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54 **Hook bolt lock.**

57 In a hook bolt lock wherein the hook bolt (4) pivots between a first, projecting, position and a second, retracted, position under the action of an operating handle (7) which lies flush with the surface of the window or door frame in which the lock is incorporated and can slide in the casing between "closed" and "open" positions. The handle (7) is connected to the hook bolt (4) through a transmission mechanism (6) which includes a rotary member (12) and connecting links (8,9) which are pivotally connected (at 13,14) to the rotary member (12) and the second (9) of which is pivotally connected (at 10) to the hook bolt (4). In addition, for preventing opening of the lock by the application of pressure to the hook bolt end (5), locking means (26,28; 11,35) is provided comprising an abutment surface (28; 35) on the first link (8) and a cooperating abutment (26; 11) mounted on the casing (2), the arrangement being such that the abutment surface (28; 35) is urged against the abutment (26; 11) in response to pressure applied to the hook bolt end (5). In one version further locking means (34,39) is provided for locking the hook bolt (4) in its retracted position when the door or window is open. In addition, auxiliary locking means (40 - 50) may be provided for locking the hook bolt (4), transmission mechanism (6) and handle (7) in the "locked" position.

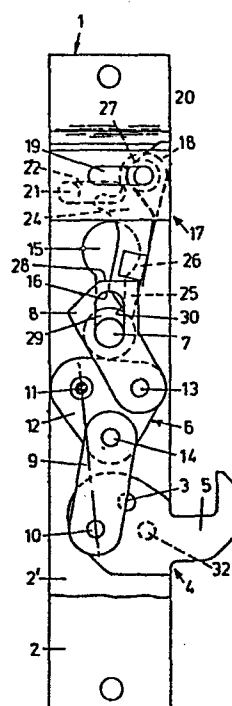


FIG.1

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HOOK BOLT LOCK

5 This invention is concerned with a hook bolt lock
for e.g. a sliding window or sliding door, comprising a
hook bolt mounted for pivotal movement in a lock casing
about a fixed axis between a first position, in which an
end of the hook bolt projects from the casing, and a second
10 position, in which said end is retracted into the casing,
an operating handle which lies flush or substantially flush
with the surface of the window or door frame when the lock
is mounted therein, and which is mounted for sliding
movement in the casing between first and second end po-
sitions corresponding to the first and second positions
15 respectively of the hook bolt, and a transmission mechanism
comprising a rotary member which is operatively connected
to the handle in such a manner that sliding movement of the
handle causes rotation of the member to take place, and
further which is operatively connected to the hook bolt in
20 such a manner that rotation of said member causes pivotal
movement of the hook bolt to take place.

One such lock is described in US-A 3120748, when
read together with US-A 2789852 referred to therein. In
this lock the linear sliding movement of the handle is
25 converted to rotary movement of the hook bolt by virtue of
the transmission mechanism comprising the rotary member.
One shortcoming of this lock is that there is no provision
therein for preventing its operation by the application of
pressure to the end of the hook bolt, when in its project-
30 ing position, such as to cause it to be rotated to its
second position, i.e. out of its locking position.

It is of course well known in the construction of
locks of all kinds to prevent retraction of the bolt from
its locking (projecting) position by application of pres-
35 sure to the projecting end thereof; one hook bolt lock

1 having this feature is described in US-A 2736185. In this
lock, however, the handle is of a rotary type, thereby
simplifying the transmission mechanism required, which thus
contains a simple toggle arrangement for locking the hook
5 bolt against retraction by the application of pressure
thereto. The use of a rotary handle in some instances,
and especially when flush with the door or window frame,
is, however, disadvantageous in that a key or like imple-
ment is required for effecting its rotation.

10 A further disadvantage of the lock of US-A
2736185 resides in that the overall dimensions of the lock
are determined by the "throw" of the levers of the trans-
mission mechanism required to give on the one hand an
adequate rotation of the hook bolt and on the other a
15 favourable mechanical advantage in the mechanism.

In the construction of lock described in US-A
3120748 these various disadvantages are mitigated by the
use of the sliding handle. However the more complicated
transmission mechanism of this lock does not lend itself
20 readily to the incorporation of the locking means for
preventing retraction of the hook bolt in response to the
application of pressure to the projecting end thereof, in
particular because of the rigid connections between the
rotary member and the operating levers operatively by which
25 the rotary member is connected to the handle and hook bolt.

