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A METHOD OF CONCEALING EXPOSED DOOR CLOSERS**DESCRIPTION**5 **1. Background of invention****1.1 Field of the Invention**

10 The present invention relates to the method of installing exposed door closers which are normally mounted at or near the door head, on the surface of the door or its frame (transom) so that the door closer and the closer arms may be completely hidden from view.

15 **1.2 Brief Description of Prior Art**

A door closer typically consists of a closer device and 2 closer arms.

Traditionally there are 2 types of door closer:

20 1. The exposed type where the closer device and the closer arms are exposed to view.

25 2. The concealed type where the closer device is mortised into the door at the head and closer arms are tucked between the closer device and the door head.

2. Summary of the invention

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The present invention gives the exposed door closer the advantage of concealment and allow the door closing speed controls to be access without having to remove the closer device.

5 This invention also modifies existing models of door closers, brackets, door frames to mount an ordinary door closer in such a manner so that no parts may be visible when the door is closed.

2.1 Construction of the rebate

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Most exposed closer devices have mounting screw holes on the side. As the slimmest of closer devices is around 39-40mm, mounting them in timber doors panels of 45mm would not be suitable as there would be hardly enough space (only 5 to 6mm) for the installation of the brackets. This will seriously affect the performance of fire doors and acoustics doors.

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As such, it is recommended that if this method of installation described in this invention is to be used in respect of 39-40mm thick exposed door closers, it should be applied to metal doors or thicker timber doors.

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For door closers to be mounted on the frame (transom), a hole is mortised or stamped out of the center of the frame. (See FIGS 1A and 1B)

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The hole should be large enough to accommodate the exposed closer device when installed with the spindles pointing in a vertical position.

The hole is then covered by an add-on rebate so that the overall frame profile matches that of a normal door frame.

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Most closer arms are thick and take up a lot of space. This is because of the need to install an adjustable screw action arm.

5 When concealing the closer arms, the rebate will have to be thicker in order to conceal both closer arms.

For architectural/ aesthetic purposes, the rebate need not be of uniform thickness – i.e. the standard 15-25mm rebate for the hinge and lock side with a thicker rebate at the top, say 35-40mm. The width of the doorway remains unaffected which is
10 important for the purpose of satisfying fire safety standards. A door frame with a slightly thicker rebate at the head only (10-15mm more) would not be too obvious (see FIG. 2) as they are usually at a height of 2,100mm.

In the event the same rebate thickness is required on all sides of the frame, the
15 closer arms can be changed to a flat metal bar of 3-5mm thickness. This would give an overall thickness of 10-11mm. This can then be concealed in a thinner rebate 20-25mm. (see FIG. 3)

Where the door closer has only one arm where it slides along a track, the closer
20 device can be mounted into the door frame or door with the arm sliding in the door or door frame respectively. The whole assembly can be in-line or off-set. (See FIG. 3A)

The regular 2-arm door closer has the mechanical advantage of the single arm door
25 closer in offering a stronger closing force. To overcome this deficiency in the one-arm system, the distance between the fixing point of the arm and the closer can be increased.

While most one-arm door closer uses the sliding mechanism to meet the new
30 European Standard for closers – EN1154 where the forces required are clearing

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stipulated, usually the usage of very strong piston spring or rack and pinion will be sufficient.

5 The rebate is to be routed to remove material so as to allow the closer arms to fold and be fully concealed in the cut-off in the rebate. The rebate can be butt to the frame head and fastened with nails/ screws, dowels etc.

10 Alternatively the rebate can be mounted with 'L' or other similar brackets located in the main frame and mechanically fixed from the side of the rebate that faces the closing door leaf. This conceals the screw/nail heads when the door is closed. (see FIGS. 1A and 1B for mounting in the timber frame and a metal frame respectively)

15 Most closer devices measure 45-75mm in height from spindle to spindle. When installed, the active spindle (bottom) is flushed or slightly recessed in the door frame. Since the door frame are only 25mm wide, the top of the closer will protrude by 40-50mm from the back of the frame.

20 Building practices require 30-50mm clearance around the frame from the masonry/brick/ lintel in order to slide the frame into wall opening. For the door head, this clearance would be sufficient to accommodate the closer device without having to hack into the masonry/brick/lintel.

