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(54) Multi-point lock.

(57) A multi-point lock construction that can reduce the amount of preparation of an edge member of a closure or opening necessary for it to be fitted with the lock comprises a control unit (1) and a remote bolt (3,4) that can be fitted mortice fashion into a solid or hollow edge member, and a bar (2) which fits parallel to the face of the edge member operably connects the drive member (10) to the remote bolt (3,4). The remote bolt is caused to be thrown by the interengagement of a follower movable with the bar (2) and an inclined slot (74) at the bolt. The control unit may operate more than one remote bolt through one or more bars.

A spring-loaded latch bolt (25) and a dead bolt (26) may be included and linked so that retraction of the dead bolt (26) causes retraction of the latch bolt (25). A catch (62) prevents the remote bolts (3,4) from being unintentionally shot.

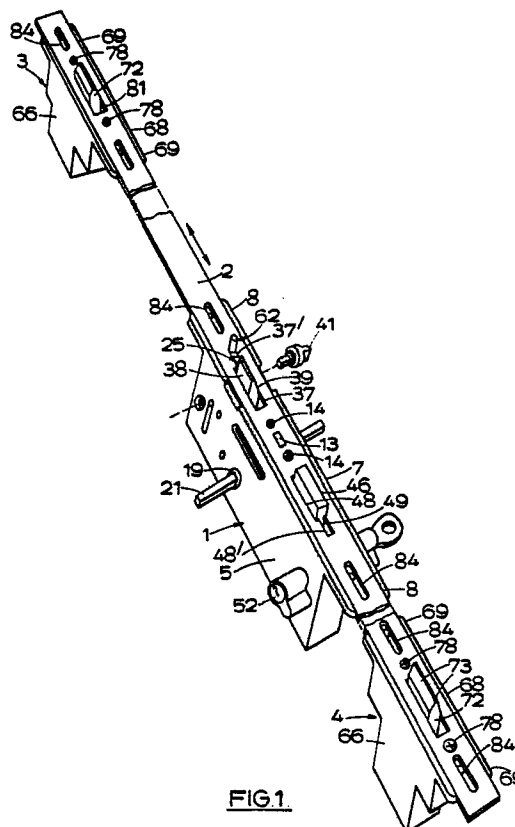


FIG.1

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MULTI-POINT LOCK

This invention relates to a multi-point lock for a closure such as a door or window whereby the closure is held in a closed position in an opening by means of a plurality of bolts operating at spaced locations between an edge member of the closure and an adjacent edge member at the periphery of the opening, the location of at least one of the bolts being remote from control means, such as a handle, by which operation of the bolt is effected.

Commonly such multi-point locks include a latch bolt which also operates between the edge member and adjacent member. The latch bolt has an associated operating handle and the remote bolt is normally arranged to be operated by that handle as well. There may be two, or possibly more, of the remote bolts which are interconnected for simultaneous operation.

Known multi-lock constructions have generally required an appreciable amount of preparation work to be done on the member to which the lock is to be fitted for use in order to enable it to accept the lock. This adds to the cost and time involved in fitting the lock, even when the lock is fitted as original equipment to the member, and it can make it difficult to apply the lock to an existing member. For example, in the case of a door which includes hollow, such as extruded aluminium, members in its construction and is fitted with a multi-point lock at one of its hollow stile members, it has been common for the lock to be assembled, at least partially, in the stile member before the member is connected to the other components of the door where the lock is provided as original equipment, or after the stile member has been disconnected from the rest of the door when the lock is required to be fitted to an existing door. It has been impossible to apply some known multi-point lock constructions to solid stile members.

The present invention is particularly concerned with multi-point locks of the kind which comprise a control unit adapted to be mounted in a hollow in an edge member of a closure or opening and having a fore-end by which it can be fixed at or adjacent to a face of the edge member, operating means embodied in the control unit, one or more remote bolts spaced from the control unit, and, operatively coupled to the operating means and to the remote bolt or bolts, one or more bars which are movable by the operating means to shoot and retract the remote bolt or bolts transversely of the bar or bars.

The invention is characterised in that the operating means includes a linearly reciprocating drive member adjacent to the fore-end of the control unit which moves parallel to the fore-end and

has fast with it at the fore-end the or each bar which extends longitudinally from the drive member in the direction of the linear movement of the drive member and moves with the drive member to operate the or each remote bolt.

