

"Hinge for an opening door or window frame"

5 The present invention relates to hinges for an
opening door or window frame, of the type comprising
one first and at least one second knuckle parts, each
provided with a leaf for fixing it to the movable frame
and to the fixed frame, respectively, of the door or
window; a pin which connects the first and second
10 knuckle parts together such that they can rotate; and
first and second means of adjustment between the first
and second knuckle parts parallel to and at right
angles to, respectively, the general plane of the door
or window.

15 Such hinges are currently used in a multitude
of applications, including those with relatively heavy
doors with frames consisting of metal sections. In this
as in other similar applications, the process of
adjusting the first and second knuckle parts of the
20 hinges of the door or window, in other words between
the movable frame and the fixed frame, must be able to
be carried out with the greatest possible precision in
order that when the door or window is closed, the
movable frame of the door or window sits precisely in
25 the fixed frame.

 The particular purpose of adjustment in a
direction at right angles to the general plane of the
door or window is to adjust the compression of the seal
with which one of the two frames is normally provided
30 in order to achieve the ideal amount of compression and
so ensure that external agents cannot enter.

 The function of adjustment in a direction
parallel to the general plane of the door or window,
however, is to adjust the gap between the movable and
35 fixed frames along their respective hinged uprights, in

order to compensate for any structural imperfections or errors of assembly when the door or window is installed.

5 A fundamental requirement of the abovementioned means of adjustment is that as far as possible they should be able to be operated easily and quickly. These objectives are not fully achieved in currently known solutions, particularly as regards the adjustment of the gap between the movable and fixed frames.

10 Document EP-A-0,467,122 in the name of Dr Hahn GmbH provides for the use of two eccentric sleeves inserted one inside the other in the cavity of one of the two knuckle parts, by means of which sleeves it is possible, after making an adjustment in one of the two
15 directions, to eliminate the error of adjustment thus introduced in the other direction.

This solution, besides requiring that the installer perform operations which are far from easy, has the effect of limiting the effects of the
20 adjustment of the door or window gap because the amount of adjustment possible in the plane parallel to the general plane of the door or window is small, or at any rate of fixed size.

A much more efficient solution from this point
25 of view has been proposed by the applicant in its own Italian utility model application No. TO97U000055, corresponding to international patent application No. WO 84/41720, according to which the first and second means of adjustment are independent of each other, the
30 first being functionally connected to the abovementioned first knuckle part and the second to the abovementioned second knuckle part of the hinge. The first means of adjustment according to this known solution involve an arrangement such that the pin is
35 inserted loosely into a cavity of elongate section in

the first knuckle part and can be moved in a diametrical direction within this cavity by means of one or more, advantageously a pair of, opposing set screws, either of which, or both simultaneously, can be
5 adjusted with an external driving tool.

Though much more practical and functional than the solution mentioned previously as regards the ease and speed with which the adjustment can be performed, this solution is nonetheless relatively costly.

10 From EP-A-0837206 a hinge for swingingly supporting a door leaf from a door frame is known, wherein the first means of adjustment include a cam integral with the pin of the hinge and engaged rotatably inside a cavity in the abovementioned first
15 knuckle part. The cam is formed by an eccentric section of the pin bearing a retainer resilient member having an indented edge designed to cooperate with corresponding indentations provided in the inner wall of the cavity of the first knuckle part.

20 By this arrangement adjustment is carried out in a stepwise and thus not in a continuous manner, and moreover stability of the adjusted position in the installed condition may be jeopardized owing to any plays or yielding or breakage of the retainer resilient
25 member.

The object of the present invention is to provide a hinge for an opening door or window frame of the type defined above, configured in such a way as to ensure the greatest possible simplicity, efficiency and
30 speed of adjustment of the movable frame with respect to the fixed frame, which hinge must be satisfactorily simple and inexpensive to produce and, especially as regards adjustment in a direction parallel to the general plane of the door or window, such as to ensure
35 the greatest possible stability when installed.

One particular object of the invention is to provide a hinge for an opening door or window frame of the type defined above that will enable simple adjustment in a direction parallel to the general plane
5 of the door or window directly on site, and without undesirable effects of any kind on the adjustment at right angles to the general plane of the door or window which can generally be carried out at a preliminary stage prior to the fitting to the door or window.

