

actuating means for a lift door catch

The invention relates to an actuating mechanism for a lift door catch in accordance with the preamble of claim 1, said catch blocking the lift door and preventing it from being opened, except when the lift cage is at the landing equipped with the lift door. In particular the actuating mechanism of the invention is intended for demountable building hoists and for industrial applications.

For reasons of safety it is generally prescribed that permanently as well as demountably installed lifts should have a protection, which prevents a lift door from being opened, if the lift cage has left the landing, at which the lift door is mounted, thereby avoiding the risk of anyone falling out through the lift door opening, when the lift cage has left the landing.

In permanently installed lifts the release of the door catch usually is automatic, whereas the catch in building hoists in general is manually released by means of a particular actuating mechanism, which prevents the transfer of a release motion to the hoist door catch, if the hoist cage is anywhere else than at the landing in question. When the hoist cage is at the landing, a connection is established between an actuating member and the hoist door catch, so that the door may be released by operating the actuating member.

A plurality of actuating mechanisms for releasing a door catch of a lift cage have been proposed, among other things there exist actuating mechanisms including a cam wheel, which is engaged with a stationary cam provided at a landing. The door catch of the lift cage may then be released by the actuating mechanism provided at the lift cage.

In most cases the cam wheel of the actuating mechanism will engage the cam every time the lift cage passes the landing, even on those occasions, when the lift cage does not stop at this landing. Thus, there will be an excessive wear of the movable parts, resulting in heavy costs for maintenance and inspection. Consequently, this solution is unsatisfactory.

Various cam mechanisms have been proposed in the past in order to solve these problems, in which the cam wheel passes

the cam at a short distance therefrom. When the actuating mechanism is operated in the release direction, the cam wheel will engage the cam, the cam wheel rolling on the cam and guiding the actuating mechanism in such a way, that the latter will be able to carry out its release motion. If there is no cam, i.e. beyond a landing, the cam wheel can not be brought into engagement with such a cam, the actuating mechanism having no guidance, and thus being unable to release the door catch. Unfortunately, the solutions offered hitherto are unsatisfying. They have a great number of cooperating parts having a complicated design, which requires numerous manufacturing steps. Consequently, such prior art mechanisms are very expensive to produce.

E.g. the GB-A-1 047 977 discloses an actuating mechanism of this kind. It comprises four bell cranks, two articulated levers, one link having one forked end, two links being forked in each end, one bevel gear unit and a plurality of springs. Thus, the system is very complicated, and furthermore it requires a careful assembly for bringing the components into their exactly correct positions, so that they will be able to cooperate in a satisfactory manner.

The US-A-3 659 677 discloses an other type of mechanism. The actuating mechanism of this structure comprises a handle, which is rotated to release a gate lock for the cage of a hoist. Such rotation of the handle is possible only when a cam wheel engages a ramp, provided at each landing of the hoist. Otherwise the rotational movement of the handle is prevented by a stop. Though this system is less complicated than the above system, it comprises a plurality of particularly designed components, as well, e. g. including welded lugs, extensions and spring guides. This results in the structure being complex and expensive to manufacture.

The US-A-3 721 319 exemplifies a further actuating mechanism, also having a rotatable handle, by means of which the catch of a lift door may be released. The system has a plurality of specially designed members, requiring a rather accurate manufacturing and assembly, making also this system comparatively expensive.

The object of the invention is to provide an actuating

mechanism of the kind described in the introductory part, which avoids the disadvantages of the prior art, and which has a rugged and uncomplicated construction, permitting it to be manufactured at an essentially lower cost than has been possible in the past, at the same time as a high reliability is maintained even after a long time of use.

This object is reached, in accordance with the invention, by a mechanism of the above kind, which includes the features of the characterizing part of claim 1.

10 The invention will now be described more in detail by means of a preferred embodiment, wherein the actuating mechanism of the invention is applied to sliding door provided at a landing, with reference to the annexed drawing, in which:

Fig 1 is a side elevation of a mechanism in accordance with the invention for the release of a door catch, and

Fig 2 is a front elevation of the mechanism of fig 1.

