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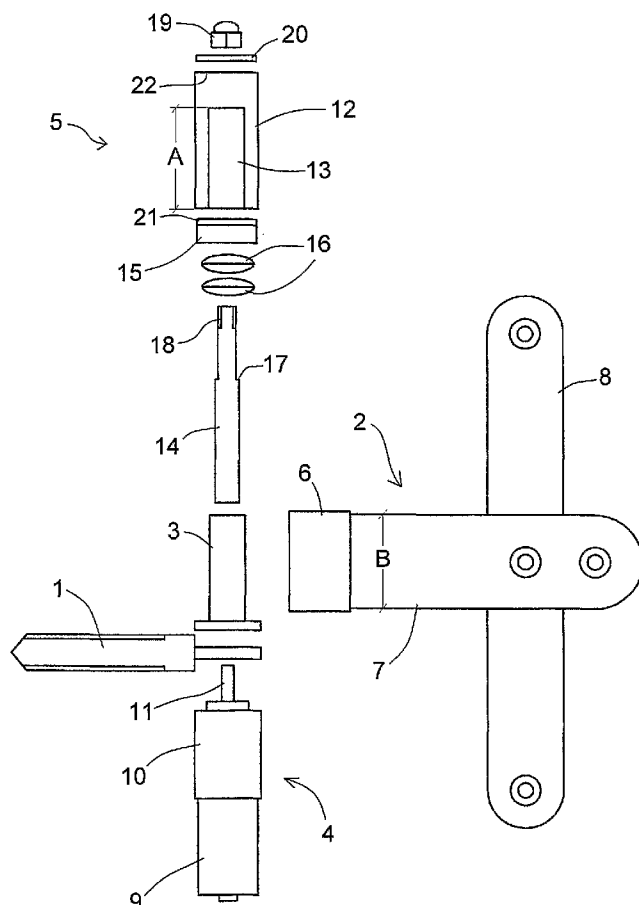
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(54) Title: UNIVERSAL MOTOR HINGE FOR DOOR LEAVES AND SHUTTERS



(57) Abstract: A motor hinge for shutters and the like, comprising a fixed wing (1) with a hinge pivot (3), a movable wing (2), a gearmotor (4) associated with the fixed wing (1) and a transmission system (5) between said gearmotor (4) and said movable wing (2), wherein there is provided a dragging cap (12) coaxial to said hinge pivot (3) of the fixed wing, mechanically connected to the gearmotor (4) and provided with a slot (13) fitting on a portion (7) of said movable wing (2).



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- *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*
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“Universal motor hinge for door leaves and shutters”

DESCRIPTION

The invention relates to a universal motor hinge for door leaves and shutters. More in detail, the invention relates to a device wherein a tubular motor-gear assembly is housed in the fixed wing of the hinge.

A prior art motor hinge of this kind is known from CH 533229, essentially disclosing a hinge having a rotating liner which is fixed to the door leaf by a rigid square, and is operated by a reduction gear inserted in the fixed part of the hinge. This is however a dedicated system, allowing no adaptation and yielding a relevant overall size, making it a feasible solution for large hinges only (e.g. main doors), but unsuitable to common door leaves or shutters and, above all, to fitting on existing door leaves. Further to this, no clutches or other safety devices are provided.

The technical problems can be summarized as follows: the hinge must fit to different types of door leaf; the connection with the leaf must not be a rigid fixture, but leave a certain play to compensate for settling and expansion due to heat and/or humidity, especially for wooden door leaves, and to verticality error; an anti-crushing function must be provided for preventing harm to people staying within the manoeuvring area of the moving door leaf; a guard for the mechanical reduction gear must be provided to prevent damage in the event that movement of the door leaf is impaired; it must always be possible to manually open or close the door leaves, when required.

In general terms, the known technique does not provide a motor hinge solving all the aforementioned problems in a satisfactory manner.

A first aim of the invention is thus to provide a universal motor hinge suitable to all kinds of door leaves and in particular to door leaves or shutters made of wood or aluminium.

Other aims are to make a hinge equipped with an anti-crushing safety device, a mechanical guard for the motor and a cut-out system to disengage the motor for manual opening and closing in an emergency situation, all above without incurring in a complex design; still a further aim is that the motor hinge can be fitted to existing door leaves or shutters, without having to remove or replace the original movable wing.

The objects are achieved with a motor hinge for shutters and the like, comprising a fixed wing with a hinge pivot, a movable wing that is rotatable on said hinge pivot, a gearmotor associated with the fixed wing, and a transmission system between said gearmotor and said movable wing, characterised by a dragging cap mounted coaxially on said hinge pivot of the fixed wing, mechanically connected to the gearmotor and provided with a slot for fitting on a portion of said movable wing.

