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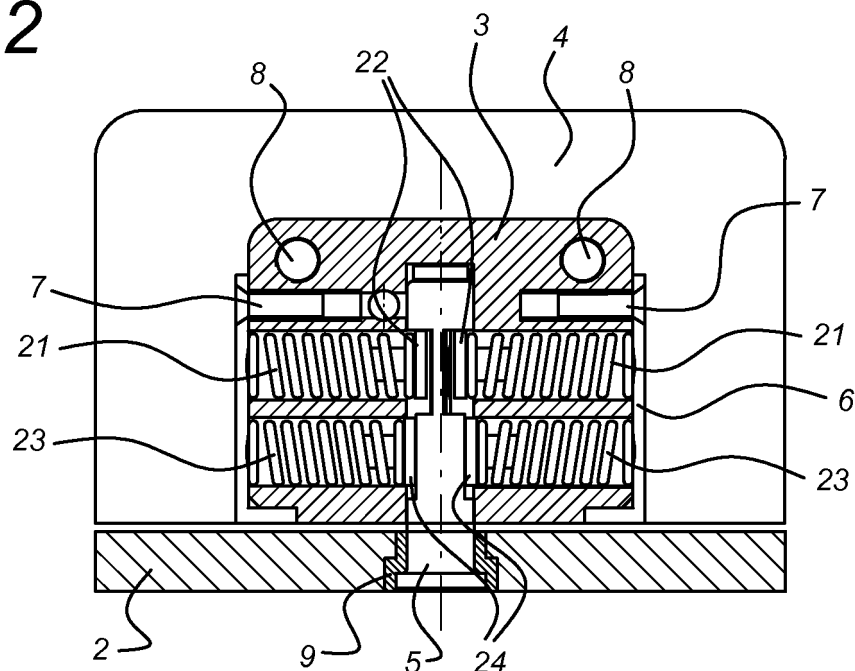
Remarks:

This application was filed on 16-11-2018 as a
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under INID code 62.

(54) **TANDEM DOOR HINGE**

(57) Door hinge for the food retail, with a self-closing
operating range between -5 and 80 degrees. The
self-closing torque over the 80 degrees operation
range is performed by two sets of springs. One set takes care
for the closing torque in the upper part of the range and

another set of springs takes care for the lower part of the
range. The hinge is provided with a mechanism to prevent
additional friction in case of misalignment between the
two hinges of one door.

Fig. 2**EP 3 461 977 A1**

Description

Field of the invention.

[0001] This invention concerns a door hinge which is used e.g. to self-close an acryl or glass door in a fully automatic way after it is manually opened. This hinge can be used in cool or refrigeration furniture in e.g. supermarkets, such as cooling cabinets for fresh and/or perishable products.

State of the art

[0002] There are several hinges known as e.g. described in European patent application EP-A-2 441 908 of the same applicant which are specially designed for this application.

Summary of the invention

[0003] The present invention seeks to provide an improved hinge for use with door panels, especially suited for cooling furniture, such as cabinets, in retail applications.

Short description of the drawings

[0004]

Fig. 1 shows a perspective view of a part of an embodiment of the hinge according to the present invention;
 Fig. 2 shows a cross sectional view of the hinge of Fig. 1;
 Fig. 3 shows a perspective view of a housing of the hinge embodiment of Fig. 1;
 Fig. 4 shows a perspective view of a cover plate for the embodiment of Fig. 1;
 Fig. 5a-c shows a top sectional view and two side views of a main hinge pin of a hinge embodiment;
 Fig. 6 shows a cross sectional view of a mounting plate and main hinge according to a further hinge embodiment;
 Fig. 7 shows a top view of a complete hinge according to an embodiment of the present invention; and
 Fig. 8 shows a graph of the closing torque versus the closing angle of an embodiment of the hinge according to the present invention.

