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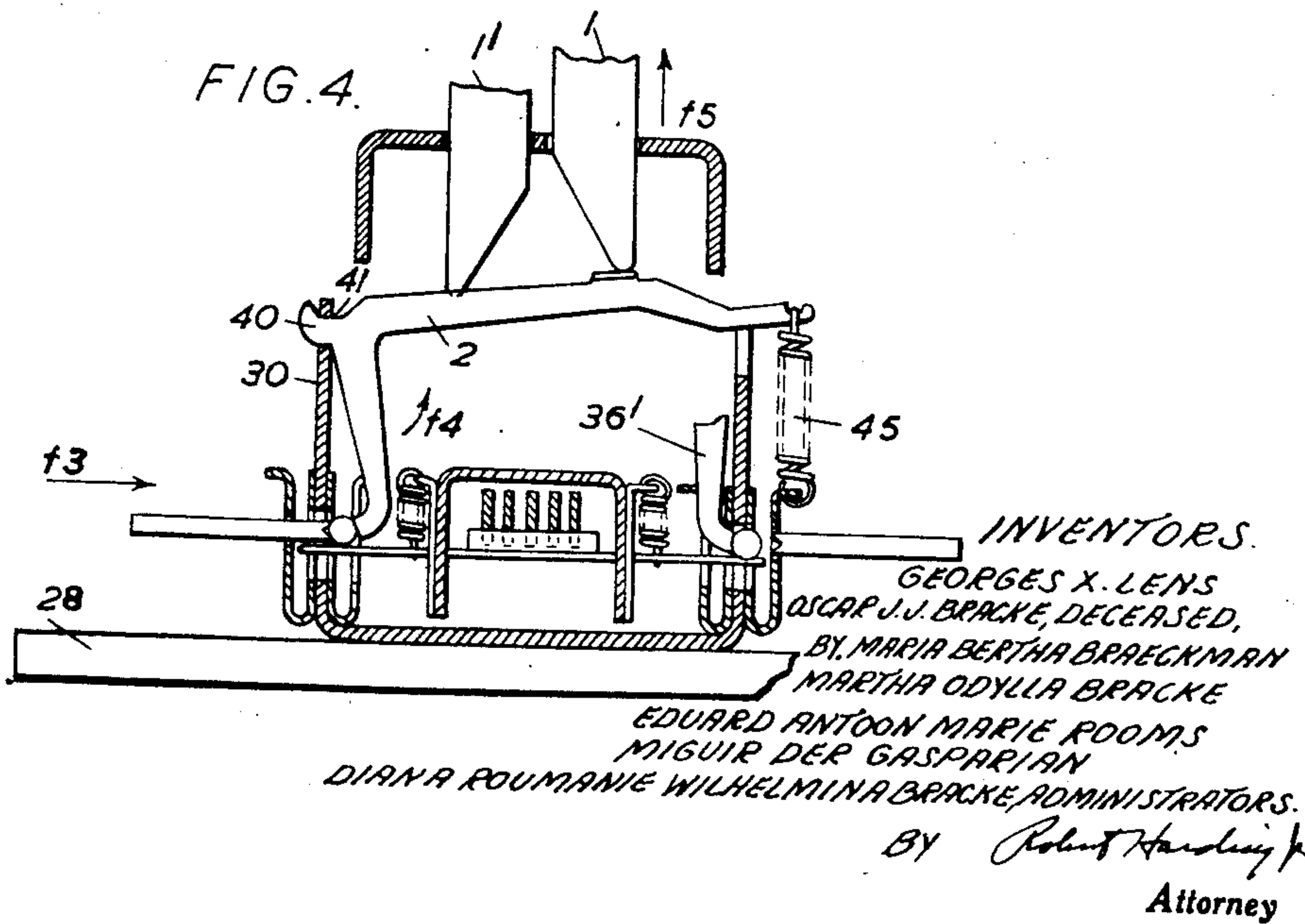