25 However, as frames are grouted on site, that is, the clearance would be filled with cement/sand/mortar, the protruding part of the closer device will have to be protected by boxing it up in a casing to prevent mortar/cement from coming into contact with it. This is a mortar box or mortar guard.

30 The closer device will then be mounted into the box and, screwed sideways to the side of the box for mechanical stability.

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For the purpose of protection against mortar, 0.8-1.5mm metal is more than sufficient for the box. However, for the side of the closer device on which the fixing holes are located, 1.5mm thick or more material is needed to hold the closer device firmly in place when it is exerting forces to close a 30-60kg door.
5 Alternatively a mortar box of 0.8mm material can be used and only the fixing hole positions reinforced with metal or threaded weld or plugs.

2.2 Modification of the closer device

10 Preferably the closer device should be modified to have the following features:-

- a) Mounting screws directions changed from horizontal to the vertical position.
(see FIG. 4A)
- 15 b) Door closing speed adjustment control to be relocated to easily accessible positions where the closer device does not need to be shifted or rebate opened to adjust speed. (see FIG. 4A2)

This can be done either by adding simple brackets or gears or modifying the design
20 of the closer device. (see FIG. 4B)

2.3 Brackets

Depending on the installation method, 2 types of brackets can be used:-

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- 1) Fixed bracket

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This is a simple and cheap method, where the bracket comes with flanges which are screwed directly to the door frame and covered by the add on rebate later.

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Alternatively, the length of the bracket can be increased to give access for inserting screws between the box and the closer device. The box can then be screwed to the inside at the hole mortised in the door frame. (see FIG. 4C), This will do away with the need for flanges. The box is screwed into position in the door frame and installed on site empty.

When installing the closer device, the box is unscrewed and removed from the door frame where the closer device can be inserted into the box and secured by screws to the box or bracket.

The box with the secured closer device mounted inside is then inserted into the main frame hole and screwed or fixed into position.

For a fixed bracket, when door closing speed adjustments are required, the box will have to be taken out of the frame as most exposed door closers are made with speed control adjustments accessible only from the sides.

Depending on the door closer model, suitable holes have to be drilled into the box so as to allow adjustment without having to remove the box from the closer device. If the screw adjustments are located in the protruding part of the box and have a likely hood of seeping cements/mortar into the box, plastic/rubber plugs can be used to block the holes. (see FIG. 5A)

2) Sliding bracket

In this case, the mortar box will have an additional bracket mounted within the box with long holes so as to allow the door close body to slide up/down and into /out of the box without having further unscrew the door closer from the box.

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5 The door closer is held in the concealed position by screws or twist/ slide tabs. These tabs are mounted on the door frame/ bracket and moved into position after the sliding the closer device up into the frame to keep the closer device from sliding out. Some examples of sliding bracket are shown on drawing. (see FIG. 5B)

10 The rebate can also be mounted to the slide bracket, to be slid open in one operation, instead of being removed separately. In this case the rebate acts as a stop when screwed to the main frame.

15 For easy adjustments it is preferable that the arm can be disconnected at the joint so that the door closer can slide out easily without having to unscrew it from the door or frame.

The arm is directly screwed to the face of the door, and will fold to be hidden in the rebate of the frame.

20 The closer arms are mounted in a "parallel arm" position, where the arms are parallel to the face of the door.

25 In order for the door to close properly, adequate space between the closer device and the door face is required. This is achieved by shifting the position of the closer device further from the door and covering it with a wider rebate or rebating the door panel at the top so as to mount the closer arm to the inside of the rebate and nearer to the door face away from the spindle. The distance may vary from 45mm up to as far as the door frame allows. (see FIG. 5C)

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Since doors are 45-50mm thick, the rebate on the door would leave less material at the top of the door to be screwed to and wood screws for the closer arm will go in the rebate so that both arms can fold into the cut-off in the door frame.

5 This problem is surmounted by placing another metal mounting bracket for the arm. The 'L' bracket uses wood screws for mounting to the door, and machine threads for the arm to bracket. This is because machine screws are shorter and carry more load than wood screws. (see FIG. 6B)

10 Depending on the size of the bracket and weight of the door, 1.5-3mm thick metal is sufficient for the purpose.

Alternatively the closer arms can be modified in the various ratios of both lengths so as to close the door properly or one of the closer arms can be mounted on the
15 top of the door, further away from the closer device.