Detailed description of the hinge embodiments

[0005] This invention attempts to have a better solution for self-closing of doors e.g. as used in cooling furniture such as cooling cabinets in supermarkets after that they are opened by customers to take out a product. The hinge is improved in such a way that the internal force which will close the door, the so called closing torque is divided across the full automatic closing range in such a way that

the closing torque is low in the fully open position and will slowly increase till the door is almost closed. This nice torque distribution is required to get a slow and nice automatic closing movement of the door from the fully open position of 80 degrees (in the cooling furniture) to the fully close position of zero degrees. This is achieved by using the so-called tandem principle where two pairs of springs cooperate to get the required closing torque for the full operation range of zero to 85 degrees. Existing hinges designed for this application have an automatic closing range from 40 degrees to -5 degrees. Note that to be sure that the doors will always be closed the hinge zero position is located on -5 degrees related to the door fully closed position.

[0006] The required nice torque distribution over the automatic closing range is achieved by using two sets of spring. One pair of springs works on the top section of the hinge main pin, the second pair of spring's works on the bottom section of the hinge main pin. The top section takes care for the range between 85 and 0 degrees and the bottom section takes care for additional torque in the range between 45 and zero degrees. The transition between the torque delivered by the upper and lower section is bump-less.

[0007] In other words, and with reference to the Figs. 1-8, a hinge for a panel door is provided in a first embodiment, wherein the hinge 1 comprises a mounting plate 2, two mutually connectable clamping parts 4, 4' for clamping the panel door in between them along an edge of the panel door, a main hinge pin 5 having a longitudinal axis and being attached to the mounting plate 2, and a hinge housing 3 comprising an aperture for accommodating the main hinge pin 5. The main hinge pin 5 comprises a primary part 15 with a primary flat surface 16 parallel to the longitudinal axis and a secondary part 10 with a first secondary flat surface 11 and a second secondary flat surface 12, both parallel to the longitudinal axis, the first secondary flat surface 11 being at a predetermined angle with respect to the second secondary flat surface 12. The hinge housing 3 further comprises a first set of pressure elements 21, 22 operatively cooperating with the primary flat surface 16 and a second set of pressure elements 23, 24 operatively co-operating with the first secondary flat surface 11 and the second secondary flat surface 12.

[0008] In an exemplary embodiment, the first set of pressure elements 23, 24 is operative in a closing range of at least 45 to 0 degrees of the hinge housing 3 with respect to the mounting plate 2, and the second set of pressure elements 21, 22 is operative in a closing range of at least 85 to 0 degrees of the hinge housing 3 with respect to the mounting plate 2.

[0009] In an even further embodiment, the second secondary flat surface 12 is parallel to the primary flat surface 16. The transition from the first secondary flat surface 11 to the second secondary flat surface 12 is sharp in a further embodiment to provide the bump-less operation in cooperation with the primary flat surface 16.

[0010] The outer edges of the first secondary flat surface 11 are rounded off to increase the closing range and also to get a smooth turnaround and extended lifetime.

[0011] The main hinge pin 5 is attached to the mounting plate 2 in a further embodiment such that the primary flat surface 16 and second secondary flat surface 12 are at a bias angle of at least -5 degrees with respect to a main longitudinal axis of the mounting plate 2.

[0012] Further embodiments of this invention attempt to have a solution for closing of the doors at a reproducible way by using a so-called misalignment correction mechanism. By existing hinges, the hinge main pin is fixedly connected to the hinge mounting plate. When there is any misalignment between the upper and lower hinge of the door, e.g. because the beams of the furniture are not aligned, the doors hinge will experience more friction in some parts of the operation range. As a result the closing speed and closing torque will be strongly dependant of this friction. By making the joint between the hinge base-plate and the hinge main pin more flexible, the door closing will become almost independent of the door alignment. The hinges as described here will always be used as a set, one left turning and one right turning hinge for closing of one door.

[0013] In more general terms, and with reference to Figs. 2, 5 and 6, hinge embodiments are provided, wherein the main hinge pin 5 is attached to the mounting plate 2 by means of an alignment correction component 9. In a further embodiment the alignment correction component 9 is a flexible attachment material around a bottom part 17 of the main hinge pin 5 in a chamber provided in the mounting plate 2.

[0014] The invention embodiments will be described in relation to the following drawings. Note that for some structural features other terms may be used, which are considered equivalent in view of the claims as attached and the reference numerals used therein.