The actuating mechanism 1 of figs. 1 and 2 is intended for operating a catch 3 of a sliding door 4 of a hoist. Since the design of the door is quite unimportant for the invention per se, a closer description of the door will not be given herein. The catch 3 is provided at the top of the door opening, and extends above and along the door opening. It includes a knee lever 10, one arm 12 of which having a bore for a pivot 6, which is rigidly connected to the upper part of the door opening. The catch 3 is rotatable about the pivot 6 axis in the direction of the arrow P, said axis being parallel to the door 4. A vertical stop lug 8 is joined to the other arm (opposite to the pivot) of the knee lever 10 and protrudes into the path of movement of the door, closely behind the closed door 4 (or behind a stop member associated with the door). Furthermore, the catch 3 comprises a horizontal actuating surface 48 to be engaged by the actuating mechanism 1, which will be described more closely below. If the catch is rotated a sufficient angle about the pivot 6, the stop lug 8 will be displaced out of the path of movement of the door 4, permitting the door to be opened.

The actuating mechanism 1 of the invention comprises a manual operating means of any appropriate type, not shown. When the operating means is operated, an operating link 16 is

linearly moved upwardly in the vertical direction (arrow L). The upper end of the operating link 16 has a yoke 18 provided with a through bore. The operating link 16 is guided in suitable guides 22, rigidly connected to the door 4, one of which being shown in the figures. Further, a radial pin 24, rigidly connected to the link 16 protrudes radially therefrom. A return spring 26 is disposed about the link 16 between the radial pin 24 and the guide 22. The distance between the guide 22 and the pin 24 and the length and the characteristic of the spring are adapted to each other, so that the link 16 (and thereby the actuating mechanism 1) is biased by an appropriate return force.

The lower end, having a through bore, of a first link arm 28 is inserted into the yoke 18 of the operating link 16, a pivot 20 extending through the bore of the yoke 18 and through the bore provided in the lower end 30 of the link arm 28. Thus, said link arm 28 is rotatable about the pivot 20 in relation to the link 16. The upper end of the first link arm 28 is forked, as well, and has a through bore for a pivot 34. The gap between the fork arms of the first link arm 28 is somewhat larger than the width of a cam wheel 36 to be placed in the space between the fork arms. Of course the distance from the pivot axis of the bore to the bottom of the fork is larger than the radius of the cam wheel 36.

A second link arm 38 comprises a lower yoke 40, in which the gap between the fork arms is somewhat larger than the width of the yoke 32 of the first link arm 28. This yoke 40 and the cam wheel 36 have each a through bore for the pivot 34. Thus, as seen in fig 2, the yoke 40 of the second link arm 38 surrounds the yoke 32 of the first link arm 28, when assembled and by means of the pivot 34, which is introduced into the bores of the respective yokes 32, 40 and the cam wheel 36, the second link arm 38 may be pivoted about the pivot 34 in relation to the first link arm 28. The cam wheel 36 is rotatable on said pivot 34 and has such a radius that it protrudes outside the assembled yokes 32, 40 (fig 1). The upper end of the link arm 38 is flat and has a through bore for a pivot 42. The upper end of the link arm 38 is received in a yoke 44 of an actuating arm 46, which is linearly

displaceable in the vertical direction (direction of arrow F), the second link arm 38 being pivotable about the pivot 42 in relation to the actuating arm 46.

For the arm 46, which at the upper end has a contact surface 48 engageable with the actuating surface 14 of the catch 3 for rotating the same, there are two guides 50 and 52 disposed above each other. Thereby the actuating arm 46 is movable in the vertical direction, only. Additionally, a stop member 54 is provided on the actuating arm 46, the abutment of which against the upper surface of the upper guide 52 limiting the downwards movement of the actuating arm 46.

The link arms 28 and 38 are disposed to make an angle with each other in such a way that the pivot 34 will be located outside the connection line between the pivots 20 and 42 at a larger distance from the hoist door 4 towards the hoist cage than that of the pivots 20 and 42. Thus, the link arms 28, 38 and the pivots form a toggle joint mechanism.

Further, a cam 56, shown with broken lines in fig 1, is provided on the cage in such a manner that when the cage is at a landing or a stop level, the cam 56 will be opposite the cam wheel 36 in question.

