

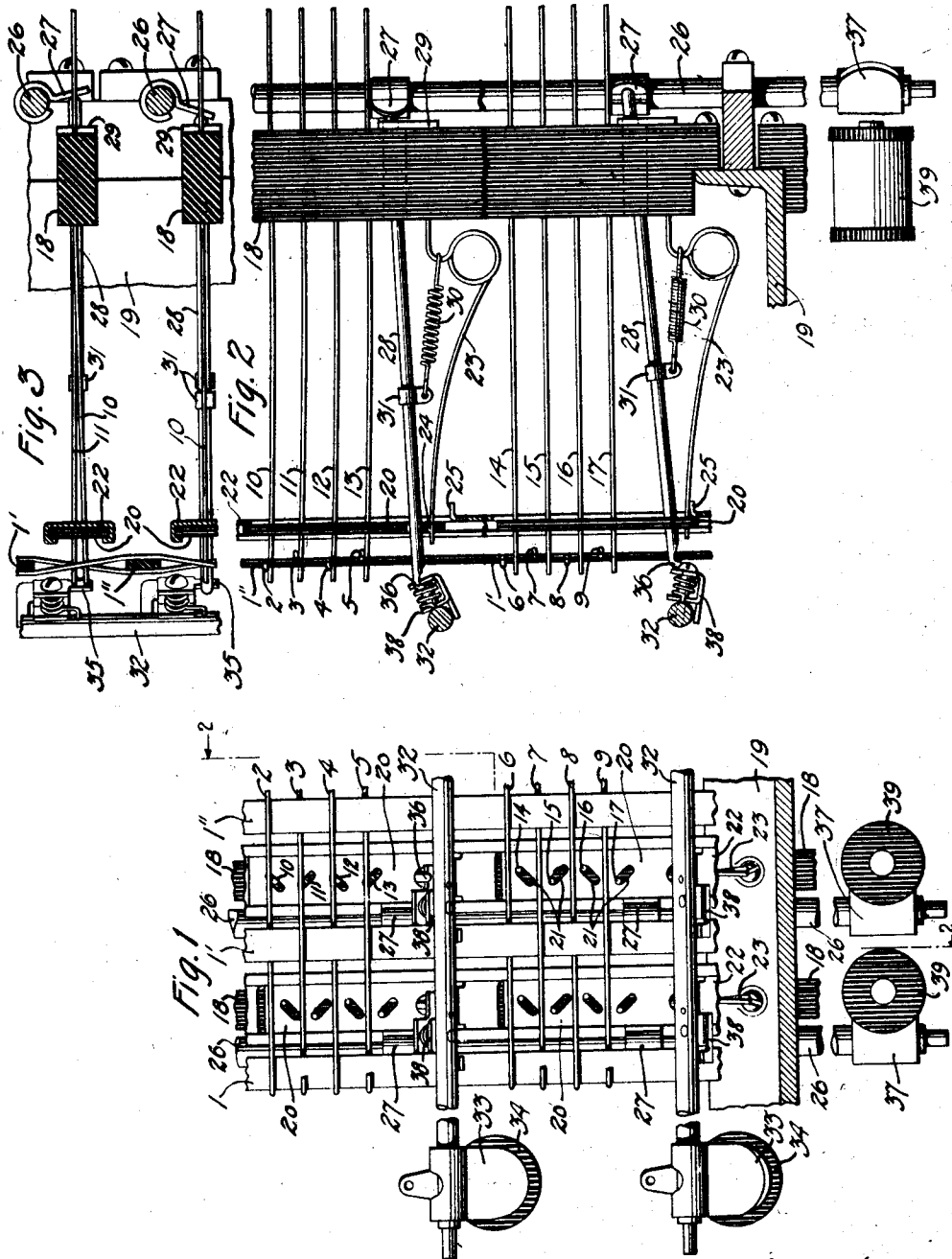
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1,543,670

F. H. GRAHAM

COORDINATE SWITCH

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UNITED STATES PATENT OFFICE.

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COORDINATE SWITCH.

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To all whom it may concern:

Be it known that I, FRANK H. GRAHAM, a citizen of the United States of America, residing at New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Coordinate Switches, of which the following is a full, clear, concise, and exact description.