It is thus the object of the present invention to
provide an improved hook bolt lock which is provided with a
sliding operating handle flush with the frame of the door
or window in which it is incorporated and which has locking
30 means for preventing the rotation of the hook bolt from its
first, projecting, position in response to the application
of pressure to the projecting end thereof, such improved
lock being so constructed as to provide for relatively
small overall dimensions with a view to incorporation
35 especially in the so-called 'profiles' of aluminium windows
and doors.

1 This object is resolved in accordance with the
present invention, in a hook bolt lock of the type set out
in the first paragraph above, in that a first link opera-
tively connects the handle to the rotary member, being
5 pivotally connected to the rotary member, and a second link
is pivotally connected at one end to the rotary member and
at the other to the hook bolt and thus provides the opera-
tive connection therebetween, the pivotal connections being
such that the application of pressure to the projecting end
10 of the hook bolt, when the latter is in its first position,
is effective, through the second link, to urge the rotary
member to rotate and thus to urge the first link in one
direction, and in that locking means is provided for
preventing such movement of the first link in said one
15 direction and thus movement of the hook bolt from its first
position, in response to such applied pressure, said
locking means comprising an abutment which is mounted on
the lock casing and against which an abutment surface
provided on the first link is pressed when the latter is
20 urged in said one direction.

 The provision of links pivotally connected to the
rotary member allows the overall dimensions of the lock to
be reduced, since the mechanics of the system are no longer
dependent solely upon the 'throw' of the rotary member but
25 rather also upon the arrangement of the two links there-
with. In addition, as will become clearer from the
following discussion of further features of the lock in
accordance with the invention, the provision of the two
links pivotally connected to the rotary member facilitates
30 the incorporation of the feature of locking the hook bolt
against retraction by the application of pressure to its
projecting end.

 Thus, in one embodiment of lock in accordance
with the invention, when the hook bolt is in its first
35 position, the pivotal connections of the links with the
rotary member are disposed both at the same side of a line

1 extending through the axis of the rotary member and the
pivotal connection of the second link with the hook bolt,
and thus urging the first link in said one direction is
effective to urge the handle from its first to its second
5 end position in this case, furthermore, the abutment is
movable between an operative position, in which it is
operatively engageable by the abutment surface on the first
link, and an inoperative position, and cam means is
provided movable with the operating handle, when the latter
10 is moved from its first to its second end position, and
engageable with a cam surface associated with the abutment,
for camming the abutment out of its operative position, the
arrangement being such that the operating handle is
connected to the first link by a lost motion arrangement
15 allowing movement of the handle relative to the first link
sufficient to effect the camming action.

In this way, it will be appreciated, a positive
stop can be applied to the first link, and thus to the hook
bolt, when the latter is urged out of its projecting
20 position by the application of pressure to the projecting
end thereof, but this stop does not interfere with the
normal operation of the lock by moving the sliding handle.

Conveniently, furthermore, in said one embodi-
ment, actuating means is provided, comprising an actuator
25 which is urged into a position in which it projects from
the casing at the same side as the hook bolt end, but is
retractable into the casing, such retraction of the
actuator causing the abutment to be urged into its
operative position, while movement of the actuator to its
30 projecting position causes the abutment to be moved to its
inoperative position. The actuating means, it will thus
be appreciated, is effective to render the locking means
operative when the window or door in which the lock is
incorporated is closed, but does not interfere with the
35 operation of the lock when said window or door is open.

1 In a second embodiment of lock in accordance with
the invention, when the hook bolt is in its first position
and the handle is in its first end position, the pivotal
connections of the links with the rotary member are
5 disposed at opposite sides of a line extending through the
axis of the rotary member and the pivotal connection of the
second link with the hook bolt, and thus urging the first
link in said one direction is effective to urge the handle
in a direction away from its second end position. Thus
10 the application of pressure to the projecting hook bolt end
in this case serves to urge the first link, and thus the
handle, in a direction opposite to the direction in which
the handle would be moved to cause the hook bolt to be
retracted to its second position.

15 Conveniently, furthermore, in the second embodi-
ment of lock the abutment, which may be fixed in the casing
in this case, and indeed may be constituted by the pivot
pin on which the rotary member is mounted, is engaged by
the abutment surface on the first link when the handle is
20 moved into its first end position, and in fact defines said
position.