[0015] Fig. 1 shows a simple drawing of a tandem hinge 1 without a cover plate 4' (see Fig. 4). The cover plate 4' is mounted with two screws in mounting holes 8 to the housing 3 (in this embodiment including an integrated cover plate 4) to clamp the door to the hinge 1 (see also Fig. 7). The figure also shows the mounting plate 2 which will be mounted to the top or bottom profile of the furniture/cabinet using mounting holes 2'. Note that also the two spring cover base trim plates 6 are visible that will keep the four springs in position using screws 7.

[0016] Fig. 2 gives a cross cut of the tandem hinge 1. It shows all the parts of the hinge 1: The hinge base housing 3 (with integrated cover plate 4); Four springs 21, 23 with four pressure pins 22, 24; Two spring cover base trim plates 6 with two screws 7; Hinge main pin 5; Mounting plate 2 with alignment correction component 9.

[0017] Fig. 3 shows the tandem base housing 3 (including one cover plate 4) without any other components, thus showing the apertures 24, 25 for the springs 21, 23, and the screw aperture 7' for the screw 7.

[0018] Fig. 4 shows the cover plate 4' which is normally

mounted to the base housing 3 to clamp the door to the hinge 1, using apertures 8' aligned with the mounting holes 8 of the housing 3 (see e.g. Fig. 3).

[0019] Fig. 5a-c show a drawing of the hinge main pin 5 from three different angles. The drawing clearly shows the top section 10 and bottom section 15 of the pin. The top section 10 takes care for closing in the upper region of the closing angle range. The bottom section 15 has two simple flat sides 16 and will deliver additional closing torque in the lower region of the closing angle range. The ring shaped part 17 at the bottom of the pin is in fact part of the alignment correction mechanism 9 in combination with the mounting plate 2.

[0020] Fig. 6 shows a drawing of the alignment correction mechanism 9 that is used to make mounting of the doors easier and take care that the door will turn smoothly despite of any alignment errors. The hinge main pin 5 is vulcanized to the mounting plate 2.

[0021] Fig. 7 shows the self-closing range of -5 to 80 degrees of the hinge 1. Note that the door can be moved further open by hand till the fully open position. This area is however not self-closing.

[0022] Fig. 8 shows a diagram for the self-closing torque of the hinge.

[0023] Note that the embodiments shown in the figures and described herein are fitted with double components for the force providing elements. It is conceivable that a hinge embodiment is provided wherein the force springs 21, 23, pressure pins 22, 24, primary flat surface 16, secondary flat surfaces 11, 12, etc. are provided on a single side of a hinge housing 3. By proper selection of materials, dimensions, a suitable closing force can also be generated.

[0024] The described invention is especially designed for application in cooling and refrigeration furniture, such as cooling cabinets, etc. This invention attempts to have a better solution for self-closing of doors, e.g. of cooling furniture in supermarkets after that they are opened by customers to take out a product. When the door is opened by a customer and left open after the product is taken out of the furniture, the door will close itself slowly. First the top section 10 will take care that the doors will be closed because the two top springs 21 together with the two top pressure pins 22 will first put power to the rounded edges of top section 10. The total force put on it will be about 400N. Because the main hinge pin 5 is mounted on the stationary part (mounting plate 2), the housing 3 will move and the door will be closed. The round edges will increase the maximum closing angle and will also take care for a smooth nice turnaround of the hinge 1. If the door closes, the force provided by the spring 21 will decrease, however the arm between the point where the pressure pin 22 touches the main hinge pin 5 and the centre of the main hinge pin 5 will increase resulting in an increased closing torque as can be seen in the diagram of figure 8. At about 15 degrees the second flat part 12 of the top section 10 will help further to close the door. The force provide by the upper part 10 however will not

be enough to fully close the door. For that reason the bottom section 15 will help in cooperation with the upper section 10 to close the door. The lower section 15 starts at 40 degrees opening of the door. At 40 degrees the two lower section springs 23 will together with the pressure pins 24 put a total force of about 600N on the flat edges 16 of the lower section 15 which will deliver an additional torque to close the door further. When further closing, the force provide by the upper section 10 will reduce and the force provide by the lower section 15 will increase because the distance from the point where the pressure pin 24 touches the hinge main hinge pin 5 will increase resulting in a maximum closing torque of 1.4 Nm at about 15 degrees. To be sure that the doors will always be closed the hinge zero position is located on -5 degrees related to the door fully closed position of the door. This nice torque distribution is required to get a slow and nice self-closing movement of the door from the fully open position of 80 degrees to the fully close position of zero degrees. The transition between the torque delivered by the upper and lower section is bump-less.