The device operates as follows:

- a) no cage is at the landing; thus there is no cam 56 in front of the cam wheel 36. If then the operating link 16 is displaced upwardly, the pivot 34 only will move outwardly. Thus, no vertical movement will be transferred to the actuating arm 46, the catch 3 remaining in its blocking position with the stop lug 8 protruding into the path of movement of the door 4, so that the door 4 remains blocked.
- b) the cage is at the landing; now, if the operating link 16 is displaced upwardly, the pivot 34 and the cam wheel 36 initially will swing outwardly, as before, and when they have been displaced a distance, corresponding to the small gap provided between the cam wheel 36 and the cam 56 in the unaffected state of the mechanism 1, the cam wheel 36 will engage the cam 56. Up to now the actuating arm 46 remains in its initial position. If the displacement upwardly of the operating link 16 continues, the cam 56

prevents a further displacement of the cam wheel 36, thus locking the link arms 28 and 38, so that the vertical movement of the operating link 16 will be transferred to the actuating arm 46, the contact surface 48 of which
5 engages the contact surface 14 of the catch 3, thereby rotating the catch 3 about the pivot 6. After a sufficient vertical displacement of the operating link 16 and the other members, during which the cam wheel 36 rolls on the cam 56, the catch 3 has been pivoted to such an extent
10 that the stop lug 8 has been displaced out from the path of movement of the door 4, permitting it to be opened. Upon release of the actuating mechanism, it will be returned to its start position by means of the return spring 26, and when the door 4 is completely closed, the
15 catch 3 will pivot back to its blocking position by its own weight.

Conveniently, at least one sensor is provided to sense whether the catch 3 is in its blocking position or not. The sensor thereby interrupts the power supply to the driving
20 motor of the hoist to prevent the actuation thereof, if the door is not correctly closed.

The invention is of course not limited to the above described embodiment, but may be modified in various manners within the scope of claim 1. E.g. instead of forked links or
25 link arms, flat link arms disposed side by side in a pivotable manner may be used. Of course, those skilled in the art realize, that the rotatable cam wheel may be replaced by any appropriate type of cam follower.

Neither is the invention limited to a particular kind of
30 catch mechanism to be used for blocking the hoist door 4 in its closed position, but any type of blocking mechanism could be utilized to be released by the actuating mechanism of the invention.

The described embodiment is related to horizontally dis-
35 placeable doors provided at landings. However, those skilled in the art realize that the actuating mechanism of the invention is applicable to side hung single or double doors, and to vertically displaceable doors, as well.

CLAIMS

1- An actuating mechanism for a catch (3) of a door of a hoist cage or of a landing, having a vertically displaceable operating member (16), a vertically displaceable actuating member (46) connected to said operating member (16), and disposed to release said catch, thereby permitting the door (4) to be opened, when a hoist cage is at a landing, a coupling mechanism, comprising a cam follower (36), and which connects said actuating member (46) to said operating member (16), said cam follower being engaged with a cam (56) by displacing the operating member in a release direction, thereby blocking the coupling mechanism in such a manner that a continued displacement in the same direction of the operating member (16) will be transferred to a door catch release displacement of said actuating member (46), whereas no movement is transferred to said actuating member (46) from said operating member (16), if said cam (56) is absent from said cam wheel (36), characterized in that said coupling mechanism, which connects said operating member (16) to said actuating member (46), is a toggle joint mechanism (20, 28, 34, 38, 42).

2. An actuating mechanism in accordance with claim 1, characterized in that said toggle joint mechanism comprises a first link arm (28), which at one end via a first pivot (20) is connected to said operating member (16) and which at the other end via a second pivot (34) is connected to a first end of a second link arm (38), the other end of which being pivotably connected to said actuating member (46) via a third pivot (42).

3. An actuating mechanism in accordance with claim 2, characterized in that said cam follower is a cam wheel (36), rotatably supported by said pivot (34), which connects said first link arm (28) and said second link arm (38) to each other, said cam wheel (36) extending outside said link arms (28, 38) in the vicinity of said pivot (34).

4. An actuating mechanism in accordance with any of claims 1-3, characterized in that said toggle joint mechanism is angled towards said cam (56) in such a manner that said cam follower (36) is the element, which is closest to said cam (56).



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5. An actuating mechanism in accordance with any of claims 1-4, characterized in that said cam follower (36) is at a distance from said cam (56) in the unaffected state of said actuating mechanism.