The second embodiment of lock may also comprise
further locking means for locking the first link, and thus
the hook bolt, in the second position of the latter, said
25 further locking means comprising a further abutment surface
provided on the first link and a further abutment carried
by a support pivotally mounted on the casing for movement
into and out of an operative position in which it can
operatively engage said further abutment surface, actuating
30 means being provided for moving the abutment into and out
of its operative position, said actuating means comprising
an actuator which is urged into a position in which it
projects from the casing at the same side as the hook bolt
end, but is retractable into the casing, and the support
35 and actuator being connected by a pin-and-slot connection
such that movement of the actuator between its projecting

1 and retracted positions causes pivoting movement of the support to take place.

Thus in the case of the second embodiment the hook bolt can be retained in its retracted position while
5 the window or door is open, the further locking means releasing the first link only upon retraction of the actuator, e.g. by closing the door or window. Thus, the risk of damage to the hook bolt end or the frame of the door or window or both by collision therebetween is
10 minimised.

The first and second embodiments referred to above are suitable for use where the handle is accessible only at one side of the door or window. Where, on the other hand, it is desired to provide a handle at each side
15 of the door or window, it will be desirable also for the operation of the lock to be disabled when the window or door is closed and to this end, in a third embodiment of lock in accordance with the invention auxiliary locking means is provided for locking the hook bolt, transmission
20 mechanism and operating handle against movement in the casing when the hook bolt is in its first position. Conveniently such auxiliary locking means comprises a locking member movable between an advanced, locking, position and a retracted position in the casing, said
25 member having an abutment surface engageable with a stop associated with the hook bolt, transmission mechanism and operating handle, e.g. mounted on the hook bolt. Such locking member may be moved between its advanced and retracted positions by means of a key-actuated lever.

30 To illustrate the present invention there now follows a detailed description to be read with reference to the accompanying drawings, of three locks in accordance therewith, these locks having been selected for description by way of non-limiting example.

35 In the accompanying drawings:

1 Fig. 1 is a side view, with parts removed, of a first lock in accordance with the invention, in a locking condition:

 Fig. 2 is a view similar to Fig. 1, but showing
5 the lock in an unlocked condition;

 Fig. 3 is a view from the opposite side of the lock shown in Figs. 1 and 2;

 Figs. 4 and 5 are views similar to Figs 1 and 2 respectively but of a second lock in accordance with the
10 invention; and

 Figs. 6 and 7 are also views similar to Figs 1 and 2 respectively, but of a third lock in accordance with the invention.

 The first lock in accordance with the invention
15 (see Figs. 1 to 3) comprises a casing 2 made up of profiled front and back plates 2,2'. Within the casing 2 a pivot pin 3 is provided for a hook bolt generally designated 4, which pivots on the pin 3 between a first position (Fig. 1), in which a hook end 5 thereof projects from the casing,
20 and a second position (Fig. 2), in which the end 5 is retracted into the casing. The hook bolt 4 carries a pin 32 which projects through a curved slot 33 formed in the back plate 2' and is engaged by a spring 31 (Fig. 3) to urge the hook bolt 4 into its first, projecting, position.
25 For moving the hook bolt 4 between its first and second positions an operating handle 7 is provided, which lies flush or substantially flush with the surface of the frame of the door or window in which the lock is incorporated. The handle 7 is slideable, between first and second end
30 positions corresponding to the first and second positions of the hook bolt 4, linearly in a recess (not shown) formed in said frame and comprises an integral pin slideable in slots 15,15' formed in the plates 2,2' of the casing. The handle 7 is operatively connected to the hook bolt 4 by a
35 transmission mechanism generally designated 6, now to be described.

1 The transmission mechanism 6 of the first lock
comprises a rotary plate member 12 pivotally mounted on a
pivot pin 11 carried by the casing 2. Pivotally con-
nected, by a pin 13, to the member 12 is a first link 8
5 having a slot 16 which receives the pin of the handle 7.
Also pivotally connected, by a pin 14, to the member 12 is
one end of a second link 9, the other end of which is
pivotally connected, by a pin 10, to the hook bolt 4.
Thus movement of the handle 7 from its first to its second
10 position effects through the first link 8 rotation of the
member 12 such that, through the second link 9, the hook
bolt 4 is pivoted between its first and second positions.

It will be observed from Fig. 1 that, when the
hook bolt 4 is in its projecting position, the pivot pins
15 13, 14 lie both on the same side of a line (shown in
chain-dot) extending through the pins 10, 11 so that the
application of pressure to the projecting end 5 of the bolt
is effective, through the transmission mechanism 6, to urge
the handle 7 to its second end position.