This invention relates to automatic telephone exchange switching apparatus, and more particularly to the so-called coordinate switches of the type generally adapted for establishing connection in an automatic telephone exchange system.

This invention is particularly adaptable to a switching system of the type disclosed in a patent to Charles L. Goodrum and John N. Reynolds, No. 1,515,735, granted November 18, 1924, but it will be apparent to those skilled in the art that this invention may be applied equally well to perform other switching functions with few changes in the operating circuit.

The object of this invention is to provide an economical and improved form of coordinate switch, which will be compact, simple, and reliable in operation and wherein each operating part is readily accessible for adjustment. This is accomplished by providing longitudinally movable contact operating bars whereby the coordinately arranged contact selecting bars may be located outside of the zone of the active and passive conductors or contacts where they will be readily accessible.

For further details of the invention, reference may be made to the accompanying drawing, in which Fig. 1 is a partial front assembly view of said switch. Fig. 2 is a sectional view thereof showing the upper set of active contacts in operative position. Fig. 3 is a top view of Fig. 2.

The structure shown consists in general of a stationary grid, comprising the vertical bars of insulating material 1, 1' and 1'', sets of interwoven cross wires 2, 3, 4, 5 and 6, 7, 8 and 9 referred to hereinafter as passive conductors, together with vertical rows of active wire contact sets 10, 11, 12, 13 and 14, 15, 16, 17, and operating mechanism for selectively moving the various sets of active contact wires into engagement with other associated passive conductors. The structure may be of any desired width to accommodate as many vertical rows of active

contacts sets and as many sets per row as may be required.

The active contact wires 10, 11, 12, 13, and 14, 15, 16, 17 are arranged on vertical bars of insulating material 18 which are held securely on the switch frame 19 by any suitable means.

Each set of active contact wires is provided with an operating card 20 having apertures 21 through which the active wires extend in juxtaposition to the grid wire contacts. The operating cards 20 are slidably arranged in guides 22 and held in normal non-operated position therein by means of resilient supports 23 which, like the active contact wires, are embedded in the vertical bar 18. Each of the resilient supports 23 extends through an individual aperture 24 in the cards 20 and each is tensioned downwardly so as to normally hold the active contact wires out of engagement with their associated passive conductors. A stop 25 is provided for each resilient support for limiting the downward movement of the active contact wires.

With each vertical row of active contact sets there is associated a vertical rotatable bar 26 which is provided at one end with an armature 37, arranged to be attracted by an electromagnet 39, whereby the bar 26 is rotated out of its normal position in response to each energization of said electromagnet. On each vertical bar 26 there is provided a number of rigid arms 27, each associated with a longitudinally movable bar 28, which is supported at one end on bushing 29, embedded in the insulation bar 18, and at the other end by the card 20 with which it is associated. A spring 30 is provided to hold the bar 28 in operable relation with the arm 27 of the vertical selective bar and is preferably hooked at one end on the collar 31 rigidly fastened at the middle portion of the bar 28 and the other end is attached to the resilient support 23 as shown.

With each set of passive contacts 2, 3, 4, 5, etc., there is associated a horizontal rotatable bar 32 each of which is provided with an armature 33 and an electromagnet 34 whereby the bar is rotated. Each horizontal bar 32 is provided with a number of arms 35 pivotally arranged and yieldable in one direction for a purpose which will be hereinafter described. Each of these arms 35 is individually associated with a set of

active contact wires and a bar 28. Each of the bars 28 is provided at its front end with a hook shaped portion, with which the associated arm 35 is adapted to engage when magnet 39 is energized. When magnet 39 is deenergized, the arm 35 is free to move in a vertical path in front of its associated operating bar 28 without engaging it.

When the vertical bar 26 is rotated out of its normal position by electromagnet 39, the operating bars 28 are moved into positions wherein they intercept the path of other associated arms 35 as shown more clearly in Fig. 2. The continued movement of the arm 35 results in lifting the operating card 20 so as to permit the active contact wires 10, 11, 12, and 13 to engage the passive conductors 2, 3, 4, and 5 respectively. The operating bars 28 and 32 together with arms 35 thereon, remain in their off-normal position throughout the duration of the connection, but the vertical bar 26 may be immediately restored to normal.