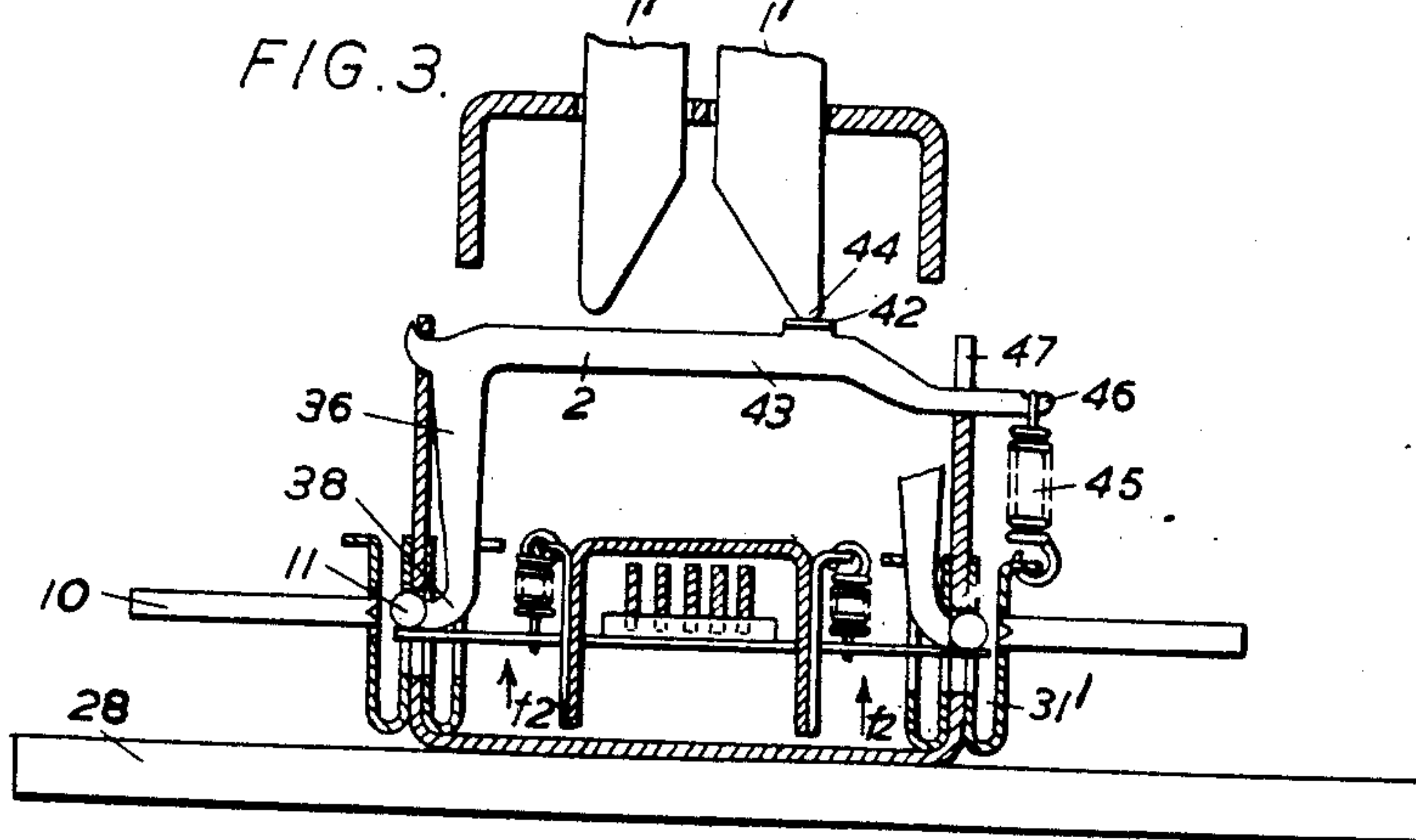
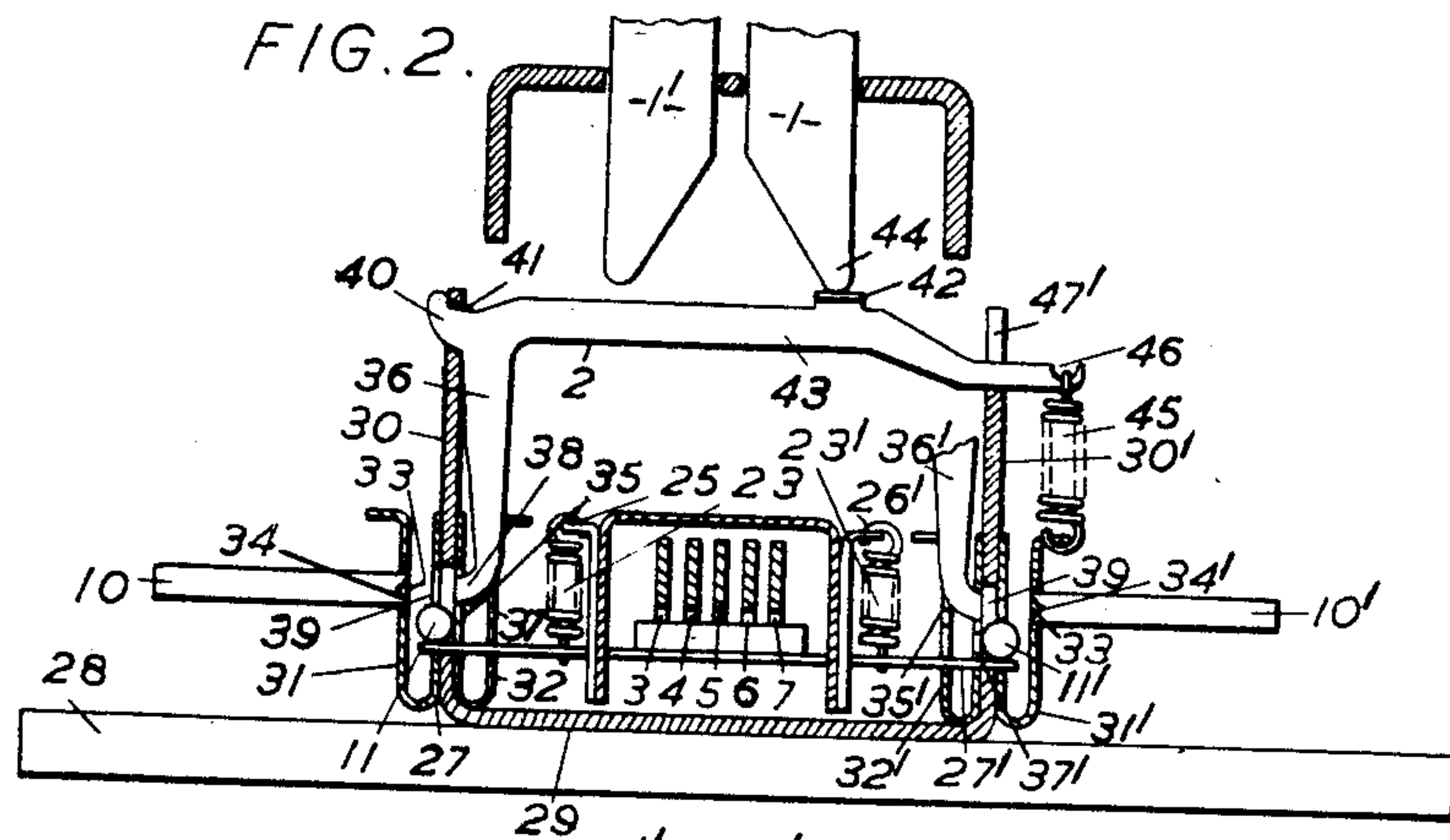
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SELECTING AND CONTROLLING MECHANISM FOR MOVABLE PARTS