20 To prevent such movement of the handle 7, and
indeed to prevent the bolt from being thus moved out of its
first position, locking means is provided which comprises
an abutment 26 carried on a lever 24 which is pivotally
mounted in the casing 2 on a pin 20 for movement into and
25 out of an operative position (see Fig. 1) in which the
abutment 26 is disposed in the path of an abutment surface
28 formed on the first link 8.

For moving the lever 24 into and out of its
operative position, furthermore, actuating means generally
30 designated 17 is provided, comprising a plate-like actuator
18 movable between a projecting position (Fig.2), in which
it projects from the casing 2, at the same side thereof as
the hook bolt 4, and a retracted position (Fig.1), in which
it is held accommodated within the casing, e.g. when the
35 door or window in which the lock is incorporated is closed.
The actuator 18 has formed therein a slot 19 in which the

1 pin 20 is accommodated and also carries a pin 21 slideable
in a slot 22 formed in the casing 2. A spring 23 mounted
on the back plate 2' (Fig.3) acts on the pin 21 thus to
urge the actuator 18 into its projecting position. A
5 further spring 27, of lesser force, is also provided which
acts to urge the lever 24 into its operative position upon
retraction of the actuator 18 (see Fig.1), but when the
actuator 18 is moved to its projecting position the pin 21
engages with a cooperating recess formed in one edge of the
10 lever 24 and cams the latter out of its operative position.

From the foregoing it is clear that, when the
door or window in which the lock is incorporated is closed,
the abutment 26 will block any movement of the first link 8
in a direction to move the handle 7 towards its second end
15 position in response to the application of pressure to the
hook bolt end 5.

For enabling the handle 7 to be moved from its
first to its second end position the pin of the handle 7
carries a camming ring 29 which cooperates with an inclined
20 cam surface 30 of the lever 24 to cam the latter out of its
operative position. This camming action is achieved,
furthermore, by the pin of the handle 7 being movable
relative to the first link 8 along the slot 16 therein,
which thus provides the necessary lost motion to enable the
25 lever 24 to be retracted before the pin engages the end of
the slot 16 and begins to move the hook bolt 4 out of its
first position.

Turning to Figs 4 and 5, the second lock in
accordance with the invention is generally similar, except
30 as now described, to the first lock. In this case,
however, as will be seen from Fig. 4, when the hook bolt 4
is in its first position the pins 13,14 are disposed at
opposite sides of a line (shown in chain-dot) extending
through the pins 10,11. Thus in response to the applica-
35 tion of pressure on the hook bolt and 5 in this case the
rotary plate member 12 is urged, through the second link 9,

1 in a clockwise direction and thus, through the first link 8, urges the handle 7 in a direction away from its second end position, i.e. in a direction opposite to its "opening" movement.

5 For preventing such movement of the handle 7, and thus corresponding movement of the hook bolt 4 out of its first position, locking means is provided comprising an abutment provided by the pin 11 and a cooperating abutment surface 35 formed on the first link 8. Indeed the co-
10 operation between the abutment and abutment surface serves to define the first end position of the handle 7 so that pressure applied to the hook bolt end 5 as aforesaid merely serves to urge the abutment surface 35 against the abutment (11); it will of course be appreciated that the first link
15 8 is restrained against lateral pivotal movement on the pin 13 by the engagement of the pin of the handle 7 in the slots 15,15'.

It will be apparent from the foregoing that in this case no release mechanism is required for the engage-
20 ment of the abutment surface 35 with the fixed abutment since, to open the lock, it is necessary only to move the handle 7, and thus the first link 8, in a direction to move the abutment surface 35 away from the abutment.

The second lock also has further locking means
25 for locking the first link 8, and thus the hook bolt 4, in the second position of the latter, that is to say in its retracted position. This may be desirable where, when the window or door is open, the hook bolt end 5 would otherwise be urged to project with the consequential risk of damage
30 to the bolt or to the door or window frame when the latter is closed. The further locking means comprises a lever 36 pivotally mounted in the casing 2 and having at its lower end an abutment 39 which can engage with a further abutment surface 34 formed on the first link 8. The lever 36 is so
35 positioned that the abutment surface 34 engages the abutment 39 when the handle 7 is in its second end