As the bar is at the fore-end of the control unit it is possible for it to extend along the face of the edge member to which the lock is fitted for use, or in a groove in the face or it may extend just behind the face. In a preferred form the bar is made of flat strip material and is arranged so that its broader faces are parallel to the fore-end of the control unit. Thus it may lie flat against or closely parallel to the face.

The control unit is preferably adapted to be received into a mortice in the edge member opening to the face at or adjacent to which the bar is disposed. The remote bolt may be similarly adapted. It is possible, therefore, for the lock to be fitted to an edge member from the face at which the lock is to be operative. This enables it to be fitted to a solid edge member, as for example of a wooden door. The bar may lie on the face of the edge member, where in the preferred strip form it will be relatively inobtrusive, or it may be accommodated in a groove in the face. Providing mortices and surface grooves in edge members does not normally present undue difficulty, even in respect of existing doors and frames, and so it will be realised that an embodiment of the lock according to the present invention is possible which may be fitted to an edge member with relative ease.

The lock may also be installed in a hollow edge member. The control unit and remote bolt may be located in mortice fashion in the edge member, and the bar may be disposed at the inside or outside of a face wall of the hollow member.

Preferably the movement of the bar is translated into the transverse movement of the remote bolt by means of a follower co-operating with an inclined cam surface. A follower, conveniently in the form of a roller, associated with the bar may engage with a slot associated with the remote bolt inclined relative to the directions of movement of both the bolt and the bar. The cam action can be arranged to give an advantage in the translation of the movement so that the throw of the bolt can be greater than the distance moved by the bar.

There may be more than one remote bolt. The control unit may be intermediate the locations of the remote bolts, or the remote bolts may be at locations which are to one side of the control unit. The bar may be operatively coupled to each of the remote bolts, or there may be individual bars for

the remote bolts connected to the drive member.

The operating means may comprise a handle or key. A toothed element rotatable by the handle or key may mesh with a rack formed on, or carried by, the drive member to move the drive member.

A spring-loaded latch bolt may be embodied in the control unit. A handle for retracting the latch bolt against the spring-loading may also operate the drive member. The latch bolt may have a head which has a flat face and a chambered face and which can be rotated into alternative positions to suit either hand of operation.

In addition to, or instead of, a spring-loaded latch bolt, the control unit may include a dead bolt. Such a bolt may be restrained from being shot when the or each remote bolt is retracted. There may be co-operation between the dead bolt and the bar, or one of the bars, which provides the necessary restraint. For example the bar, or one of the bars, may have a slot in it through which the dead bolt projects when it is shot, and when the bar is moved to the position in which the, or its associated, remote bolt is retracted that slot may be moved out of register with the dead bolt so that it cannot be shot, or a portion of the slot may co-operate with a mating part of the bolt to prevent the bolt from being shot. Where there is a latch bolt there may be a linkage which causes that bolt to be retracted as the dead bolt is retracted.

The multi-point lock now provided has particular application to hinged closures. In such an application it is intended that the lock will operate between the free edge member of the closure and the edge member at the periphery of the opening against which the free edge member closes. Normally the lock will be on the closure but it may be fitted to the peripheral edge member of the opening. Preferably the or each remote bolt has a chamfered nose which co-operates with an associated striker of a keeper to cause the closure to be urged against the edge member of the opening, thereby to help to provide a weather seal at the closure, where appropriate, and reduce draughts around the closure.

It would be possible for the lock to be used with a sliding closure, for example a patio door, to operate between overlapping surfaces of edge members.

Preferably a catch is provided which operates to prevent the drive member from being actuated unintentionally to cause the remote bolt or bolts to be shot. The catch may be in the form of a plunger which engages with a slot in the bar, or one of the bars, and prevents the bar, and hence the drive member, from being moved to the bolt-shooting position.

It is possible for the remote bolts to be operated by a night latch action.

An embodiment of the invention will now be described by way of example only with reference to the accompanying drawings, in which:

Figure 1 is a front perspective view of a multi-point lock according to the present invention, and

Figures 2 and 3 are side views respectively of a control unit and a remote bolt unit of the lock, both with cover plates removed.

In this embodiment of the invention the multi-point lock is intended to be fitted to the stile member at the free edge of a hinged door.