The operating bar 28, when engaged by bar 32, is moved a small distance lengthwise so as to be entirely clear of its associated operating arm 27 so that any subsequent movement of said arm is ineffective to disturb the connection already established.

In the system described in the aforementioned patent to C. L. Goodrum and J. N. Reynolds, only two of the arms corresponding to 35 of bar 32 will be in use at one time, but all the arms 35 of the operating bar 32 are in their uppermost position regardless of the fact that all but two are performing no function. Fig. 2 illustrates in dotted lines the bar 28 in its pre-selected position. Now, in the event of the bar 32, which carries arms 35, being restored to normal while the bar 26 remains in its selected position as shown, it is essential that the bar 32 shall be able to return to normal immediately. The present invention provides for such restoration by having the arms 35 yieldable so that upon the arms 35 engaging with bar 28 they will be rotated against the resistance of restoring springs 38, thereby permitting bars 32 to restore.

What is claimed is:

1. In a switching mechanism, sets of disengaged contacts, a selective mechanism therefor including a selective bar, a longitudinally movable member associated with each set of said contacts, an operating bar for said members, and means carried by the first mentioned bar for moving said member in operable relation with the second mentioned bar to effect interengagement between said contacts.

2. In a switching mechanism, sets of active contacts arranged in a row on an upright support, sets of passive contacts arranged in a row and disposed coordinately to the first mentioned row but out of en-

gagement therewith, a selective mechanism for said active contacts comprising a selective bar, a plurality of longitudinally movable members, means carried by said bar to impart a preliminary movement to said member, and means for operating said members to effect interengagement between said active and passive contacts.

3. In a switching mechanism, rows of sets of active contacts, rows of sets of passive contacts associated therewith, a selective mechanism therefor comprising a plurality of longitudinally movable bars, a selective bar associated with each row of active contacts, an operating bar associated with each row of passive contacts, means carried by said selective bar for simultaneously moving said longitudinally movable bars in operable relation with said operating bars, and means for operating the third mentioned bars to effect interengagement between said active and passive contacts.

4. In a switching mechanism, sets of passive contacts, sets of active contacts associated therewith and mounted on an upright support, an operating card for each set of said active contacts, a movable member journaled at one end in said support and the other end in one of said cards, a selecting bar, a plurality of arms carried by said bar adapted to impart a longitudinal movement to said members, and an operating bar for selectively engaging said members to effect interengagement between said active and passive contacts.

5. In a switching mechanism, sets of disengaged active and passive contacts, a member for each set of said active contacts, a pair of rotatable bars, a longitudinally movable member for operating said active contacts, a movement of one of said bars being effective to move said second mentioned member into operable relation with the other bar, said other bar when operated being effective to establish connection between said active and passive contacts at their crossing point, and resilient means for restoring said second mentioned member from operated to non-operated position.

6. In a switching mechanism, sets of disengaged active and passive contacts arranged in coordinate rows, selective and operating bars therefor, a plurality of longitudinally movable members adapted to be moved into operable relation with said operating bars, a rotatable member carried yieldingly by each of said operating bars thereby for permitting said bar to restore from operated to non-operated position.

7. In a coordinate switch, contact members arranged by sets, a selective mechanism therefor including selecting and an operating bar, an insulating card for each set of said active contacts, a movable member permanently in operable relation with said

- card, an arm carried by said selecting bar for imparting a longitudinal movement to said member, a hook formed at the end of said member, an arm carried by said operating bar adapted to engage the hook portion of said member, and means for operating the second mentioned bar to establish connection between said active and passive contacts.
- 10 8. In a switching mechanism, sets of active and passive contacts, selective and operating bars therefor, an insulating card for each of said sets of active contacts, a longitudinally movable member permanently in
15 operable relation with said card, means for rotating said bars to move said member and its associated insulating card thereby establishing a connection between said sets of active and passive contacts, a resilient member arranged to support said card and to restore said card to normal when said bars are released, and a second resilient member arranged to restore the said movable member to normal simultaneously with the restoration of the other resilient member.
- 25 In witness whereof, I hereunto subscribe my name this 5th day of September A. D., 1922.

FRANK H. GRAHAM.