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## UNITED STATES PATENT OFFICE

2,653,486

## SELECTING AND CONTROLLING MECHANISM FOR MOVABLE PARTS

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10 Claims. (Cl. 74-471)

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The present invention relates to a mechanism for the selection and control of movable parts which can, in particular, be used for the control of crossbar apparatus. More particularly, the invention provides novel means for the selection and operation of the so-called vertical bars which are used in multi-switches of the crossbar type.

An object of the invention resides in a selecting and controlling mechanism for movable parts, each of said part or parts being under the control of clutch means which are themselves controlled by selection means, the actuation of these selection means having the effect of causing the displacement of said clutch means associated therewith in order to place said clutch means under the control of common control means; which, when actuated, drives by means of said clutch means, the selected movable part or parts which are associated therewith.

A further object of the invention resides in the fact that the selection means comprise a plurality of code bars such as disclosed in the Belgian Patent No. 424,561 which can be actuated in a plurality of different combinations, each particular combination resulting in the operation of one particular selection lever corresponding to that particular combination, which will in turn actuate the clutch means.

A feature of the invention resides in clutch means which are constituted by a small independent member guided in fixed parts and which is normally under the control of a selection lever, which, when actuated, will place said independent clutch member under the control of common control means.

Another feature of the invention resides in an intermediate lever mechanically related to a corresponding movable part and which will be actuated by said common control means by means of said independent clutch member.

Another feature of the invention resides in common control means which are constituted by a common control bar provided with a series of teeth along one of its longitudinal edges, each of which may engage its correspondent independent clutch member when said common control bar is actuated and provided the corresponding selection lever has been actuated.

Another feature of the invention resides in said teeth being provided with grooved ends whereby said independent clutch member, once it is engaged by said tooth will be held between the latter and said intermediate lever, whereby said selection lever is no longer necessary to maintain said independent clutch member under

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the control of said common control bar, and can be released.

Another feature of the invention resides in the fact that said independent clutch member is constituted by a ball.

Another feature of the invention resides in the provision of a first channel in which said ball is guided when it is displaced under the control of the selection lever and of a second channel, perpendicular to the first, in which said ball is guided when it is further displaced under the control of the common control bar.

Another feature of the invention resides in a fixed part comprising a central plate fixed perpendicularly to main base-plate, and two profiled parts having a U-shaped cross section fixed by one of their faces on both sides of said central plate, the three adjacent central sides belonging to the central plate and to both profiled parts being provided with a slot in which said ball can be guided when it is displaced by the selection lever, further slots being provided in the external faces of said profiled parts in order to permit on the one hand the insertion of a tooth of the common control bar and on the other hand, of one end of the intermediate lever, thereby allowing a further guided displacement of said ball under the control of the common control bar, said ball in turn actuating said intermediate lever.

Another feature of the invention resides in the displacement of said common control bar along its main plane and perpendicularly to its longitudinal edges.

Another feature of the invention resides in the fact that said selection lever is directly actuated by said code bars.

Another characteristic of the invention resides in the fact that each of said selection levers is provided with two actuating arms located on both sides of the code bars and that two common control bars are also provided on both sides of the code bars, whereby by utilizing two intermediate levers symmetrically located on both sides of the code bars for each of said selection levers, an arrangement for the actuation of two movable parts will be provided which will occupy a minimum amount of space.

Other features and objects of the present invention will appear from the following description of an embodiment, given as a non-limitative example, with reference to the appended drawings, in which:

Fig. 1 represents a perspective view of the arrangement, parts having been cut away in order



to show more clearly some of the mechanical details;

Fig. 2 represents a cross-sectional side view of the mechanism in its normal position;

Fig. 3 represents a cross-sectional side view of the mechanism in its clutch position;

Fig. 4 represents a cross-sectional side view of the mechanism in its actuated position;

Fig. 5 represents a perspective view of part of the code bar arrangement including a selection lever the code bars and selection lever turned upside down.

The main parts of the mechanism shown on Fig. 1 will be first of all briefly described.

This selecting and controlling mechanism may be adapted to the selection and control of the vertical movable bars pertaining to the arrangement described in my U. S. Patent No. 2,589,267, granted on March 18, 1952.

In order to facilitate the understanding of the invention, it should be noted that only one selection and control mechanism has been shown on Fig. 1.

