

3. In combination, a contact set, a select finger having a pointer portion comprising the forward portion of the finger and having a drive portion which comprises the rear portion of the

finger and consists of a pair of opposed flexible arms separated throughout such portion and joined together within the pointer portion, means pivoting the finger for rotation about the junction of said portions, a member lying between said arms within the drive portion and acting therethrough to rotate the finger as a whole to bring the pointer portion into and out of association with said contact set, and means for actuating the contact set subject to said pointer portion being currently associated therewith.

4. In combination, a contact set, a select finger having a pointer portion comprising the forward portion of the finger and having a drive portion which comprises the rear portion of the finger and consists of a pair of opposed flexible arms separated throughout such portion and joined together within the pointer portion, a pivot, said arms having mutually complementary pivot-engaging sections formed therein at the junction of said portions to retain the finger on the pivot for rotation thereabout, a member lying between said arms within the drive portion and acting therethrough to rotate the finger as a whole to bring the pointer portion into and out of association with said contact set, and means for actuating the contact set subject to said pointer portion being currently associated therewith.

5. In combination, two stackups of contact members, a finger pivotally mounted at the rear end thereof for rotation back and forth to bring the forward end into and out of association with said stackups alternatively, said finger having opposed arms of flexible material fixed therewith and extending rearwardly therefrom, a member lying between said arms to the rear of the said pivotally mounted end of the finger and acting through said arms to effect the said rotation of the entire finger, and means for actuating either stackup subject to the forward end of the finger being currently in association therewith.

6. In a switch having rotatable selecting fingers and having stackups of contact members and means for selecting them respectively by rotating said fingers, opposed plate-like members spaced apart to receive the fingers therebetween, and pivots extending between said plates and arranged in a row, said fingers lying between said plates and rotatably engaging said pivots respectively, each finger being of split flexible construction enabling it to be moved longitudinally into and out of assembled position.

JOHN I. BELLAMY.

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