

A METHOD OF CONCEALING EXPOSED DOOR CLOSERS

DESCRIPTION

1. Background of invention

1.1 Field of the Invention

5 1. **Background of 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 so that the door closer and the closer arms may be completely hidden from view.

1.2 Brief Description of Prior Art

15 A door closer typically consists of a closer device and two closer arms.

Traditionally there are two types of door closer:

- 20 1. The exposed type where the closer device and the closer arms are exposed to view.
2. The concealed type where the closer device is mortised into the door at the top and closer arms are tucked between the closer device and the door frame head.

2. Summary of the invention

25 Currently in the market the concealed type of closer device requires the door and the door frame to be worked in a factory before delivering it to site for installation. The present invention allows the door frame head to be worked in a factory before transporting them to site for installation.

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

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

5 The invention is a means of concealing exposed door closers comprising a recessed door frame head, and a recessed rebate removably attached to the door head whereby a door closer device is housed and concealed in the door frame head and closer arms are concealed in the rebate.

10 3. Brief Description of the Drawings

An example of this invention will now be described by reference to the following drawings.

FIG. 1 is a sectional view (left) of a timber door frame head and a rebate, and an exploded view (right) of an assembly of a timber door frame head, a closer device and a rebate.

15 FIG. 2 is a sectional view (left) of a metal door frame head and a rebate, and an exploded view (right) of an assembly of a metal door frame head, a closer device and a rebate.

FIG. 3 is a perspective view (left) of one possible type of closer arms and a sectional view (right) of the said closer arms.

FIG. 4 is a perspective view (left) of another possible type of closer arms and a sectional view (right) of the said closer arms.

20 FIG. 5 is a sectional view of the concealed door closer in the door frame head with a single closer arm where the closer arm is off-set away from the closer device.

FIG. 6 is a sectional view of the concealed door closer in the door frame head with a single closer arm where the closer arm is in line with the closer device using a sliding arm in a channel.

25 FIG. 7 is a perspective view of a mortar box or mortar guard in relation to the door frame head.

FIG. 8 is an exploded view of an assembly of a door frame head, a mortar box and closer device.

30 FIG. 9 is a sectional view of an assembled closer device within a mortar box within a door frame head.

FIG. 10 is a perspective view of a closer device where the mounting threads are placed in a vertical position.

FIG. 11 is a perspective view of where the door closing speed adjustment controls are located at the base of the rebate.

FIG. 12 is a sectional view of a closer device using gears to operate the speed controls.

5 FIG. 13 is a sectional view of a closer device using an allen key to operate the speed controls.

FIG. 14 is a perspective view of a mortar box with plastic/rubber plugs.

FIG. 15 is a perspective view of a type of sliding bracket.

FIG. 16 is a perspective view of another type of sliding bracket.

10 FIG. 17 is a perspective view of a door leaf with two possible types of metal mounting bracket to attach the closer arm.

FIG. 18 is a perspective view of a closer arm attached to the top of a door leaf.

FIG. 19 is a sectional view of relative position of closer arms when assembled.

FIG. 20 is a perspective view of a door closer assembled with a bent closer arm.

FIG. 21 is a perspective view of closer arm attached to a recess in the top of a door leaf.

15 FIG. 22 is a perspective view of a closer device directly bolted to a door frame head.

FIG. 23 is a perspective view of a door frame head formed by abutting split frames.

FIG. 24 is a perspective view of a door frame head formed by interlocking rebated split frames.

20 FIG. 25 is a perspective view of a door frame head formed by abutting split frames conjoined by flange or bracket.

4. Description of the preferred embodiments

4.1 Construction of the door frame head and 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.

For door closers to be mounted on the frame (transom), a hole (2) is mortised or stamped out of the center of the door frame head (4).

5 The hole (2) should be large enough to accommodate the exposed closer device (6) when installed with the spindles (8) pointing in a vertical position.

The hole is then covered by an add-on rebate (10) so that the overall frame profile matches that of a normal door frame head (4).

10 The rebate (10) is to be routed to remove material to form a recess (12) so as to allow the closer arms (16) to fold and be fully concealed in the recess. The rebate is abutted to the door frame head (4) and fastened with nails/ screws, dowels etc.

15 Alternatively the rebate (10) can be mounted with 'L' or other similar brackets located in the door head frame head (4) and mechanically fixed from the side of the rebate that faces the closing door leaf. This conceals the screw/nail heads when the door (14) is closed. (See FIGS. 1 and 2 for mounting in a timber and a metal door head frame respectively)

20 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.

When concealing the closer arms (16), the rebate (10) will have to be thicker in order to conceal both closer arms.

25 For architectural/ aesthetic purposes, the rebate (10) 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 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 as they are usually at a height of 2,100mm.