10 According to the invention this object is achieved by virtue of the features set forth in Claim 1.

Additional advantageous features of the invention are defined in Claims 2-8.

15 The invention will now be described in detail with reference to the accompanying drawings, which are provided purely by way of non-restrictive example and in which:

Figure 1 is a schematic front view of a hinge
20 for an opening door or window frame according to the invention,

Figure 2 is a plan view of Figure 1,

Figure 3 is a vertical section taken on III-III as marked in Figure 2,

25 Figure 4 is an exploded perspective view of the hinge,

Figure 5 is a partly exploded perspective view showing an example of how the gap in a door or window frame equipped with the hinge according to Figures 1 to
30 4 is adjusted,

Figures 6, 7 and 8 show three top-down plan views of Figure 1 in three different possible situations of adjustment of the frame gap,

Figure 9 is a view in horizontal section and on
35 a larger scale taken on IX-IX as marked in Figure 3,

corresponding to the adjustment situation shown in Figure 6,

Figure 10 is a view in horizontal section and on a larger scale taken on X-X as marked in Figure 3 in the adjustment condition shown in Figure 9,

Figures 11 and 12 are two views similar to Figure 9 in the adjustment conditions corresponding to Figure 7 and Figure 8, respectively,

Figure 13 is a perspective view of a variant of the hinge, and

Figure 14 is a view in longitudinal section through the hinge shown in Figure 13.

Referring initially to Figures 1 to 4, reference 1 is a general indication for a hinge according to the invention for opening door or window frames, particularly but not exclusively for heavy doors. It essentially comprises a first knuckle part 2 and a second knuckle part 3 arranged axially one above the other and connected rotatably by a pin having the general reference 4.

The first knuckle part 2 is produced in one part with a leaf 5 to enable it to be fastened, with screws 6 inserted through holes 7, to an upright of a movable frame F (Figures 5-8) of the door or window. Similarly the second knuckle part 3 is made in one piece with a leaf 8 so that it can be fastened, with screws 9 inserted through holes 10, to a corresponding upright of the fixed frame M (Figures 5-8) of the door or window.

The pin 4 has a lower part 11 which rotates, as explained later, in the second knuckle part 3. The upper part of the pin 4 consists, according to the invention, of a cam indicated generally by the number 12 and normally formed by a hollow body separate from the pin 4 and rigidly connected to the top of the lower

part 11 of the pin 4, e.g. by driving or equivalent systems.

The cam 12 is formed by two active profiles, namely an upper profile 12a and a lower profile 12b, separated by an intermediate grooved part 6. Below the active part 12b is an annular flange 53 external to the knuckle part 2.

Each of the two active parts 12a, 12b of the cam 12 has a particular and characteristic configuration illustrated in greater detail in Figures 9 and 10-12. This configuration, which is identical for both active profiles 12a, 12b, includes a first angular portion 14 and a second angular portion 15. These are on opposite sides of the axis of the pin 4 marked A, with which they are concentric, and both are of constant radius, a shorter radius in the case of the first angular portion 14 and a longer radius in the case of the second angular portion 15.

The first and second angular portions 14, 15 are connected by third and fourth angular portions 16, 17 of variable radius. Between the first angular portion 14 and the third angular portion 16 on the one hand, and the fourth angular portion 17 on the other, are two recesses 18, 19.

As can be seen in Figure 10, the profile of the intermediate grooved part 13 of the cam 12 is similar to that of the third and fourth angular portions 16, 17 of the active profiles 12a, 12b.