1 position. For moving the lever into and out of an operative position, furthermore, actuating means generally designated 17 is provided of a similar construction to the actuating means 17 of the first lock. Thus, again, the
5 actuator 18 is urged into a projecting position by means of the spring 23. In the case of the second lock, the pin 21 is accommodated in a profiled slot 38 formed in the lever 36, the arrangement being such that, as the actuator 18 is moved from its projecting position into the casing 2, the
10 lever 36 is pivoted clockwise (viewing Fig.5) to move the abutment 39 out of operative position. Thus, when the window or door is closed, the abutment 39 is held out of its operative position. When the window is opened, on the other hand, the actuator 18 moves to projecting position,
15 the pin 21 thus causing the lever to pivot anti-clockwise to bring the abutment 39 into the operative position. The abutment 34 has an inclined camming face associated therewith so that, as the handle is moved to its second end position, the first link 8 is cammed over in the region of
20 the slot 15 to move the abutment surface 34 past the abutment 39.

The third lock in accordance with the invention (see Figs 6 and 7) is generally similar to the second lock, but is provided with auxiliary locking means operable e.g.
25 by means of a cylinder lock (not shown), so that provision can in this case be provided for operating the lock as aforesaid from either inside or outside. The auxiliary locking means comprises a lever 41 slideable transversely along a guide rail 40 and having a recess 42 which can be
30 engaged by the operating tongue (not shown) of a cylinder lock assembled in a key hole 43 formed in an extension of the casing 2. The lever 41 carries a pin 48 which is captive in a slot 47 formed in a locking plate 44, the latter also having a vertical slot 45 formed therein
35 accommodating a pin 46 mounted in the casing 2. Thus, transverse sliding movement of the lever 41 effects

1 vertical sliding movement of the locking plate 44. Along
its upper edge, the locking plate 44 has a shoulder 49 which
provides an abutment for an abutment pin 50 carried by the
hook bolt 4, the arrangement being such that when the hook
5 bolt is in its projecting position, the pin 50 abuts
against the shoulder 49. In this position, therefore, the
hook bolt cannot be moved to its second position even by
operation of the handle 7, but rather the bolt 4, trans-
mission mechanism 6 and handle 7 are all locked against
10 movement within the casing.

If desired, auxiliary locking means of the
aforementioned type may also be used in the first lock
described above. Furthermore, whereas reference has been
made to the use of cylinder locks for use with the auxil-
15 iary locking means, locks of other types may also be
contemplated in this connection.

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1 Claims:

1. Hook bolt lock for e.g. a sliding window or sliding door, comprising

5 a hook bolt (4) mounted for pivotal movement in a lock casing (2) about a fixed axis (3) between a first position, in which an end (5) of the hook bolt (4) projects from the casing (2), and a second position, in which said end (5) is retracted into the casing (2),

10 an operating handle (7) which lies flush or substantially flush with the surface of the window or door frame when the lock is mounted therein, and which is mounted for sliding movement in the casing (2) between first and second end positions corresponding to the first and second positions respectively of the hook bolt (4), and

15 a transmission mechanism (6) comprising a rotary member (12) which is operatively connected to the handle (7) in such a manner that sliding movement of the handle (7) causes rotation of the member (12) to take place, and
20 further which is operatively connected to the hook bolt (4) in such a manner that rotation of said member (12) causes pivotal movement of the hook bolt (4) to take place,

characterised in that a first link (8) operatively connects the handle (7) to the rotary member (12),
25 being pivotally connected (at 13) to the rotary member (12), and a second link (9) is pivotally connected at one end (14) to the rotary member (12) and at the other (10) to the hook bolt (4) and thus provides the operative connection therebetween, the pivotal connections (10,13,14) being
30 such that the application of pressure to the projecting end (5) of the hook bolt (4), when the latter (4) is in its first position, is effective, through the second link (9), to urge the rotary member (12) to rotate and thus to urge the first link (8) in one direction,

35 and in that locking means (26,28; 11,35) is provided for preventing such movement of the first link (8)

1 in said one direction and thus movement of the hook bolt
(4) from its first position, in response to such applied
pressure, said locking means (26,28; 11,35) comprising an
abutment (26; 11) which is mounted on the lock casing (2)
5 and against which an abutment surface (28; 35) provided on
the first link (8) is pressed when the latter (8) is urged
in said one direction.