5 6. An actuating mechanism in accordance with claim 2, characterized in that at least one of the pivot connections between said operating member (16) and said first link arm (28) and between said actuating member (46) and said second link arm (38) is a yoke (18, 44), provided on one of the link
10 members and which surrounds one end of the other link member, a pivot (20, 42) being inserted through both of said cooperating link members (18, 28; 38, 44).

7. An actuating mechanism in accordance with claim 2 or claim 3, characterized in that the connection between said
15 first link arm (28) and said second link arm (38) is formed by a yoke (40) provided on one of said link arms (38), which surrounds a thinner yoke (32) provided on the other of said link arms (28), said cam wheel being surrounded by said thinner yoke (32) and being rotatable on a pivot (34) ex-
20 tending through said yokes (32, 36).

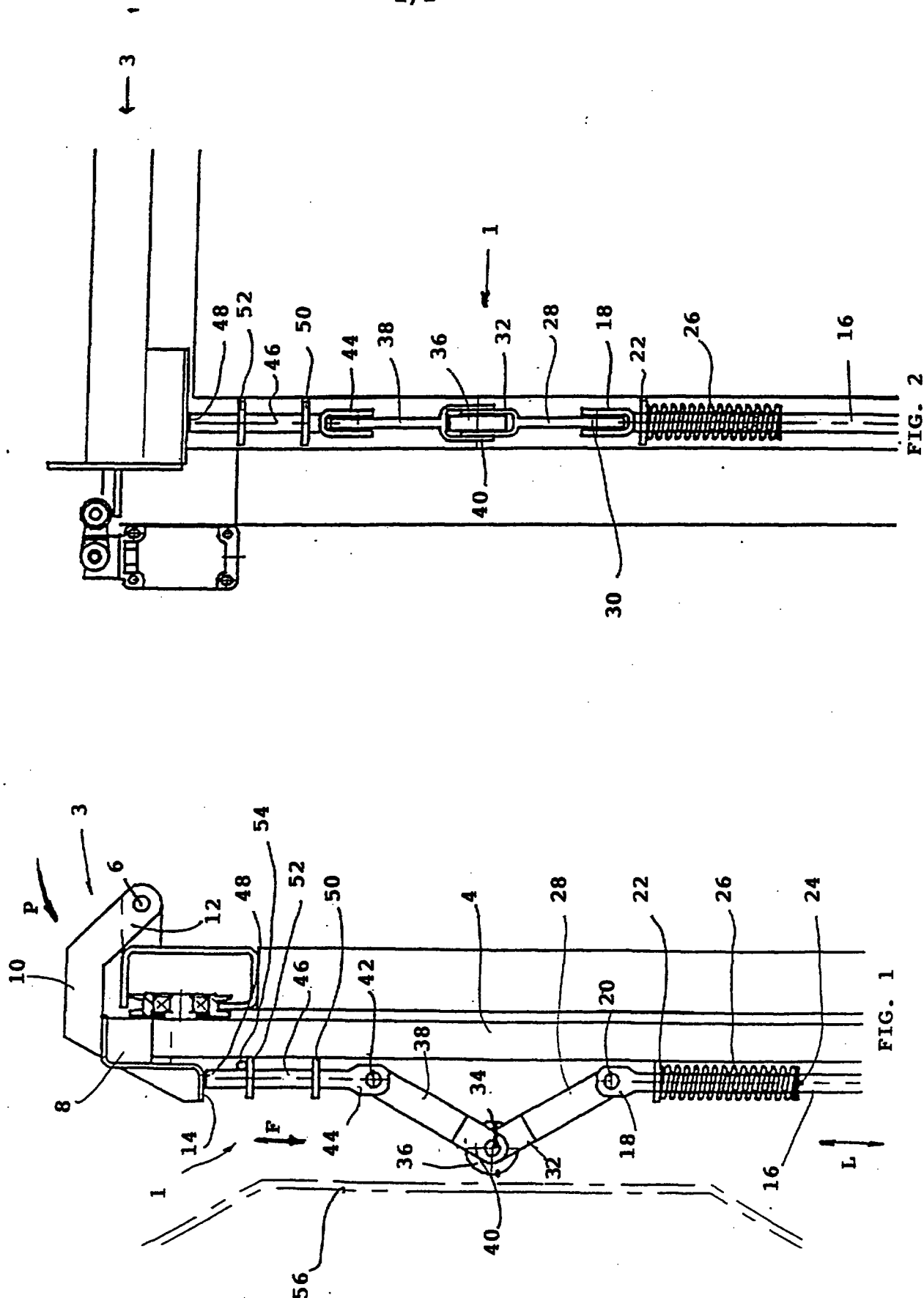
8. An actuating mechanism in accordance with any of claims 1-7, characterized in that said cam (56) is associated with a hoist cage and said cam follower (36) is disposed at a landing.