The cavity of the first knuckle part 2 into which the cam 12 is inserted also has a special and characteristic configuration, in such a way that it is functionally complementary to the configuration described earlier for the active profiles 12a, 12b of the cam 12. In particular, and still referring to Figure 9, this cavity, which has the general reference

20, possesses more or less flat first and second angular sections 21, 22 situated on opposite sides of the axis A of the pin 4 and separated from each other by a distance approximately equal to (in practice slightly greater than) the distance between the first and second angular portions 14, 15 of each active part 12a, 12b of the cam 12. The edges of the first section 21 join up with two angular sections 22, 23 whose constant radius is approximately equal to (in practice slightly greater than) that of the first angular portion 14 of the active parts 12a, 12b of the cam 12. The second section 22 joins up with two angular sections 24, 25 whose variable radius is slightly greater than the variable radius of the second and third angular portions 16, 17 of the active parts 12a, 12b of the cam 12. Between the angular sections of constant radius 22, 23 and the angular sections of variable radius 24, 25 are two inward projections 26, 27 complementary with the recesses 18, 19.

It should be noted that, with the special configuration illustrated in the drawings and described above, between each active part 12a, 12b of the cam 12 of the pin 4 and the cavity 20 of the first knuckle part 2 there are always, in any relative angular position, at least two and more conveniently four axial areas of mutual direct pressure or reaction contact arranged in pairs on diametrically opposite sides of the pin 4. The pair of areas B, C is contained in a diametrical plane at right angles to the general plane of the door or window, and the pair of areas D, E is contained in a diametrical plane parallel to the general plane of the door or window. This arrangement ensures efficient guiding and no looseness between the cam 12 and the knuckle part 2 regardless of how the device is adjusted.

In order to modify the relative angular position between the cam 12 and the cavity 20, this cam 12 is formed with a central hole 28 coaxial with the axis A of the pin 4, its shape being conveniently
5 hexagonal to take a hexagonal driving key of the hexagon socket wrench type, marked H in Figures 5 to 8.

Shown at 29 is a set screw, also conveniently with a hexagonal slot, screwed into a threaded hole 30 in the side of the first knuckle part 2. The inner end
10 of the screw 29 engages with the intermediate grooved part 13 of the cam 12 to prevent it, and therefore the pin 4, from rotating relative to the first knuckle part 2. Thus there is no need of providing an auxiliary resilient positioning member which might negatively
15 affect stability of the adjusted position in the installed condition owing for instance to any plays or yielding thereof.

With the arrangement described above, the hexagon socket wrench H can be used to carry out an
20 adjustment of the first knuckle part 2 relative to the second knuckle part 3 in a direction parallel to the plane of the door or window - in other words to adjust the gap L between the upright of the fixed frame M and the corresponding upright of the movable frame F. The
25 invention makes it possible to adjust this gap L independently from the other possible adjustment, which is the adjustment in a direction perpendicular to the general plane of the door or window, and without in any way influencing the latter adjustment. This is a direct
30 consequence of the fact that, because of the configuration described above, adjustment of the gap L occurs by virtue of a movement of translation only of the movable frame F relative to the fixed frame M in a direction parallel to the general plane of the door or
35 window.

Figures 6 and 9 show a neutral condition of intermediate adjustment between two extreme conditions illustrated in Figures 7, 11 and 8, 12 respectively. In this intermediate condition, which corresponds to a gap
5 in which L is e.g. of the order of 5 mm, the hexagon socket wrench H is at right angles to the general plane of the door or window: in this condition the cam 12 is central with respect to the cavity 20, with the contact areas B and C corresponding to the centre line of the
10 flat sections 21 and 22, respectively, and the contact areas D and E situated near the stop projections 26 and 27, respectively.

Turning the socket wrench H clockwise gives the extreme position shown in Figures 7 and 11, which
15 corresponds to the largest possible gap L e.g. of the order of 7 mm. The affect of this rotation, occupying an angle S of e.g. approximately 40° , is that the recess 19 is brought up against the stop projection 27. The contact areas B, C and D, E are maintained
20 throughout the rotation as far as the extreme position described above.

Turning the socket wrench H anticlockwise through the same angle S, however, results in the extreme position shown in Figures 8 and 12, in which
25 the recess 18 meets the stop projection 26. This reduces the gap L to about 3 mm, and the contact points B, C and D, E are again maintained throughout the rotation.

The socket wrench H, which advantageously also
30 serves as a pointer giving an immediate visual check of the degree of adjustment, may of course be stopped in any intermediate position between the two extreme positions described above, according to need: the range of adjustment is therefore conveniently variable in a

continuous manner between ± 2 mm from the central position shown in Figures 6 and 9.