[0025] One further part of this invention embodiments is a way to prevent friction inside the hinge 1 because of misalignment between the upper and lower hinge 1 of a door. This unwanted friction can cause problems when closing the door, besides opening of the door al also easier if the friction inside the hinge 1 is reduced. By introducing this alignment correction component 9 as part of this invention the hinge 1 will always work at a reproducible way independent where it is mounted. The hinge main pin 5 is vulcanized to the hinge mounting plate 2 with a rubber compound 9. The flexibility of the compound 9 is chosen such that the pin 5 can turn 5 degrees in all directions but that it will not rotate because of the closing torque provided by the hinge 1 itself. The mounting plate 2 is provided with a chamber and the hinge main pin 5 is provided with a special round edge or lower part 17. The area between is vulcanized with a special rubber compound 9 as alignment correction component 9.

[0026] The hinges 1 as described here will be used as a set, one left turning and one right turning hinge for closing of one door. Each hinge 1 is provided with a cover plate 4' to clamp the door to the hinge 1.

Claims

1. Hinge for a panel door, comprising a mounting plate (2), and a main hinge pin (5) having a longitudinal axis and being attached to the mounting plate (2), wherein the main hinge pin (5) is attached to the mounting plate (2) by means of an alignment correction component (9).
2. Hinge according to claim 1, wherein the alignment correction component (9) is a flexible attachment material around a bottom part (17) of the main hinge pin (5) in a chamber provided in the mounting plate

(2).

3. Hinge according to claim 1 or 2, wherein the alignment correction component (9) comprises a rubber compound.
4. Hinge according to any one of claims 1-3, wherein the alignment correction component (9) is vulcanized.
5. Hinge according to any one of claims 1-4, wherein the hinge (1) further comprises two mutually connectable clamping parts (4, 4') for clamping the panel door in between them along an edge of the panel door, and a hinge housing (3) comprising an aperture for accommodating the main hinge pin (5), the main hinge pin (5) comprising a primary part (15) with a primary flat surface (16) parallel to the longitudinal axis and a secondary part (10) with a first secondary flat surface (11) and a second secondary flat surface (12), both parallel to the longitudinal axis, the first secondary flat surface (11) being at a predetermined angle with respect to the second secondary flat surface (12), the hinge housing (3) further comprising a first set of pressure elements (23, 24) operatively cooperating with the primary flat surface (16) and a second set of pressure elements (21, 22) operatively co-operating with the first secondary flat surface (11) and the second secondary flat surface (12).
6. Hinge according to claim 5, wherein the first set of pressure elements (23, 24) is operative in a closing range of at least 45 to 0 degrees of the hinge housing (3) with respect to the mounting plate (2), and the second set of pressure elements (21, 22) is operative in a closing range of at least 85 to 0 degrees of the hinge housing (3) with respect to the mounting plate (2).
7. Hinge according to claim 5 or 6, wherein the second secondary flat surface (12) is parallel to the primary flat surface (16).
8. Hinge according to any one of claims 5-7, wherein the transition from the first secondary flat surface (11) to the second secondary flat surface (12) is sharp.
9. Hinge according to any one of claims 5-8, wherein the main hinge pin (5) is attached to the mounting plate (2) such that the primary flat surface (16) and second secondary flat surface (12) are at a bias angle of at least -5 degrees with respect to a main longitudinal axis of the mounting plate (2).