According to a preferred constructional aspect, the dragging cap is formed by a hollow cylinder made of steel, having an open lower face to be coaxially mounted on the hinge pivot, and a close upper face with a central hole for coupling with the shaft of the reduction gear.

The slot is made on the side surface of the cylindrical cap, and said slot is substantially shaped as an upturned "U", thus having an open lower end to be inserted on the body of the movable wing and enable the fitting of said dragging cap.

According to further preferred aspects, the dragging cap is mechanically connected to the gearmotor by a clutch acting as anti-crushing safety device and mechanical guard of the reduction gear. The clutch is preferably made with a friction pad inserted between the dragging cap and a drive shaft that coaxially traverses the hinge pivot of the movable wing; more preferably, there is provided an adjustable spring system for pre-loading the clutch.

The dragging cap is fitted with a certain play onto the body of the movable wing; the axial locking of the entire mechanism occurs between the dragging cap and the drive shaft, but not directly on the movable wing. Small movements between the two wings are then allowed by the system, both on the rotation plane and in an axial vertical direction, for compensating expansions and for preventing the entire device from "getting stuck" in case the rotation axis is not perfectly vertical.

The motor is preferably a step motor and/or a brush motor, with a low voltage DC supply.

The invention is also proposed as an assembly kit applicable to the existing hinges of door leaves or doors. Owing to above-disclosed drive system, by means of the dragging cap fitted onto the movable wing, only the fixed wing has to be replaced, whilst the original

movable wing (already fixed to the door leaf) can be maintained.

The hinge is well suitable for automation of door leaves, shutters, doors and swing doors of substantially any type; it is adaptable in an almost universal manner; it is also a safe and reliable device owing to the clutch transmission and the low-voltage power supply.

The features and advantages will be clearer from the following detailed description of a preferred embodiment, with the help of the attached Fig. 1 that is an exploded view of the main components of a hinge according to the invention.

With reference to said figure, a motor hinge is shown that essentially comprises: a fixed wing 1; a movable wing 2, rotatable on a hinge bush 3 carried by said fixed wing 1; a gearmotor 4; a transmission system 5 between gearmotor 4 and movable wing 2.

The fixed wing 1 is normally fixed to the wall or abutment of the window. The movable wing 2, in the embodiment given as example, comprises essentially a cylindrical bush 6 and an arm 7 perpendicular to the rotation axis; said arm 7 supports two further arms 8 to be fixed to the door leaf with known means.

The gearmotor 4 comprises a motor 9 and a reduction gear 10 provided with an output shaft 11. The motor 9 is preferably a step motor, or a brush motor, with a low-voltage power supply. The reduction ratio of reduction gear 10, in a preferred embodiment, is 1 to 1996.

The bush 3 is fixed to the upper face of the reduction gear 10 by means of screws (not shown) or equivalent means.

The transmission system 5 is essentially based on a dragging cap 12, which is mounted coaxially on the bush 3 and connects the movable wing 2 to the gearmotor 4.

More in particular, the cap 12 is connected to a shaft 14 that is fixed to the shaft 11 of the reduction gear and traverses coaxially the bush 3; said cap 12 then couples with the movable wing 2 by means of a slot 13 that is open at the lower side, substantially in the form of an upturned U that is suitable for insertion on the arm 7 of the movable wing 2. The width of the slot 13 is greater than the thickness of the arm 7, so as to leave some clearance between the cap 12 and the wing 2.

The height of the slot 13 is greater than the height of the arm 7, to leave some axial sliding play between the bush 6 and the hinge bush 3, i.e. dimension "A" (see Fig. 1) is slightly greater than dimension "B".

Fig. 1 shows the cap 12 with the frontally visible slot 13; in practice, the actual mounting position of the cap 12 is rotated by 90 degrees with respect to the shown position.

The dragging cap 12 is substantially made from a hollow steel cylinder with an open lower base and a closed upper base 22 and is provided with a central hole (not illustrated) for fixing to the shaft 14.

The dragging shaft 14 is fixed to the shaft 11 by means of a screw, a key or another known connection.

The mechanical connection between the dragging cap 12 and the shaft 14 is preferably achieved by means of a clutch rather than a rigid connection. In the example, the clutch is made with a friction pad 15

and a pair of preloading Belleville washers 16. The shaft 14 has a narrowing that forms a stop collar 17 for supporting the preloading Belleville washers 16, and an upper threaded end 18, wherein a locking nut 19 is tightened, with a washer 20 resting on the upper face 22 of the cap 12.