In this case the arms will be flat metal bars that pivot at the top of the door through its fixing point which will be located nearer to the opening face. (see FIG. 6C)

20 To do this the relative position of the closer arms vis-avis one another must be reversed so that the door-mounted closer arm slides is above the device-mounted closer arm can operate within the permissible gap at the top of the door.

Regular closer arms are joined with the device-mounted closer arm below the
25 door-mounted closer arm. The reverse occurs when the closer device is mounted into the door frame.

For the closer arm which is mounted on the door, the arm has to be joined above the other arm. This is because the former is fixed to the top of the door and can
30 only operate parallel/ to the door frame. (see FIG. 6D)

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If it is situated in normal position the arm would be bent and unworkable.

5 When adjusting the closer arm, consideration must be also given to the position of the closer device as it can be shifted towards the hinge or away from to hinge to increase torque, turning moment, closing forces and also door opening angle.

For acoustic and fire rating purpose, suitable fire/ acoustic seals and rebate materials can be used to seal the top of the doors and the door frame.

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Special care must be taken since the door top may be rebated by the removal of material and thus weakening the door at the top. For doors with lower fire rating, the timber rebate with suitable intumescent seals will suffice (30 to 60 minutes), but for those with long periods of fire rating, the rebate recommended is to be made of metal or non-combustible material like calcium silicate. (see FIG. 6A and 6B)

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For metal doors, the above is also applicable but due to the strength offered by 1-2mm thick metal sheet, instead of plywood, the closer device can alternatively be mounted in the door panel.

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In this case the brackets are with provisions to be fixed in the door panel instead and similar fixed or sliding brackets can be used.

25 For light doors, when the arm can be thinner, the closer device can be mounted with its spindle hidden in the door panel and the door side of the arm occupying the 3-4mm gap between the door and frame. If not the side of the door facing the rebate will have to be rebated or a recess cut so as to allow space for the arm to move without rubbing the top of the door or the frame. (see FIG. 6A)

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Where the closer device is mounted on the door, only a slot in the rebate is required for the concealment of the closer arm. An 'L' bracket can be used to screw/ weld/ fix to the main frame at the correct position for screwing/ attaching the closer arm to.

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To further increase the distance between the spindle and the end of the closer arm, the rebate can be increased in width and the 'L' bracket mounted further away from the door face or a slot made in the main frame where the suitable brackets are mounted with a bent arm first before attaching it to the main frame. (see FIG. 7)

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The rebate is made with a cut-off on the face of the door facing the rebate to conceal the arm and screwed to the main frame. (see FIG. 7A)

2.4 Modification of the door frame

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Instead of using brackets to secure the closer device to the door frame, the door frame can be modified to allow for mounting the closer device in the following manner:-

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1) Bolt through frame

The side screws are inserted through the frame with pre-drilled holes to insert the screws in the exposed part of the door frame.

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The closer device is thus bolted directly to the door frame.

The holes can then be filled with putty or covered by an architrave. (see FIG. 8)

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2) Split frame

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The frame is produced with the slot to house the closer device in such a manner that one part of the frame can be removed to reveal the slot and allow for the closer device to be screwed to the frame directly.

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If the speed adjustment controls are located at the side of the closer device, the length of the slot can be increased to allow space for the screw driver to adjust the speed.

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The split can be located behind the rebate and use the rebate to conceal the split/ joint.

To improve the stability of the removable part of the frame various fixing methods can be used; butt joined, rebated, with flanges/ brackets. (see FIG.

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CLAIMS

- 1) A removable rebate on the door frame (transom) constructed with recesses and cutouts in accordance with the description of the invention herein to accommodate and thus conceal the closer device and arm(s).
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- 2) The rebate, according to claim 1, accommodates the closer device and the closer arm(s) by securing the same with either fixed brackets or sliding brackets to the door frame or door head.
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- 3) The fixed bracket can also act as a mortar guard in the case of frame-mounted closers.
- 4) The rebate, according to claim 1, accommodates the closer device and the closer arm(s) by securing the same with either the bolt through frame or the split frame.
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- 5) A closer device with closing speed control valves controlled by relocating the access screws in such a position which permits access to the same without removing the closer device from its bracket.
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- 6) The closer device, according to claim 4, has repositioned holes for the purpose of bolting the same into the door frame or door head.
- 7) Closer arms with thickness of 3-5mm and secured in such a manner that allows the same to operate within the narrow space between the door head and the door frame.
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