Once the door or window is in the desired position the pin 4 is locked, as indicated, to be prevented from rotating relative to the first knuckle part 2, by screwing in the set screw 29 in the manner illustrated in Figure 10 with reference to the central position shown in Figure 9.

Adjustments between the first knuckle part 2 and the second knuckle part 3 in a direction perpendicular to the general plane of the door or window, in other words adjustment of the pressure between the movable frame F and the fixed frame M, is done in a manner known per se (described in the aforementioned Italian utility model application No. TO97U000055) by means of a sleeve 32 inserted in the cavity of the second knuckle part 3.

This sleeve 32, which is normally made of a self-lubricating plastic with a low coefficient of friction, contains an eccentric cylindrical cavity 33 in which the lower part 11 of the pin 4 is inserted and can rotate. The eccentricity of the cavity 30 with respect to the peripheral surface of the sleeve 32 may be for example of the order of 1 mm.

The sleeve 32 has at its upper end an annular flange 34 that sits on the upper edge of the second knuckle part 3, and externally one or more axial key-like projections 35 (of which there are advantageously three) designed to engage in a series of internal longitudinal splines 36 in the knuckle part 3.

During assembly the keys 35 are inserted into those splines 36 to which the desired degree of pressure between movable frame F and fixed frame M corresponds. Clearly, this setting, which is normally effected by the door or window manufacturer, can be

modified by the installer by placing the keys 35 of the sleeve 32 in the most suitable angular position.

5 The hinge 1 is completed by a threaded part 38 engaged in a tapped hole in the lower end of the second knuckle part 3 in order to vary the vertical position of the sleeve 32, and therefore the height of the pin 4.

10 Covers 39, 40 are fixed to the leaves 5 and 8 of knuckle 2, 3 to cover their respective fastening screws 6 and 9, and protective caps 41, 42 are fitted removably to the top of the first knuckle element 2 and to the base of the second knuckle element 3, respectively.

15 The invention is also applicable to hinges having not one but two knuckle parts that fix to the fixed frame M of the door or window. A variant of this kind is shown in Figures 13 and 14, in which parts identical or similar to those already described earlier are given the same numerical references. In this
20 variant the hinge, indicated as a whole by the number 1', includes another second knuckle part 43 with an integral leaf 44 for fixing, by means of holes 45, to the fixed frame M of the door or window, and an associated cover 46. Here the pin of the hinge 1' is
25 divided in two and includes a lower pin portion 47 engaged rotatably inside the sleeve 32 and an upper pin portion 48 engaged rotatably inside the eccentric cavity 49 of a sleeve 50 similar to the sleeve 32, but upside down compared to the latter, and inserted
30 adjustably - in exactly the same way as the sleeve 32 - in the cavity 51 of the knuckle part 43.

The two pin portions 47 and 48 are connected rigidly to the cam 12 which sits inside the cavity 20 of the first knuckle part 2: the shape of the cam 12
35 and that of the cavity 20 are exactly as described

earlier, and once again the cam 12 can be prevented from rotating relative to the knuckle part 2 by means of a set screw (not visible in Figures 13 and 14) identical to the set screw 23.

5 For the rotation of the cam 12 relative to the knuckle part 2, the upper end of the pin part 48 is formed with a hexagonal axial hole, similar to hole 28, in order to accept the hexagon socket wrench H through a passage 52 through the bush 50, after removal of the
10 cap 41.

 Here again the rotation of the cam 12 produces a movement of translation only of the knuckle parts 3 and 46 relative to the knuckle part 2, and hence of the movable frame F relative to the fixed frame M, parallel
15 to the general plane of the door or window. The adjusting of the gap between movable and fixed frames is therefore, with this embodiment also, completely independent of, and without influence on, the adjustment of the pressure between the movable and
20 fixed frames in a direction perpendicular to the general plane of the door or window, as carried out by moving the sleeves 32 and 50.

 Clearly, the details of construction and the embodiment can be greatly varied with respect to those
25 described and illustrated without thereby departing from the scope of the present invention as defined in the following claims.