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CLAIMS

1. An actuating mechanism for a catch (3) of a door of a hoist cage or of a landing, having a manually displaceable operating member (16), a vertically displaceable actuating member (46) connected to said operating member (16) by a coupling mechanism (20, 28, 34, 38, 42), and disposed to release said catch, thereby permitting the door (4) to be opened, when a hoist cage is at a landing, said coupling mechanism comprising a cam follower (36), which is engageable with a cam (56), normally spaced transversely to the vertical direction and disengaged from the cam follower (36), by displacing the operating member in a release direction, when the hoist cage is at a landing, the cam (56) and the follower (36) then being located in front of each other, thereby bringing the cam follower (36) into engagement with the cam (56) and blocking the coupling mechanism as a result in such a manner that further movement in the release direction of the operating member (16) will be transferred to the actuating member via the blocked coupling mechanism, whereas no movement of the operating member (16) will be transferred to the actuating member (46), when the cam follower (36) is out of engagement with the cam (56), **characterized in** that the operating member (16) and the actuating member are generally vertically aligned and connected to each other by a toggle joint mechanism (20, 28, 34, 38, 42), comprising a first link arm (28), which at one end via a first pivot (20) is connected to said operating member (16) and which at the other end via a second pivot (34) is connected to a first end of a second link arm (38), the other end of which being pivotably connected to said actuating member (46) via a third pivot (42) and in that the cam follower (36) is located at the second pivot (34).

2. An actuating mechanism in accordance with claim 1, **characterized in** that said cam follower is a cam wheel (36), rotatably supported by said second pivot (34), which connects said first link arm (28) and said second link arm (38) to each other, said cam wheel (36) extending outside said link arms (28, 38) in the vicinity of said pivot (34).

3. An actuating mechanism in accordance with any of claim

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1 or 2, **characterized in** that said toggle joint mechanism is angled towards said cam (56) in such a manner that said cam follower (36) is the element, which is closest to said cam (56).

5 4. An actuating mechanism in accordance with any of claims 1-3, **characterized in** that at least one of the pivot connections between said operating member (16) and said first link arm (28) and between said actuating member (46) and said second link arm (38) is a yoke (18, 44), provided on one of
10 the link members and which surrounds one end of the other link member, a pivot (20, 42) being inserted through both of said cooperating link members (18, 28;38, 44).

 5. An actuating mechanism in accordance with claim 2, **characterized in** that the connection between said first link
15 arm (28) and said second link arm (38) is formed by a yoke (40) provided on one of said link arms (38), which surrounds a thinner yoke (32) provided on the other of said link arms (28), said cam wheel being surrounded by said thinner yoke (32) and being rotatable on a pivot (34) extending through
20 said yokes (32, 36).

 6. An actuating mechanism in accordance with any of claims 1-5, **characterized in** that said cam (56) is associated with a hoist cage and said cam follower (36) is disposed at a landing.

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(57) Abstract

An actuating mechanism for a catch (3) of a hoist door (4) comprises a vertically displaceable operating member (16), which is associated with a vertically displaceable actuating member (46), by means of which the catch (3) may be released. A coupling mechanism is provided between the actuating member (46) and the operating member (16) and has a cam follower (36), which in engagement with a cam (56) locks the coupling mechanism in such a manner that a displacement of the operating member will be transferred to the actuating member (46) for the release of the door catch (3). When the cam (56) is absent no movement will be transferred to the actuating member (46). The cam (56) and the cam follower (36) are provided on a hoist cage at a landing, respectively, or vice versa, so that the door catch (3) may be released, only when the hoist cage is at a landing. The coupling mechanism is a toggle joint mechanism, having two pivotably connected link arms (28, 38), the cam follower (36) being associated with the common pivot (34) of the link arms (28, 38). The opposite ends of the link arms (28, 38) are connected to the operating member (16) and the actuating member (46), respectively.