The multi-point lock comprises a control unit 1, a single long bar 2 of relatively thin, typically 1.6 mm thick, flat metal strip connected centrally to the control unit, and two remote bolt units 3,4 near the opposite ends of the bar. The lock can be fitted to the edge face of the stile member of the door. Where the stile member is, for example, a solid timber member, mortices can be cut into the member from the edge face to accept the control unit 1 and remote bolt units 3,4. The bar 2 may lie flat against the edge face or it may be accommodated in a shallow groove formed in the edge face.

The control unit 1 has a rectangular, slab-like housing 5 made up of a hollowed-out metal block 6 and a cover plate, not shown. One longer side of the housing 5 constitutes a fore-end 7 of the control unit. At the fore-end the block 6 has longitudinally projecting flanges 8, and it has a shallow channel 9 which extends all along its length and continues across the flanges. The channel 9 is of complementary width and depth to the bar 2 which extends flat along the channel. Within the hollow of the block at the fore-end 7 is a reciprocatory drive member 10, Figure 2, which moves linearly longitudinally of the channel 9. A front portion 11 of the drive member 10 projects through an oblong opening 12 in the fore-end to the channel, and a central rectangular boss 13 on the front portion 11 engages in a complementary hole in the bar 2. Screws 14 inserted through plain holes in the bar 2 at either side of the boss 13 and tightened into threaded holes in the drive member 10 fix the bar securely to the drive member. The oblong opening 12 is longer than the drive member so as to allow the latter to move in the housing lengthwise of the channel. As shown in Figure 2, a rear portion of the drive member is formed as a toothed rack 15 which extends lengthwise of the channel and is divided longitudinally by a groove 16 which locates and guides a sliding element 17. In mesh respectively with the two halves of the rack 15 are twin toothed sectors 18 which are rotatably located on co-axial central hubs 19 of associated twin winged cams 20 mounted on, for turning with, a spindle 21, or respective spindles, rotatable by handles, not shown, at opposite sides of the control unit. The

winged cams 20 are axially outside the sectors 18. Their hubs 19 have bearings respectively in the block and the cover of the housing. Each winged cam 20 has two opposed wings 22 one or the other of which, depending upon the direction of turning of the cam, engages with extensions, not shown, of two of the teeth of the associated sector 18 to cause the sector to rotate with the cam for part of its range of turning with the spindle 21, and so drive the rack to move the drive member 10, and hence the bar 2, linearly. Mounted on, to turn with, the spindle 21 between the sectors is a follower 23 which has trunnions, not shown, to provide support for the sectors. A finger 24 of the follower 23 is able to engage with one end of the sliding element 17 to slide it along the groove 16 in the drive member, when the spindle is turned in the clockwise direction as viewed in Figure 2.

Also in the housing, located in the hollow of the block 6 and by the cover, are a spring-loaded latch bolt 25 and a dead bolt 26.

A post 27 which is fixed in the block and engaged with the cover projects through longitudinal slots 28 in a lath 29 of the latch bolt 25 to help to guide the bolt in its movement and also provides an abutment for a helical compression spring 30 in a bore 31 of the lath, which normally urges the latch bolt to a projected position. A peg 32 on a transverse tail portion 33 of the lath engages in a slot 34 in the block and further assists in guiding the latch bolt in its movement. In the projected position a head 35 of the latch bolt projects through an opening 36 in the channel 9 and protrudes from the fore-end 7 of the control unit through an extended slot 37 in the bar 2. The head 35 has a straight flank 38 and a chamfered flank 39 and it is rotatable on the lath 29 to enable the presentation of the flanks to be changed to suit the hinging of the door with which the lock is used. The slot 37 in the bar extends along the bar further than the head 35 and has a reduced portion 37' at one end, the purpose of which will be made clear hereafter. A snib 40 rotatably mounted in the block is operable by a handle 41, which can be located at either side of the control unit, as appropriate for use, to engage a detent 42 with the tail portion 33 of the lath for holding the latch bolt in a retracted position against the action of the spring 30.

A two-lobed rocker 43 pivoted in the block and to the cover adjacent to the latch bolt 25 has a first lobe 44 engageable with the tail portion 33 of the lath 29 and its second lobe 45 engageable with the end of the sliding member 17 opposite that with which the finger 24 of the follower 23 co-operates. Turning the spindle 21 to cause the sliding member to be moved along the drive member 10 by the finger 24 turns the rocker 43 so that its first lobe 44 bears on the tail portion 33 and retracts the latch

bolt against the spring loading. When the latch bolt is subsequently allowed to be projected again by the spring 30 the tail portion pivots the rocker 43 in the opposite direction, and its second lobe 45 pushes the sliding member back along the drive member to its initial position.