CLAIMS

1. Hinge (1) for an opening door or window frame, comprising one first and at least one second knuckle parts (2, 3; 43), each provided with a leaf (5, 8; 44) for fixing it to the movable frame (F) and to the fixed frame (M), respectively, of the door or window, a pin (4) which connects the said first and second knuckle parts (2, 3; 43) together such that they can rotate, and first and second means of adjustment between the said first and second knuckle parts (2, 3; 43) parallel to and at right angles to, respectively, the general plane of the door or window, wherein the said first and second means of adjustment are independent of each other and the former are functionally connected to the said first knuckle part (2) and the latter to the said second knuckle part (3; 43) of the hinge (1), the said hinge being characterized in that:

- the first means of adjustment include a cam (12) integral with the pin (4) and engaged rotatably inside the cavity (20) of the said first knuckle part (2), the said cam (12) and the said cavity (20) having surfaces of mutual contact formed in such a way that rotation of the cam (12) causes a movement of relative translation only between the said first and second knuckle parts (2, 3; 43), and therefore of the said movable frame (F) relative to the said fixed frame (M), in the said direction parallel to the general plane of the door or window,

- retention means (29) controllable from the outside are provided to make the said cam (12) fixed in rotation with the said first knuckle part (2),

- there exist between the said cam (12) and the cavity (20) of the said first knuckle part (2), regardless of their relative angular position, at least



two axial areas (D, E) of mutual direct pressure contact located diametrically opposite each other relative to the pin (4).

5 2. Hinge according to Claim 1, characterized in
that there are four of the said areas of mutual
pressure contact (B, C; D, E) arranged in two
diametrical directions oriented, in the first case at
right angles to, and in the second case parallel to,
10 the general plane of the door or window.

3. Hinge according to claim 1, characterized in
that the said cam (12) comprises:

 - first and second angular portions (14, 15) of
15 constant radius on opposite sides of the axis (A) of
the pin (4), with which they are concentric, the first
angular portion (14) having a shorter radius and the
second angular portion (15) a longer radius, and third
and fourth angular portions (16, 17) of variable radius
20 that connect the said first and second angular portions
(14, 15) on opposite sides,

 and in that the said cavity (20) comprises:

 - more or less flat first and second angular
sections (21, 22) situated on opposite sides of the
25 axis (A) of the pin (4) and separated from each other
by a distance approximately equal to the distance
between the said first and second angular portions (14,
15) of the cam (12), the said first flat section (21)
being joined up with two angular sections (22, 23)
30 whose constant radius is approximately equal to that of
the said first angular portion (14) of the cam (12),
and the said second flat section (22) being joined up
with two angular sections (24, 25) whose variable
radius is slightly greater than the variable radius of



the said second and third angular portions (16, 17) of the cam (12).

4. Hinge according to Claim 3, characterized in that between the said angular sections of constant radius (22, 23) and the said angular sections of variable radius (24, 25) of the cavity (20) are two stops (26, 27) designed to engage with the first angular portion (14) of the cam (12) in order to limit its rotation with respect to the cavity (20) in either direction from a neutral central position.

5. Hinge according to Claim 1, characterized in that the said retention means comprise a threaded part (29) screwed into a capped hole (30) in the side of the said first knuckle part (2) in order to engage with a grooved part (13) of the said cam (12).

6. Hinge according to Claim 5, characterized in that the said grooved part (13) has a profile corresponding to that of the said third and of the said fourth angular portions of variable radius (16, 17) of the cam (12).

7. Hinge according to any one of the preceding claims, characterized in that the said cam (12) has an axial end seat (28) accessible from the exterior for the engagement of a drive member (H).

8. Hinge according to any one of the preceding claims, characterized in that the said second means of adjustment between the said first and second knuckle parts (2, 3; 43) include a sleeve (32; 50) inserted in the said second knuckle part (3; 43) and having an eccentric cylindrical cavity (53) in which the said pin



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(4) is inserted, the said sleeve (32; 50) and the said
knuckle part (3; 43) possessing means of mutual keying
(35, 36) to enable a fixed orientation of the sleeve
(32, 50) in a plurality of diverse relative angular
5 positions.