2. Hook bolt lock according to Claim 1 charac-
10 terised in that, when the hook bolt (4) is in its first
position, the pivotal connections (13, 14) of the links
(8,9) with the rotary member (12) are disposed both at the
same side of a line extending through the axis (11) of the
rotary member (12) and the pivotal connection (10) of the
15 second link (9) with the hook bolt (4), and thus urging the
first link (8) in said one direction is effective to urge
the handle (7) from its first to its second end position,

in that the abutment (26) is movable between an
operative position, in which it is operatively engageable
20 by the abutment surface (28) on the first link (8), and an
inoperative position,

and in that cam means (29) is provided movable
with the operating handle (7), when the latter (7) is moved
from its first to its second end position, and engageable
25 with a cam surface (30) associated with the abutment (26),
for camming the abutment (26) out of its operative
position, the arrangement being such that the operating
handle (7) is connected to the first link (8) by a lost
motion arrangement (16) allowing movement of the handle (7)
30 relative to the first link (8) sufficient to effect the
camming action.

3. Hook bolt lock according to Claim 2 charac-
terised in that actuating means (17) is provided, com-
35 prising an actuator (18) which is urged into a position in
which it projects from the casing (2) at the same side as

1 the hook bolt end (5), but is retractable into the casing
(2), such retraction of the actuator (18) causing the
abutment (26) to be urged into its operative position,
while movement of the actuator (18) to its projecting
5 position causes the abutment (26) to be moved to its
inoperative position.

4. Hook bolt lock according to Claim 1 characterised in that, when the hook bolt (4) is in its first
10 position and the handle (7) is in its first end position,
the pivotal connections (13,14) of the links (8,9) with the
rotary member (12) are disposed at opposite sides of a line
extending through the axis (11) of the rotary member (12)
and the pivotal connection (10) of the second link (9) with
15 the hook bolt (4), and thus urging the first link (8) in
said one direction is effective to urge the handle (7) in a
direction away from its second end position.

5. Hook bolt lock according to Claim 4 characterised in that the abutment (11) is fixed in the casing
20 (2) and is engaged by the abutment surface (35) when the
handle (7) is moved into its first end position.

6. Hook bolt lock according to Claim 5 characterised in that the fixed abutment (11) is constituted by
25 the pivot pin (11) on which the rotary member (12) is
mounted.

7. Hook bolt lock according to any one of
30 Claims 1, 4, 5 and 6 characterised in that further locking
means (34,39) is provided for locking the first link (8),
and thus the hook bolt (4), in the second position of the
latter, said further locking means (34,39) comprising a
further abutment surface (34) provided on the first link
35 (8) and a further abutment (39) carried by a support (36)
pivotally mounted on the casing (2) for movement into and

1 out of an operative position in which it can operatively
engage said further abutment surface (34), actuating means
(17) being provided for moving the abutment (39) into and
out of its operative position, said actuating means (17)
5 comprising an actuator (18) which is urged into a position
in which it projects from the casing (2) at the same side
as the hook bolt end (5), but is retractable into the
casing (2), and the support (36) and actuator (18) being
connected by a pin-and-slot connection (21,38) such that
10 movement of the actuator (18) between its projecting and
retracted positions causes pivoting movement of the support
(36) to take place.

8. Hook bolt lock according to any one of the
15 preceding claims characterised in that auxiliary locking
means (40 to 50) is provided for locking the hook bolt (4),
transmission mechanism (6) and operating handle (7) against
movement in the casing (2) when the hook bolt (4) is in its
first position.

20

9. Hook bolt lock according to claim 8 charac-
terised in that the auxiliary locking means (40 to 50)
comprises a locking member (44) movable between an ad-
vanced, locking, position and a retracted position in the
25 casing (2), said member (44) having an abutment surface
(49) engageable with a stop (50) associated with the hook
bolt (4), transmission mechanism (6) and operating handle
(7), e.g. mounted on the hook bolt (4).

30 10. Hook bolt lock according to claim 9 charac-
terised in that the locking member (44) is moved between
its advanced and retracted positions by means of a
key-actuated lever (41).