The dead bolt is located in the block 6 at the opposite side of the spindle 21 from the latch bolt 25. Its nose 46 projects through a complementary opening 47 in the channel 9 and a slot 48 in the bar which in the main is of complementary shape to the bolt but has a narrower extension portion 48' at one end which is complementary to a niched part 49 of the bolt just behind the nose 46. In one position of the bar relative to the control unit the narrower extension portion 48' of the slot 48 can be engaged with the niched part 49 of the bolt when the bolt is in its retracted position. When so engaged the bar prevents the dead-bolt from being shot. A peg 50 on a side face of the bolt is engaged in a guide groove 51 in the block to assist in guiding the bolt in its travel. The dead bolt is operated by a key-operated locking cylinder 52 of known kind which is accessible from either side of the control unit. A radial lug 53 on a rotary element of the locking cylinder enters a notch 54 in an edge of the dead bolt to shoot and to retract the bolt. Within the notch 54 the lug 53 co-operates with a retainer 55 which is located in a hollow in the block alongside one side face of the bolt, is spring-urged towards the notch and has a U-shaped recess 56 in it with which a peg 57 on the bolt engages. When the bolt is in either one of its retracted and shot positions, and the retainer is in its normal spring urged position, the peg 57 engages in a respective one of the two parallel limbs of the recess 56 and the bolt is thereby positively retained in that position. When the lug 53 is engaged in the notch 54 by operation of the locking cylinder 52 to move the bolt, it lifts the retainer against the spring loading sufficiently for the web part of the U-shaped recess 56 to be brought into register with the peg 57 to free the bolt for movement.

Slidably located in guide-ways 58,59 in the dead-bolt and the drive member 10 are two co-operating push rods 60,61 respectively which extend between the locking cylinder and the rocker 43. Upon operating the locking cylinder to retract the dead bolt the lug 53 engages with the adjacent push rod 60 and moves it transversely of the dead bolt. That push rod in turn moves the other push rod 61 along the drive member into driving engagement with the second lobe 45 of the rocker 43 to turn the rocker and cause the latch bolt to be retracted as the dead bolt is retracted. When the latch bolt returns to its projected position again the opposite pivoting of the rocker restores the push rods 60,61 to their initial positions.

Also in the control unit 1 at the fore-end 7 is a catch 62 in the form of a spring-loaded plunger located in a bore 63 in the block 6 opening into the channel 9. The catch 62 has a stepped diameter operative end section of which a smaller diameter outer part 64 is of a diameter complementary to the width of the reduced portion 37' of the slot 37 in the bar 2, and a larger diameter inner part 65 is of a diameter complementary to the width of the main portion of the slot 37. When the latch bolt and the inner part 65 are both engaged in the main portion of the slot 37 the bar cannot be moved along the channel 9 because they co-operate with opposite ends of that portion. If the catch 62 is depressed against its spring loading to move the inner part 65 behind the bar the smaller diameter outer part 64 is brought into register with the reduced portion 37' of the slot and the bar can then be moved.

The two remote bolt units 3,4 will now be described with particular reference to Figure 3. They are similar to one another. Each has a generally T-shaped housing 66 of similar thickness and depth from front to back to the housing 5 of the control unit 1. The housing 66 comprises a hollowed metal block 67 and a cover plate, not shown. The cross part of the T-shape of the housing 66 constitutes a fore-end 68 of the respective remote bolt unit. At the fore-end the block 67 has flanges 69 projecting longitudinally from the cross part. The flanges 69 are formed with aligned channels 70 of complementary width and depth to the bar 2, which extends along the length of the fore-end 68 and the flanges 69. Slidably located in the block 67 is a bolt 71, a nose 72 of which has symmetrically convergent chamfered flanks 73. An inclined slot 74 is formed in the bolt 71. Engaged in the inclined slot 74 is a roller 75 supported between two rearwardly extending arms 76 of a carrier 77 which is fixed by screws 78 to the bar. The carrier 77 is accommodated in the housing 66 in a hollow 79 in the block 67 at the fore-end 68 which allows the carrier to move with the bar relative to the housing. The bolt 71 passes through an elongated opening 80 in the carrier and projects through a slot 81 in the bar which is longer lengthwise of the bar than the bolt. When the bar is moved longitudinally the cam action of the roller 75 and inclined slot 74 causes the bolt 71 to slide in the housing 66 transversely of the bar between retracted and shot positions.