Movement is transmitted between the shaft 14 and cap 12 by means of the pad 15, which has a metal body and an upper portion 21 in a friction material (lining). Transmission is substantially through friction between the portion 21 of the pad 15 and the internal surface of the face 22.

The axial force between the pad 15 and the cap 12 determines the maximum torque that can be transmitted without slipping, and is adjustable by acting on the locking nut 19. By loosening the nut 19 sufficiently, compression of the Belleville washers 16 is lowered down to null and the movable wing 2 is disengaged from reduction gear 4, for manual operation.

It should be observed that the coupling between the cap 12 and the movable wing 2 is not rigid, but leaves a certain freedom of movement of the two components. In an axial direction, this freedom is the result of the difference between dimensions A and B, together with the fact that the thrust of the Belleville washers 16 is discharged onto the collar 17 of the shaft 14 and onto the body of the member 12, but not directly onto the movable wing 2; on the plane of rotation, the play is the difference between the width of the slot 13 and the actual thickness of the arm 7.

The motor 9 can also be powered by a battery; for common applications, the hinge can have a 6 V supply.

The hinge is furthermore connected to a self-powered and remote-controlled master unit, with the following work cycle: a first pulse controls opening to the end of a preset time; a subsequent pulse actuates closing, always with a preset operating time, a pulse during the opening or closing manoeuvre stops the motor. The preset opening/closing time is slightly greater than time strictly required for the manoeuvre, so that there is a brief slipping of the clutch at the end of said manoeuvre: it is then assured that full open or close position is always reached.

The device can be associated with an electromagnetic bolt and a mechanical system for locking open or shut shutters, with the sole function of protecting against the wind.

The invention can furthermore be made available in the form of a kit for substituting the common hinges of door leaves, shutters, doors, etc. The kit comprises at least the fixed wing 1, to replace the existing fixed wing, the hinge pivot 3, the gearmotor 4 and the disclosed mechanical transmission system 5 comprising the dragging cap 12 and, if provided, the clutch unit. The disclosed mounting through fitting of the dragging member 12 on the movable wing 2 enables the original movable wing to be retained.

CLAIMS

1. Motor hinge for shutters and the like, comprising a fixed wing (1) with a hinge pivot (3), a movable wing (2) that is rotatable on said hinge pivot (3), a gearmotor (4) associated with the fixed wing (1), and a transmission system (5) between said gearmotor (4) and said movable wing (2), characterised by a dragging cap (12) mounted coaxially on said hinge pivot (3) of the fixed wing, mechanically connected to the gearmotor (4) and provided with a slot (13) fitting on a portion (7) of said movable wing (2).
2. Hinge according to claim 1, characterised in that the dragging cap (12) is formed by a hollow cylinder, closed at the top, with said slot (13) being obtained on the side surface and having substantially the shape of an upturned "U".
3. Hinge according to claim 1 or 2, characterised in that the height (A) of the slot (13) is greater than the height (B) of said portion (7) of the movable wing (2).
4. Hinge according to any preceding claim, characterised in that the width of the slot (13) is greater than the thickness of said portion (7) of the movable wing (2).
5. Hinge according to any preceding claim, characterised in that the transmission system (5) comprises a shaft (14) that is coaxial to the hinge pivot (3) and connected to the gearmotor (4), and the dragging cap (12) is connected to said shaft (14) by means of a clutch (15, 16).
6. Hinge according to claim 5, characterised in that said clutch

comprises a friction pad (15) resting between a stop collar (17) of the shaft (14) and a contact surface (22) of said dragging member (12).

7. Hinge according to claim 6, characterised in that the clutch comprises at least a preload spring (16) acting on said friction pad (15).
8. Hinge according to any preceding claim, characterised in that the reduction gear (4) comprises an electric step and/or brush motor (9) with low voltage supply.
9. Hinge according to any preceding claim, characterised in that it comprises a self-powered control unit with remote control.
10. Kit device for motorizing a hinge for door leaves or the like, comprising at least a fixed wing (1), intended for mounting on a wall or abutment and provided with a hinge pivot (3), a gearmotor (4) associable with said fixed wing (1), and a mechanical transmission system (5), comprising a dragging cap (12) mountable coaxially on said hinge pivot (3), that is mechanically associable with the gearmotor (4) and is provided with an axial slot (13) for fitting onto a portion (7) of a movable wing (2).