30 In the event the same rebate thickness is required on all sides of the frame, the closer arms (16) 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 and 4)

Where the door closer has only one arm where it slides along a track, the closer device (6) can be mounted into the door frame head (4) or door with the closer arm (16) sliding in the door (14) or door frame head respectively. The whole assembly can be in-line or off-set.
5 (See FIG. 5 and 6)

The regular 2-arm door closer has the mechanical advantage of the single arm door closer in offering a stronger closing force. To overcome this deficiency in the one-arm system, the distance between the fixing point of the closer arm (16) and the closer device (6) can be
10 increased.

While most one-arm door closer uses the sliding mechanism to meet the new European Standard for closers – EN1154 where the forces required are clearly stipulated, usually the usage of very strong piston spring or a rack and pinion will be sufficient.

15 Most closer devices when installed, the active spindle (bottom) (8) is slightly recessed in the door frame head (4). Since the door frame head is only 25mm wide, the top of the closer device (6) will protrude by 40-50mm from the back of the door frame head.

20 Building practices require 30-50mm clearance around the frame from the masonry/ brick/ lintel in order to slide the door frame head (4) into wall opening. For the door frame head, this clearance would be sufficient to accommodate the closer device (6) without having to hack into the masonry/brick/lintel.

25 However, as door frames are grouted on site, that is, the clearance would be filled with cement/sand/mortar, the protruding part of the closer device (6) 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 (18). (See FIG. 7)

30 The closer device (6) will then be mounted into the mortar box (18) and, screwed sideways to the side (19) of the mortar box for mechanical stability. (FIGS. 8 and 9)

For the purpose of protection against mortar, 0.8-1.5mm metal is more than sufficient for the mortar box (18). However, for the side of the closer device (6) 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. 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.

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4.2 Modification of the closer device

Preferably the closer device (6) should be modified to have the following features:-

- 10 a) Mounting screws directions (20) changed from horizontal to the vertical position.
(See FIG. 10)
- b) Door closing speed adjustment control to be relocated to easily accessible positions
(22) where the closer device does not need to be shifted or rebate (10) opened to
15 adjust speed. (See FIG. 11)

This can be done either by adding simple brackets or gears or modifying the design of the closer device (6). By way of an example, FIG. 12 shows access to the speed controls by means of gears (23) and FIG. 13 shows access to the speed control by means of an allen key
20 (24).

4.3 Brackets

Depending on the installation method, two types of brackets can be used to mount the closer device (6) to a door frame head (4):-
25

- 1) Fixed bracket

This is a simple and cheap method, where a fixed bracket comes with flanges which are screwed directly to the door frame head (4) and covered by the add on rebate (10) later. The fixed bracket then serves as a mortar box as well (18).
30

Alternatively, the length of the fixed bracket (24) can be increased to give access for inserting screws between the mortar box (18) and the closer device (6). The mortar

box can then be screwed to the inside at the hole mortised in the door frame head (4). . This will do away with the need for flanges. The mortar box is screwed into position in the door frame head and installed on site empty.

5 When installing the closer device (6), the mortar box (18) is unscrewed and removed from the door frame head (4) where the closer device can be inserted into the mortar box and secured by screws to the mortar box or fixed bracket (24).

10 The mortar box (18) with the secured closer device (6) mounted inside is then inserted into the door frame head (4) through the hole (2) and screwed or fixed into position.

15 For a fixed bracket (24), when door closing speed adjustments are required, the mortar box (18) will have to be taken out of the door frame head (4) as most exposed door closers are made with speed control (22) adjustments accessible only from the sides.

20 Depending on the door closer model, suitable holes have to be drilled into the mortar box (18) so as to allow adjustment without having to remove the mortar box from the closer device (6). If the screw adjustments are located in the protruding part (36) of the box and have a likelihood of seeping cements/mortar into the mortar box, plastic/rubber plugs (26) can be used to block the holes. (See FIG. 14)

2) Sliding bracket

25 In this case, the mortar box (18) will have an additional bracket (28) mounted within the mortar box with long holes (30) so as to allow the closer device (6) to slide up/down and into /out of the mortar box without having further unscrew the door closer from the mortar box.

30 The closer device (6) is held in the concealed position by screws or twist/ slide tabs (32). These tabs are mounted on the door frame head (4)/bracket (28) and moved into position after the sliding the closer device up into the door frame head to keep the closer device from sliding out. Some examples of sliding brackets are shown on

drawing (See FIG. 15 for attachment to the rear of the closer device and FIG. 16 for attachment to the sides of the closer device).

5 The rebate (10) 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 door frame head (4).

10 For easy adjustments it is preferable that the closer arms (16) can be disconnected at the joint so that the closer device (6) can slide out easily without having to unscrew it from the door frame head (4).

 The closer arms (16) are directly screwed to the face of the door (14), and will fold to be hidden in the rebate (10) .

15 The closer arms (16) are mounted in a "parallel arm" position, where the closer arms are parallel to the door frame head (14).