Typically each inclined slot 74 is inclined at 35° to the longitudinal axis of the remote bolt 74 and is of a length to allow approximately 22 mm travel for 15 mm of movement of the bar. The angle and length of the slot may, of course, be varied according to the travel desired, and similarly the extent of the movement of the bar may be

varied.

There are fixing screw holes 82 and 83 respectively in the flanges 8 of the control unit housing 5 and the flanges 69 of the housings 66 of the remote bolt units 3,4. Access slots 84 in the bar opposite those screw holes enable screws to be inserted into the holes and tightened past the bar by a screw driver.

To assemble the multi-point lock on the edge face of a door stile member, as previously mentioned, it can be offered to the member from the edge face. The housings 5 and 66 are entered into respective mortices in the member. Recesses are preferably provided at the mouths of the mortices to receive the flanges 8,69. The housings are secured, and thereby the entire lock, by fixing screws applied at the flanges 8,69 and driven into the member. Apart from the mortices, recesses and the shallow groove previously mentioned for the bar, if required, the only other requirements of the member for it to accept the lock are holes into the control unit mortice from the opposite faces of the door for the handle spindle 21, or spindles, and for the cylinder lock. There may be a handle at only one side of the door, if desired.

The head 35 of the latch bolt 25 is set on the lath for the straight and chamfered flanks 38,39 to be appropriate for the hand of the hinging of the door. Keepers are mounted on the adjacent edge members of the door opening for the latch bolt, dead bolt and remote bolts, those for the latch bolt and remote bolts having strikers. There is also a striker for the catch 62.

Use of the lock with a solid stile member has been mentioned earlier herein. The lock may also be used with a hollow edge member. Again, with such a member the lock may be offered to it from an outside face to be assembled on the member. It may alternatively be offered to the inside of the member, for example from one end in the case of an extruded member. For such an arrangement the wall of the member presenting the face from which the various bolts are to be shot is formed with the necessary openings for the bolts to project through, and the housings 5 and 66 can be secured by their flanges behind that wall by screws inserted through the wall and access slots 84 in the bar and tightened into the screw holes 82,83 in the flanges, which for this arrangement would be screw-threaded.

As illustrated in the accompanying drawings, the flanges 8 of the housing 5 of the control unit and the flanges 69 of the housings 66 of the remote bolt units 3,4 by which the housings are fixed in position for use are at the fore-ends of the housings. For some installations of the multi-point lock it may be desirable for the flanges to be set back from the fore-ends. The extent by which they

are set back may vary according to installation requirements. When the housings are made as castings, which will normally be the most convenient manner of manufacture, the dies may be made adjustable to vary the positions at which the flanges are formed as required.

It will be understood from the foregoing description that the remote bolts 71 are simultaneously operated. The chamfered noses of the remote bolts enable co-operation with their respective strikers which helps to urge the stile member closely against the edge member of the door opening. The long throws of the bolts which can be achieved by means of the inclined slots 74 ensures their secure retention in their keepers. When the bar is in its bolt retracting position and the door is open the catch 62 has its inner part 65 engaging in the main portion of the slot 37 in the bar to prevent the bar from being moved from that position. To release the bar the element has to be depressed to move its outer part 64 into register with the reduced portion 37' of the slot. As the door is closed whilst the bar is in the bolt retracting position the element 62 is depressed by its striker so that the bar is freed to be moved to its bolt shooting position. The dead bolt 26 can only be shot when the remote bolts have been shot. In the bolt retracting position of the bar the narrower extension portion 27' of its slot 27 associated with the dead bolt is engaged with the niched part 49 of the bolt to prevent the bolt from being shot.

Claims

1. A multi-point lock comprising a control unit (1) adapted to be mounted in a hollow in an edge member of a closure or opening and having a fore-end (7) by which it can be fixed at or adjacent to a face of the edge member, operating means embodied in the control unit (1), one or more remote bolts (3,4) spaced from the control unit (1), and, operatively coupled to the operating means and to the remote bolt or bolts (3,4), one or more bars (2) which are movable by the operating means to shoot and retract the remote bolt or bolts (3,4) transversely of the bar or bars (2), and characterised in that the operating means includes a linearly reciprocatory drive member (10) adjacent to the fore-end (7) of the control unit (1) which moves parallel with the fore-end (7) and has fast with it at the fore-end the or each bar (2) which extends longitudinally from the drive member (10) in the direction of the linear movement of the drive member and moves with the drive member to operate the or each remote bolt (3,4).