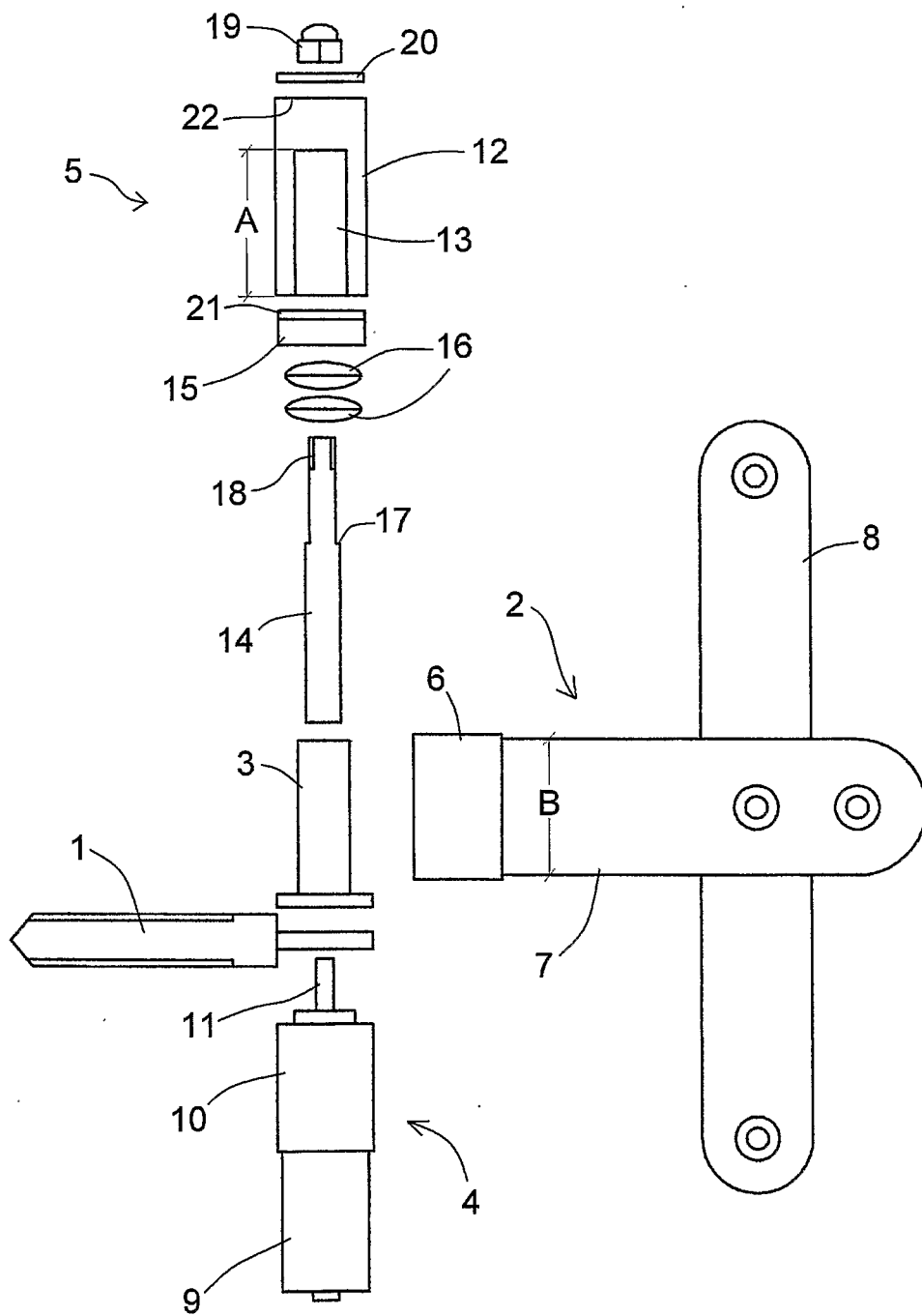


FIG. 1

INTERNATIONAL SEARCH REPORT

International application No
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A. CLASSIFICATION OF SUBJECT MATTER

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According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

E05F E05D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	FR 2 741 905 A (CARLO THIERRY DI [FR]) 6 June 1997 (1997-06-06) the whole document	1,2,4-10
A	CH 533 229 A (DUEBI AUTOMATIC AG [CH]) 31 January 1973 (1973-01-31) cited in the application the whole document	1-10
A	DE 103 41 999 A1 (EDSCHA AG [DE]) 14 April 2005 (2005-04-14) paragraph [0043] - paragraph [0044]; figures	1-10

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
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Patent document cited in search report		Publication date	Patent family member(s)	Publication date
FR 2741905	A	06-06-1997	NONE	
CH 533229	A	31-01-1973	NONE	
DE 10341999	A1	14-04-2005	NONE	