Referring to Fig. 1, it will be seen that the arrangement comprises a set of two vertical bars 1 and 1' which can be actuated by their respective intermediate levers 2 and 2' and which are operatively positioned in a first plane and only the first of which being completely shown. A set of five code bars 3, 4, 5, 6 and 7, operatively positioned for movement in a second plane, has been partially shown together with a single selection lever 8 corresponding to the two intermediate levers 2 and 2'. A periodically-operated common control bar 9 has also been partially shown with two of its teeth 10 and 10' located along one of its longitudinal edges. These teeth will be used to drive the independent clutch member, which has been represented by ball 11, when the latter has been displaced under the control of the arm 12 of the clutch-actuating lever 8, said arm corresponding with the intermediate lever 2 which will be displaced by the common control bar 9 by means of said ball 11.

The operation of the mechanism will now be described with reference to Figs. 1, 2, 3, 4 and 5.

Considering first of all Figs. 1, 2 and 5, representing the mechanism in the rest position and more particularly Fig. 5, it will be seen that the latter represents part of a set of five code bars 3, 4, 5, 6 and 7 which can be operated in a plurality of different combinations in the direction of the arrow  $f_1$ . It should be noted, however, that in order to show an adequate view of the lever 8, the code bars such as 3 as well as the lever 8 have been turned upside down.

Assuming that code bar 4 is shifted in the direction of the arrow  $f_1$ , it will be seen that the slot 43 provided in the code bar 4 will come in the same line as the slots 13, 14, 15 and 16 respectively provided in the code bars 3, 5, 6 and 7, provided of course the latter code bars are left in their normal position.

The selection lever 8 is hinged in two fixed pieces 17 and 17', only the first of which 17, being shown on Fig. 1. These fixed pieces 17 and 17' are provided with a small rectangular opening such as 18 in which lugs 19 and 19' provided at both ends of the arm 20 of the selection lever 8 are inserted. Accordingly, the openings such as 18 will provide fulcrums for the selection lever 8.

Consequently, when the code bar 4 has been shifted in the direction of the arrow  $f_1$ , the remaining code bars 3, 4, 5, and 7, remaining in

the position shown on Fig. 5, the selection lever 8 and more particularly the bent part 21 of its arm 22 will be moved under the action of the two springs 23 and 23', in the various slots 43, 13, 14, 15 and 16 provided in the code bars 4, 3, 5, 6 and 7. Each of the springs such as 23 is hooked at one end 24 to the corresponding end of the arm 22 of the selection lever 8 in a small hole 25, and at the other end 26 in a small hole provided in the main frame holding the code bar arrangement (Fig. 2).

The selection lever 8 will thus rotate about its fulcrums such as 18 and in so doing will lift the ball 11 which is normally resting on the bent end 27 of the arm 12 of the selection lever 8.

Considering the movement of the ball 11 under the action of the selection lever 8 and referring more particularly to Fig. 2, it will be seen that the complete mechanism is fixed to a main base plate 28 by means of a U-shaped part 29, the two vertical branches of which 30 and 30' are spaced sufficiently apart in order to provide room for the code bar arrangement and the selection levers such as 8, as well as the intermediate levers such as 2. On each face of the vertical branches such as 30 are fixed two profiled parts such as 31 and 32. The profiled parts 31, 31' and 32, 32' have also a U-shaped cross section but the distance between both branches is much smaller so as to afford guidance for the ball 11.

As will be seen from Figs. 1 and 2, the external branch of the profiled part 31 is provided with a small opening 33 in which the grooved end 34 of the tooth 10 can be inserted. Also, as shown on Fig. 2, the external branch of the profiled part 32 is provided with an elongated slot 35 in which the arm 36 of the intermediate lever 2 can be inserted. The internal branch of the profiled part 32 is also provided with an elongated slot 37 into which the bent end 38 of the arm 36 of the intermediate lever can project. The slots 35 and 37 also permit the bent end 27 of the arm 12 of the selection lever 8 to be inserted via both profiled parts 31, 32 and the vertical part 30 in order to control the ball 11. On the other hand, the lower end of the slot 37 is so shaped as to prevent the withdrawal of the ball 11 in the right-hand direction (Fig. 2). Although a certain amount of play in the horizontal direction has been secured for the ball 11, it will always remain guided by the slot 39 provided in the internal face of the profiled part 31 and in the vertical plate 30, and in the normal position of the selection lever 8, it will always be under the control of the bent end 27 of its arm 12.