2. A multi-point lock according to claim 1 characterised in that the or each bar (2) is operatively coupled to the or each remote bolt (3,4) by means of a roller (75) associated with the bar (2) and co-operating with a slot (74) associated with the remote bolt (3,4) inclined relative to the directions of movement of both the remote bolt and the bar (2).

3. A multi-point lock according to claim 2 characterised in that the inclination of the slot (74) causes the extent of the shooting and retracting movement of the remote bolt, resulting from the co-operation of the roller (75) with the slot (74), to be greater than the extent of the distance moved by the bar (2) in its operating linear movement.

4. A multi-point lock according to any preceding claim characterised in that the drive member (10) has a linearly movable rack (15) and the operating means further comprises a handle or key and a toothed element (18) rotatable by the handle or key and in mesh with the rack (15) such that rotation of the toothed element (18) by the handle or key moves the rack (15), and thereby the drive member (10), linearly.

5. A multi-point lock according to claim 4 characterised in that the control unit (1) embodies a spring-loaded latch bolt (25) normally urged by the spring-loading to a projected operative position, the toothed element (18) has an associated follower (23) which is rotatable with the toothed element (18) when that element is rotated in the direction which causes the drive member (10) to be moved in the direction for the or each bar (2) to retract the remote bolt or bolts (3,4), and a pivoted rocker (43) co-operates with the latch bolt (25) and is caused to be pivoted to retract the latch bolt (25) when the follower (23) is rotated as aforesaid.

6. A multi-point lock according to claim 5 characterised in that the follower (23) and a cam (20) are mounted on and rotatable with a rotary spindle (21), the toothed element (18) is rotatable relative to the spindle (21) about the rotational axis of the spindle, in either direction of rotation of the spindle, and the cam (20) has parts (22) which provide alternative means of engagement between the cam and the toothed element (18) according to the direction of rotation of the spindle (21) for the cam and toothed element to turn together for part of the range of rotation of the cam (20) with the spindle.

7. A multi-point lock according to any preceding claim characterised in that the control unit (1) embodies a dead bolt (26), and the bar (2), or one of the bars, has a slot (48) in it which registers with the dead bolt (26) when the bar is in the shot remote bolt position and enables the dead bolt to be shot through the bar, and which slot (44) is

moved out of register with the dead bolt when the bar (2) is in the retracted remote bolt position to prevent the dead bolt from being shot.

8. A multi-point lock according to any of claims 1 to 6 characterised in that the control unit (1) embodies a dead bolt (26), the bar (2), or one of the bars, has a slot (48) which includes a narrower extension portion (48') extending longitudinally of the bar (2), and the dead bolt (26) has a niched part (49) adjacent its leading end of a reduced thickness complementary to the width of the extension portion (48') of the slot (48), the slot being so positioned that when the bar (2) is in the shot remote bolt position the slot proper is in register with the dead bolt (26) and enables the dead bolt to be shot through the bar, and when the bar is in the retracted remote bolt position the extension portion (48') of the slot engages with the niched part (49) of the dead bolt and prevents the dead bolt from being shot.

9. A multi-point lock according to either one of claims 7 and 8 as dependent from either of claims 5 and 6 characterised in that the latch bolt (25) and the dead bolt (26) move in parallel directions transverse to the direction of the linear movement of the drive member, the dead bolt (26) is operated by a key-operated locking cylinder (52) having a rotary element of which a part (53) is engageable with the dead bolt to shoot and retract the dead bolt according to the direction of turning of the key of the locking cylinder (52), and a linkage extends and operates linearly transversely of the latch bolt (25) and dead bolt (26) and comprises first and second push rods (60,61), the first push rod (60) being engageable by the rotary element part (53) to be moved linearly as the rotary element is turned by the key in the dead bolt retracting direction, and the second push rod (61) co-operating with the pivoted rocker (43) to be caused by the said linear movement of the first push rod (60) to be moved to pivot the rocker (43) in the direction which retracts the latch bolt (25), the latch bolt being free to be returned to its projected position by the spring loading and causing the rotary element and push rods (60,61) to be returned to inoperative positions when the rotary element part (53) is subsequently disengaged from the first push rod (60).