Fig. 1

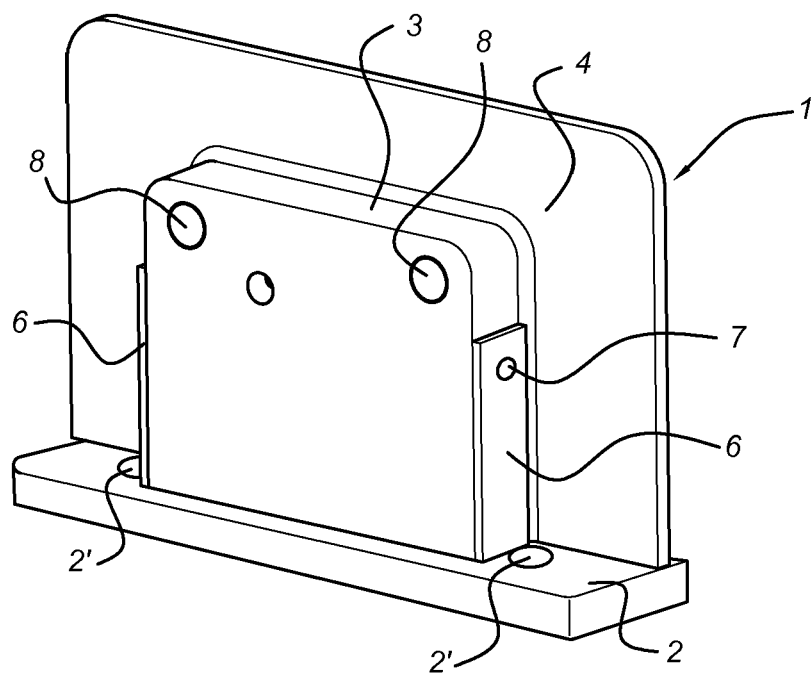


Fig. 2

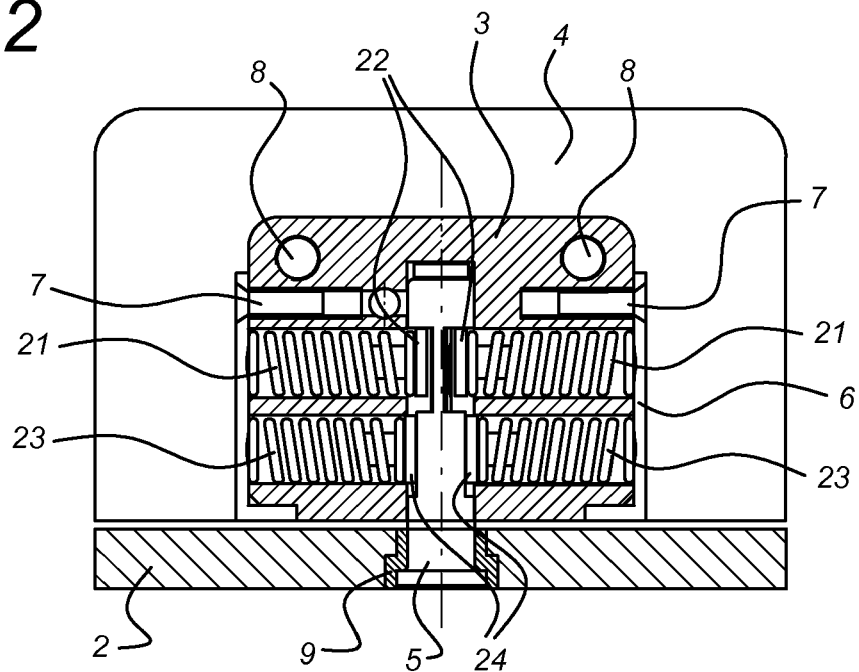


Fig. 3

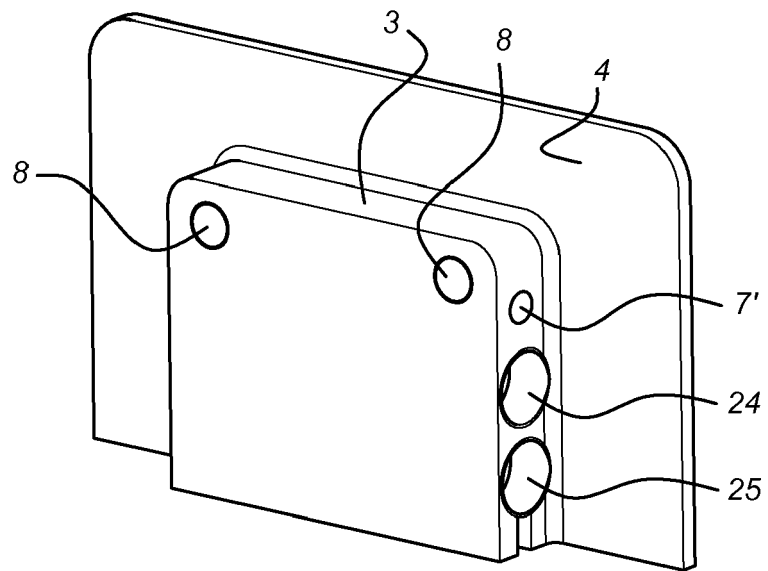


Fig. 4

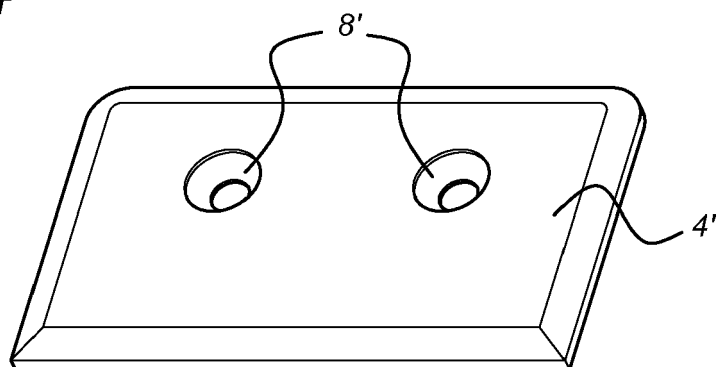


Fig. 5a

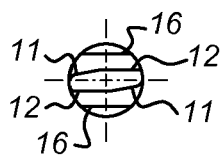


Fig. 5b

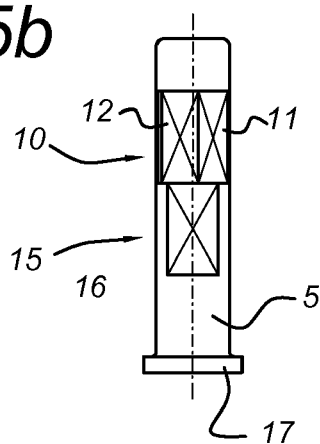


Fig. 5c

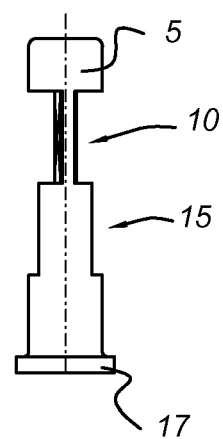