As soon as the selection lever 8 has been actuated, the ball 11 will be lifted in the direction of the arrows  $f_2$  and it will now come onto the level of the tooth 10 associated with the common control bar 9 and the bent end 38 of the arm 36 of the intermediate lever 2. This position is shown on Fig. 3.

It should be noted that when the selection lever 8 is actuated, both its arms 12 and 12' will be lifted under the action of the springs 23 and 23' and accordingly, the bent ends 27 and 27' will lift both balls 11 and 11'.

The mechanism shown on Fig. 3 is now in the clutch position and accordingly when the common control bar 9 is displaced in the direction of the arrow  $f_3$ , the tooth 10 pertaining to that common control bar 9 and more particularly the grooved end 34 thereof will contact the ball 11 and will exert by means of this ball a thrust on the bent end 38 of the lever 2. The lever 2



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being hooked to the vertical part 30 by means of its lug 40 inserted in a corresponding opening 41 provided in said vertical part 30, will rotate in the direction of the arrow  $f_4$  and by means of a bent lug 42 provided on its arm 43 will lift the vertical bar 1 in the direction of the arrow  $f_5$ , the rounded bottom end 44 of said bar 1, normally resting on said bent lug 42 under its own weight or any appropriate resilient device (not shown). A restoring spring such as 45 has been hooked in a slot 46 provided at the end of the arm 43 of the intermediate lever 2, said arm 43 being inserted in a vertical slot 47' provided in the vertical part 30' and in the normal position or in the clutch position, being held at the bottom of said slot 47'. The other end of spring 45 is hooked in the profiled part 31'.

Accordingly, as soon as the force which caused the operation of the common control bar 9 is withdrawn, the intermediate lever 2 will rotate back to its original position, as shown on Figs. 2 and 3, under the combined action of the vertical bar 1 and the restoring spring 45. In so doing, the ball 11 will be returned to the position shown on Fig. 3 and will be returned to its original lowered position shown on Fig. 2 when the selection lever 8 has been brought back to the normal position as shown in Fig. 5.

An important advantage of the use of the grooved end 34 for the tooth 10 is that, as soon as the common control bar 9 has engaged the ball 11, the latter will be maintained between said grooved end 34 of the tooth 10 and the bent end 33 of the intermediate lever 2. In this manner, it will be appreciated that the selection lever 8 no longer plays any part in the control of the ball 11 and can immediately be released after the common control bar 9 has been actuated, and accordingly further selections can immediately be proceeded with, i. e. another selection lever such as 8 can immediately be operated to prepare the operation of another vertical bar such as 1.

The above description has referred to the operation of the vertical bar 1. It will be clearly seen, however, that the operation of the vertical bar 1' is performed along identical lines, but this time the common control bar 9' (not shown), corresponding to 9, will be used, as well as the intermediate lever 2' which has been partially shown.

It will be understood that the intermediate levers 2 and 2' have been designed and interleaved in such a manner that the combined arrangement occupies a minimum amount of space necessary for an adequate operation of the mechanism.

The present arrangement evidently affords means for the simultaneous operation of the vertical bars such as 1 and 1'. Further, although only one set of vertical bars such as 1 and 1' has been shown, it will be understood that several sets of vertical bars could have been selected simultaneously or in any order, one of the two control bars, or both at once, simultaneously actuating one or the other of the two vertical bars of the selected sets or both.

Further, additional arms such as 12 could be provided on the selection levers such as 8 in order to place more than two vertical bars in the clutch position by the operation of a single selection lever, provided additional intermediate levers such as 2 are also used.

While the principles of this invention have been described above in connection with specific apparatus, it is to be clearly understood that this

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description is only made by way of example and not as a limitation on the scope of the invention.