10. A multi-point lock according to any preceding claim characterised in that a catch (62) is provided comprising a spring-loaded plunger which is engageable with a slot (37) in the bar (2), or one of the bars, to prevent the bar, and thereby the drive member (10), from being moved unintentionally to the remote bolt shooting position.

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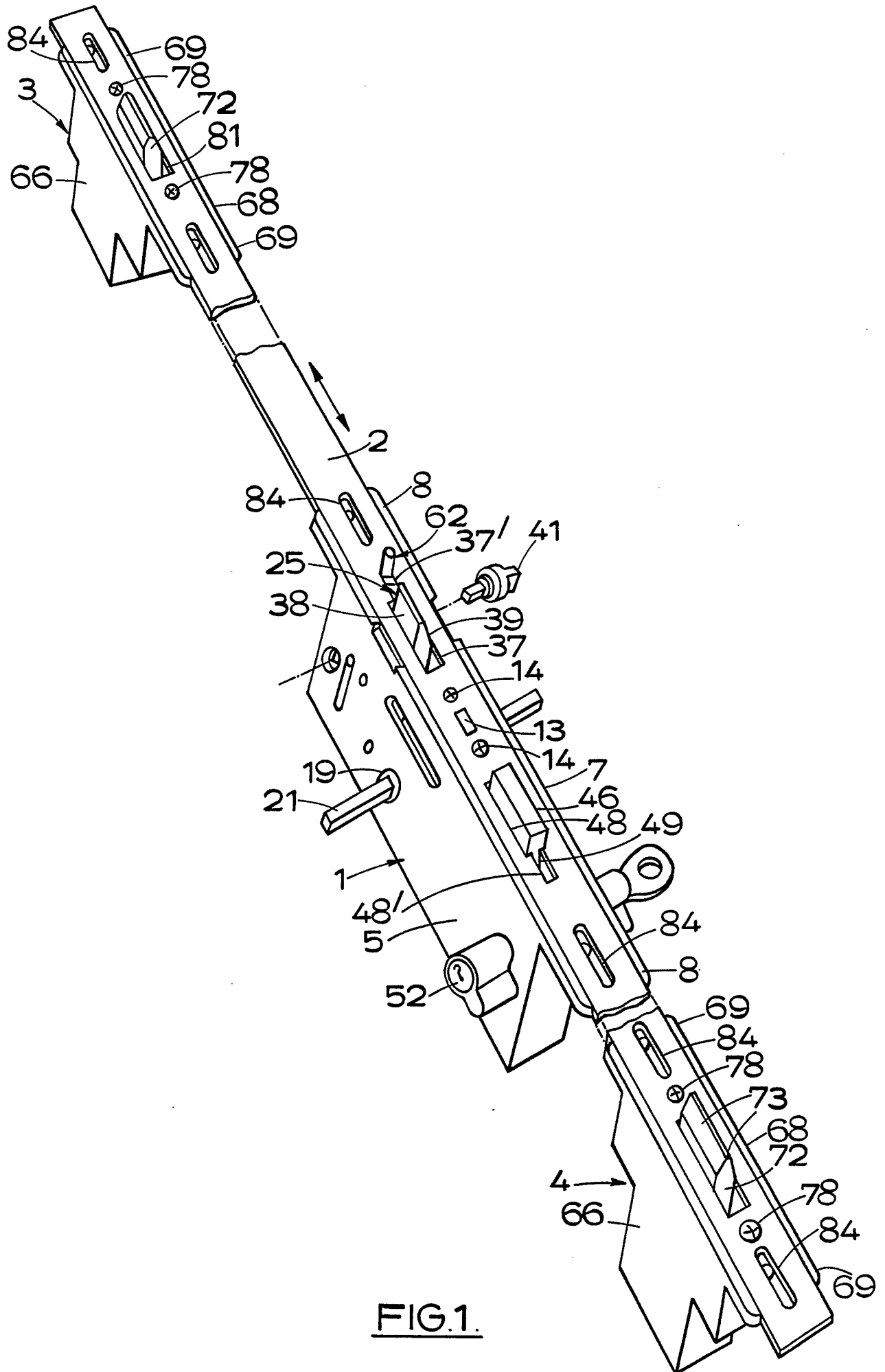


FIG.1.