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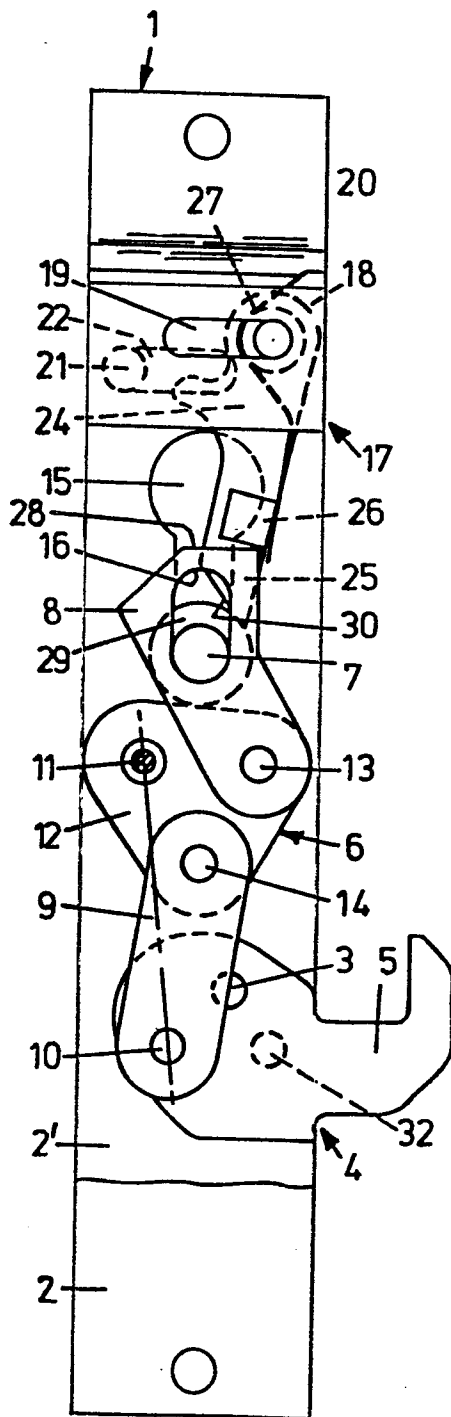