20 In order for the door (14) to close properly, adequate space between the closer device (6) 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 (10) 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 (8). The distance may vary from 45mm up to as far as the door frame head (4) allows.

25 Since doors are 45-50mm thick, the rebate (10) on the door (14) 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 recess (12) in the door .

30 This problem is surmounted by placing another metal mounting bracket for the closer arm (16). The 'L' bracket uses wood screws for mounting to the door (14), and machine threads for the closer arm to the bracket. This is because machine screws are shorter and carry more load than wood screws. (See FIG. 17)

Depending on the size of the bracket and weight of the door (14), 1.5-3mm thick metal is sufficient for the purpose.

5 Alternatively the closer arms (16) 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 top of the door, further away from the closer device (6).

10 In this case the closer arms (16) will be flat metal bars that pivot (33) at the top of the door (14) through its fixing point which will be located nearer to the opening face. (See FIG. 18)

To do this the relative position of the closer arms (16) vis-avis one another must be reversed so that the door-mounted closer arm is above the device-mounted closer arm can operate within the permissible gap at the top of the door (14).

15 Regular closer arms (16) are joined with the device-mounted closer arm below the door-mounted closer arm. The reverse occurs when the closer device (6) is mounted into the door (14).

20 For the closer arm (16) which is mounted on the door (14), the closer arm has to be joined above the other arm. This is because the former is fixed to the top of the door and can only operate parallel/ to the door frame head (4). (see FIG. 19)

If it is situated in normal position the closer arm (16) would be bent and unworkable.

25 When adjusting the closer arm (16), consideration must be also given to the position of the closer device (6) 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.

30 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 head (4).

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.

5 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 (6) can alternatively be mounted in the door panel.

10 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.

For light doors, when the closer arm (16) can be thinner, the closer device (6) can be mounted with its spindle (8) hidden in the door panel and the door side of the closer arm occupying the 3-4mm gap between the door (14) and frame. If not the side of the door facing the rebate (10) will have to be rebated or a recess (12) cut so as to allow space for the closer arm to move without rubbing the top of the door or the door frame head (4).

20 Where the closer device (6) is mounted on the door (14), only a slot in the rebate (10) is required for the concealment of the closer arm (16). An 'L' bracket can be used to screw/ weld/ fix to the door frame head (4) at the correct position for screwing/ attaching the closer arm to.

25 To further increase the distance between the spindle (8) and the end of the closer arm (16), the rebate (10) can be increased in width and the 'L' bracket mounted further away from the door face or a slot made in the door frame head (4) where the suitable brackets are mounted with a bent arm first before attaching it to the door frame head. (see FIG. 20)

The rebate (10) is made with a recess (12) on the face of the door (14) facing the rebate to conceal the closer arm (16) and screwed to the door frame head (4). (see FIG. 21)

30 4.4 Modification of the door frame head

Instead of using brackets to secure the closer device (6) to the door frame head (4), the door frame head can be modified to allow for mounting the closer device in the following manner:-

1) Bolt through frame

5 The side screws are inserted through the frame with pre-drilled holes (34) to insert the screws is the exposed part of the door frame head (4).

The closer device (6) is thus bolted directly to the door frame head (4).

10 The holes (34) can then be filled with putty or covered by an architrave. (see FIG. 22)

2) Split frame

15 The frame is produced with the slot to house the closer device (6) in such a manner that one part of the door frame head (4) can be removed to reveal the slot and allow for the closer device to be screwed to the door frame head directly.

20 If the speed adjustment controls (22) are located at the side of the closer device (6), the length of the slot can be increased to allow space for the screw driver to adjust the speed.

The split can be located behind the rebate (10) and use the rebate to conceal the split/ joint.

25 To improve the stability of the removable part of the frame various fixing methods can be used; butt joined, rebated, with flanges/ brackets (38). (see FIG. 23, 24 and 25)

CLAIMS

1. A means of concealing exposed door closers comprising a recessed door head, and a recessed rebate removably attached to the door head whereby a door closer device is housed and concealed in the door head and closer arms are concealed in the rebate.
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2. A means of concealing exposed door closers according to claim 1 wherein the closer device is secured to the door head with fixed brackets.
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3. A means of concealing exposed door closers according to claim 1 wherein the closer device is secured to the door head with sliding brackets.
4. A means of concealing exposed door closers according to any of the preceding claims wherein the door head comprises a plurality of split frames which frames enclose a recess in which the door closer device is housed and concealed.
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5. A means of concealing exposed door closers according to any of the preceding claims wherein the door head comprises a bolt-through frame which the door closer device is housed and concealed.
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6. A means of concealing exposed door closers according to any of the preceding claims wherein a mortar box is mounted into the door head before the closer device is housed and concealed therein.
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7. A means of concealing exposed door closers according to claim 6 wherein the mortar box has apertures
8. A means of concealing exposed door closers substantially as hereinbefore described with reference to the accompanying drawings.
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