What is claimed is:

1. A switching mechanism comprising a first member operatively positioned for movement in a first plane, a plurality of members operatively positioned for movement in a second plane, actuating means periodically operated, clutching means adapted in one position to establish a mechanical linkage between said actuating means and said first member to move said member in said first plane upon movement of said actuating means and in a normal second position to disassociate said actuating means from said first member to permit free movement by said actuating means, and clutch actuating means operatively associated with said plurality of members and adapted to displace said clutch means from said second normal position to said one position upon a predetermined positional agreement between said plurality of members.

2. A switching mechanism in accordance with claim 1, said clutch actuating means including means for supporting said clutch means in said second position, and means associated with said member actuating means adapted to support said clutching means in said first position independently of said clutch actuating means.

3. A switching mechanism in accordance with claim 1, further comprising an extension for said clutch actuating means, said clutching means including a ball resting on said extension when said clutching means is in said second position.

4. A switching mechanism in accordance with claim 3, further comprising means associated with said member actuating means adapted to retain said ball when said clutching means is in said first position and said member actuating means is in operated position.

5. A switching mechanism in accordance with claim 4, said clutching means including an intermediary lever having one end spaced from and in juxtaposition with said ball retaining means associated with said member actuating means and the other end bearing against said first member, said ball being interposed between said member actuating means and said one end to form a mechanical link therebetween when said clutching means is in said first position.

6. A switching mechanism in accordance with claim 5 in which said member actuating means comprises a control bar common to a plurality of switching mechanisms, a plurality of projections along one edge of said bar, each of said projections being co-operatively arranged with a particular first member clutching means and associated clutch actuating mechanism.

7. A switching mechanism in accordance with claim 6, each of said plurality of projections being provided with a grooved end to grip said ball to maintain said ball in said first position independently of said clutch actuating means.

8. A switching mechanism in accordance with claim 7, further comprising a guiding channel adapted to guide said ball from the second position to the first position thereof, and a second guiding channel registering with said first channel, said second channel being adapted to guide said ball when said ball is displaced under the control of said member actuating means.

9. A switching mechanism comprising a first movable member, a second movable member, a reciprocable member for selectively effecting movement of said first member, clutching mechanism including a freely movable member, said



movable member having a normal position wherein said reciprocable member is ineffective to cause movement of said first member, said freely movable member having an operative position wherein it is engageable by said reciprocable member, a mechanical link including said freely movable member when said last named member is in its operative position for actuating said first member upon movements of said reciprocable member displacing said freely movable member, clutch actuating means responsive to a predetermined position of said second movable member, a fixed base plate, a central plate fixed substantially perpendicular to said base plate, a pair of U-shaped members having one face affixed to opposite sides of said central plate and on opposite sides thereof, the opening of the U extending away from said base plate, the outside face of one of the U-shaped members having an opening for receiving said reciprocable member, slots in the remaining three faces and said central member for receiving said clutch actuating mechanism and for providing a guide for said freely movable member when displaced from said first to said second position, and slots in the faces attached to said central member and in said central member coextensive with said slot for receiving said reciprocable member for guiding said freely movable member during displacement by said reciprocable member.

10. A switching mechanism comprising a pair of first movable members, a plurality of adjacent second movable members each having at least one slot along one edge thereof, an actuating member for each of said first members, clutch mechanism associated with each of said first members for selectively establishing an operating link between said actuating member and the associated first member, a common clutch actuating mechanism for said clutch mechanisms

operatively associated with said plurality of second movable members and responsive to a predetermined positional agreement between the slots of said last named members comprising a pivotally mounted member extending across said members for co-operation with the slots thereof, a pair of clutch actuating arms extending from said pivotally mounted member positioned on opposite sides of said second members; each of said clutch mechanisms comprising an intermediate lever having one end bearing against one of said pair of first members and a second end in juxtaposed position with respect to one of said first member actuating members and forming a space therebetween, and a freely movable member interposable in said space, said freely movable member being normally removed from said space, said clutch actuating arms being adapted to displace said freely movable member of the associated clutch mechanism into said space upon positional agreement between said slots.

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