FIG. 1

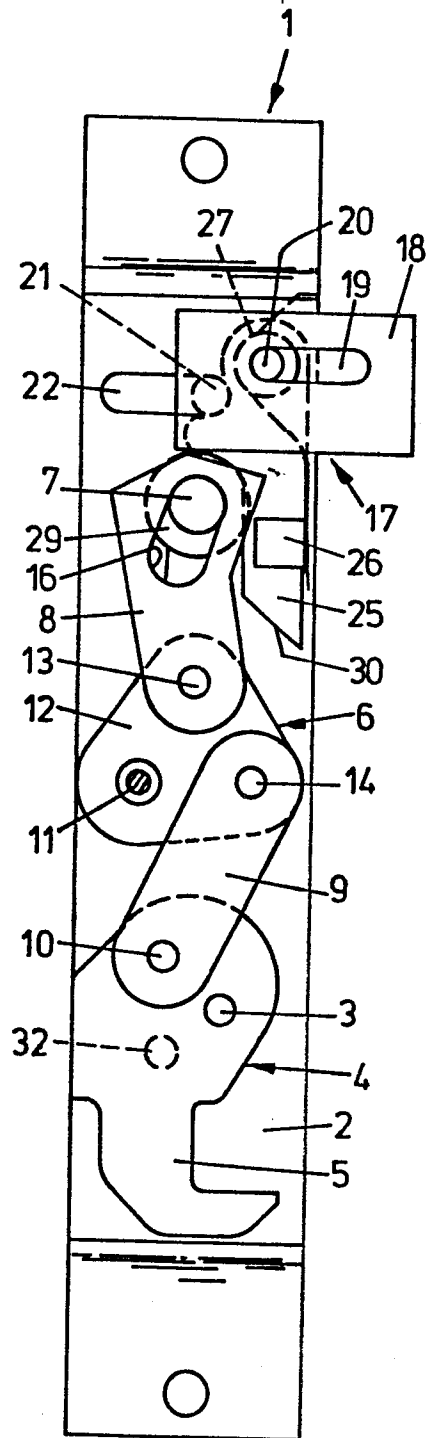


FIG. 2

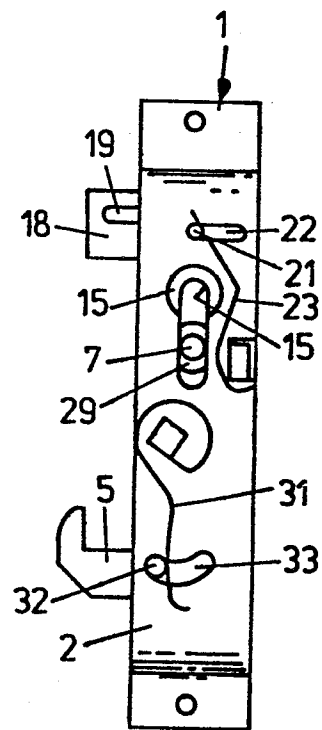


FIG. 3

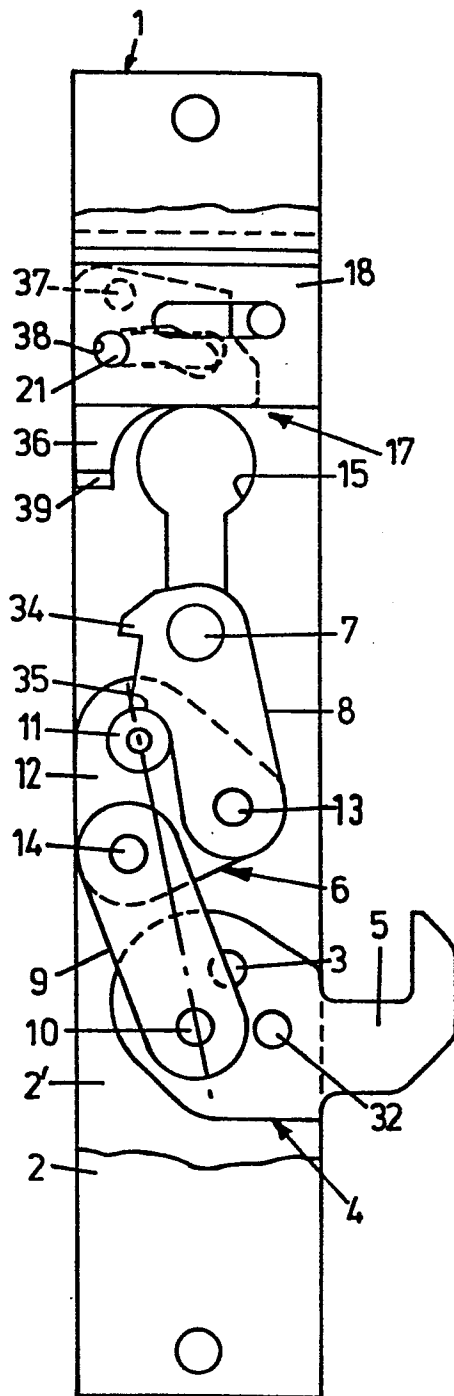


FIG.4

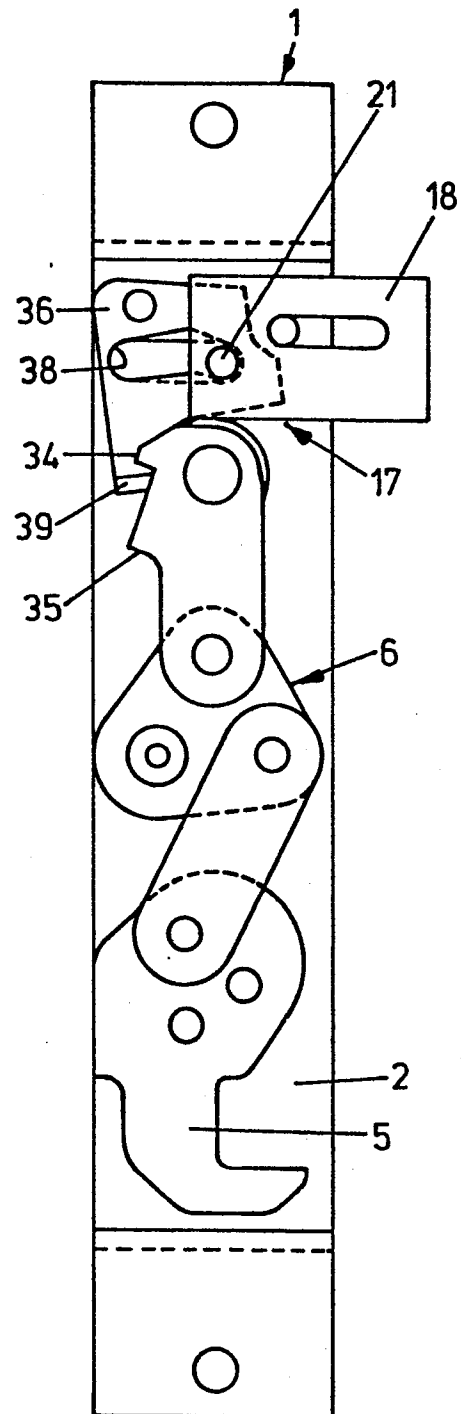


FIG.5

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