Fig. 6

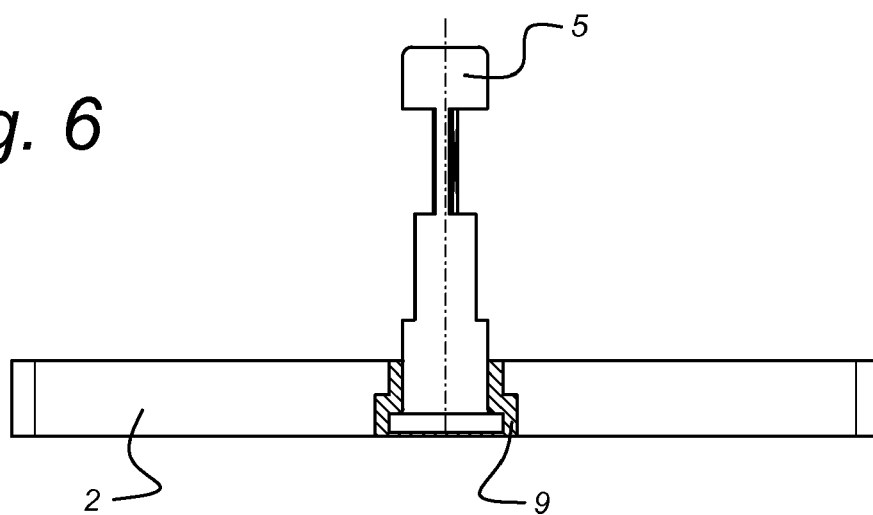


Fig. 7

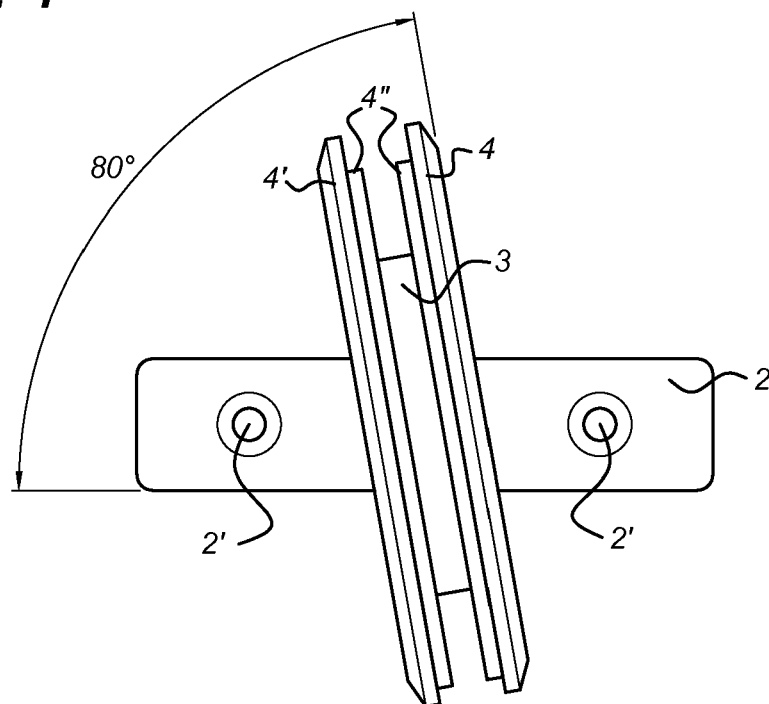
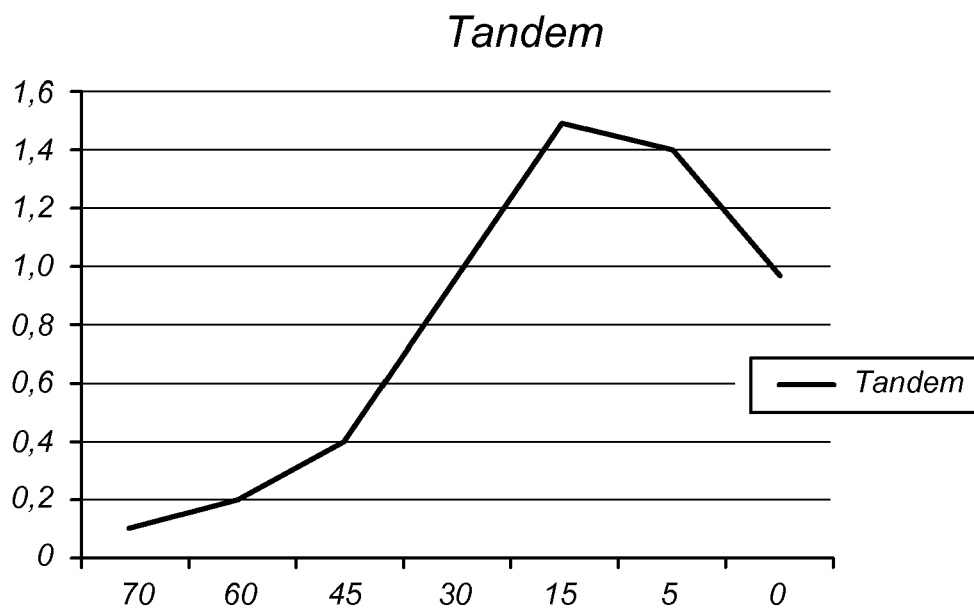


Fig. 8





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Application Number
EP 18 20 6711

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Y	* paragraph [0020] * * figure 1 *	4	
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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 15 February 2019	Examiner Prieto, Daniel
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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REFERENCES CITED IN THE DESCRIPTION

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