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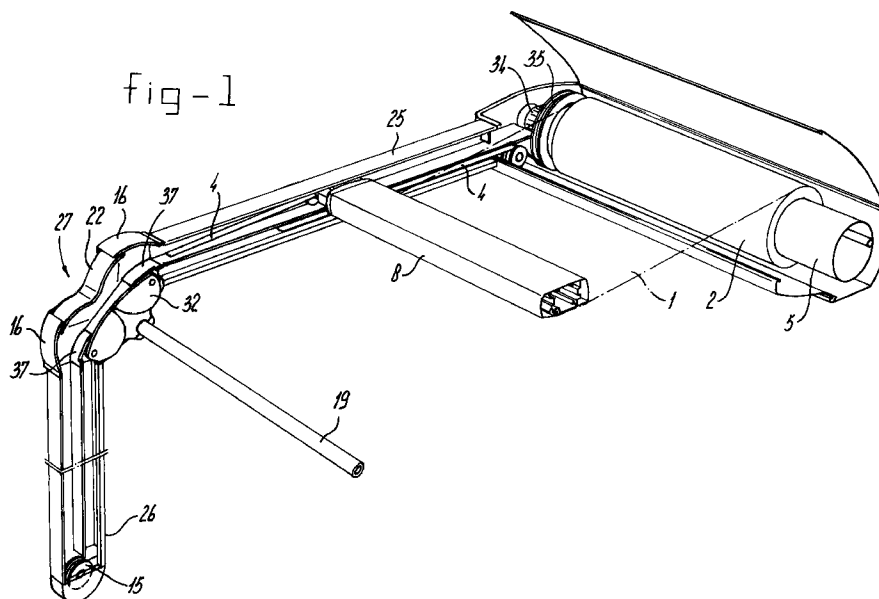
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(54) Screen structure

(57) Screen structure, comprising at least two guides (25,26) for accommodating between them an end member (8) to which a screen (1) is attached, which screen (1), at the other end, can be rolled up onto a drum (5). The guide comprises straight parts (25,26) and a hinge joint (27) which is arranged between them.

The hinge joint (27) comprises a central shell part and two adjoining side shell parts. These side shell parts execute a controlled movement with respect to the central shell part.



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Description

[0001] The present invention relates to a screen structure according to the preamble of Claim 1.

[0002] Such a screen structure is generally known and is shown, for example, in the European Application 0,608,720. In this document, the hinge part comprises a single part which, in the region of the ends, is provided with hinge openings for accommodating hinge pins which, on the other side, pivot in the straight parts of the screen structure. Although a structure of this nature is simple, it has the drawback that a considerable gap remains between the hinge and the adjoining straight parts in the bent position. It is impossible to avoid such gaps because, in many applications, the angle between the two straight parts differs considerably. Another significant drawback is that it is necessary, after the straight parts have been cut to length, to form the appropriate openings therein for accommodating the pins by means of which the hinge part is attached. The positioning of these openings requires very great precision owing to the guidance of the belt in front of the front strip or end member. A belt of this nature is required in order to ensure that the screen cloth is taut in every position. Moreover, it is necessary to produce a covering cap which is different for every angle.

[0003] European Application 0,609,487 shows an articulated hinge which is situated between two straight parts and comprises a large number of separate parts. A limited angular displacement is possible between each of these parts. At least six hinge parts of this nature are required in order to achieve an angle of 90°, making the corner joint expensive and increasing the radius of curvature.

[0004] Although this design does provide the protection between adjoining parts, the above-described problem of assembly difficulties is increased still further by the large number of hinge parts. Moreover, the number of hinge parts is varied as a function of the angle which is to be bridged so that the hinge parts, in the deployed position, are always positioned so as to bear tightly against one another (on the underside). This means that it is necessary to decide at the production site about how many so-called arc elements are required in order to bridge a specific angle, making the structure even more complicated.

[0005] The object of the present invention is to avoid the abovementioned drawbacks and to provide an improved screen structure.

[0006] This object is achieved, in the case of a screen structure as described above, by means of the characterizing features according to Claim 1. It is possible, in this case, for the outer protection of the central shell part to be designed so as to accommodate the side shells inside it, but also for the reverse to be true, in which case (one of) the side shell parts are provided with receiving parts in order to accommodate the central shell part inside them. The side shell parts according to

the invention may, via the central shell part, form an angle of at least 45° with respect to one another, and more particularly this angle is a maximum of approximately 90°, so that any angular position between 0° and 90° is possible. The connection, which is preferably mechanical, between the side shell parts ensures that the movement of the central shell part is always uniform. This ensures a uniform movement of the guides which lie opposite one another with respect to the screen, i.e. the front strip covers the same path on both sides, so that there is no possibility of it tilting and becoming jammed. This contrasts with the structure which is described in European Application 0,609,487, in which any angular displacements will take place in an uncontrolled manner, making it noticeably more difficult to assemble on site.

[0007] According to an advantageous embodiment of the invention, protective caps are present, so that the parts arranged inside the hinge part is always completely covered in any position between, for example, 0 and 90° of the hinge part. This means that the interior of the hinge part cannot be seen from the outside, and this interior is protected from external influences. The interior of the hinge part generally includes two receiving parts for the belt which connects the drum onto which the screen is wound and the end member. Moreover, it is necessary to provide a guide for the said end member inside the hinge part.

[0008] The mechanical connection between the two side shell parts may be realized either directly or via the central shell part. In the event of direct coupling, these side shell parts may, for example, each be provided with a set of teeth, the sets of teeth engaging in one another. It is also possible to use a lever system or other rod systems to connect the two side shell parts. After the insight of connecting the two side shell parts has been gained, the design of such connection is obvious to the person skilled in the art.

[0009] If there is a bend in the guide rails for a screen, it is necessary for the screen to be supported at the location of the bend, since otherwise the screen will "cut off" the bend. For this purpose, the prior art proposes support bars. According to a particularly expedient design of the invention, it is possible to attach a support bar of this nature to the central shell part of the hinge part according to the invention. It has been found that this causes the path of the cloth to essentially correspond to the path of the adjacent guide rails for the front strip or end member.

[0010] Since the effective diameter of the roll of cloth varies as a function of the length of screen which has been unwound and it is necessary to keep the screen taut between the roll and the end member, it is customary, in the prior art, to accommodate a spring structure in the end member, which spring structure, by way of the belt described above, maintains the tension on the screen.

[0011] It has been found that it is particularly difficult

to adjust this spring tension optimally. This is because this spring tension will generally have to be set on site after the various parts have been assembled, for which reason it will be understood that conditions are not optimum.

[0012] In general, it is desirable to achieve a cloth tension which is as high as possible in the open position, making the setting of the spring tension even more critical.

[0013] In the prior art, use is made of linear coil springs which cause the tension on the cloth to increase as the surface area of the cloth increases, i.e. as the screen is opened further. Gas springs are also used.

[0014] Since screens are supplied in many lengths and widths, it is important to use a spring system which is as short as possible, so that the minimum length of end member which can be supplied is as short as possible. On the other hand, a heavier spring (which is desirable in order to make the cloth more taut) requires a greater length.

[0015] Obviously, it is possible to arrange such spring systems not only in the end member but also at other positions. However, the end member is comparatively long and offers a considerable amount of space for accommodating a spring system. A spring system in the side guide would make the latter larger, which is undesirable for reasons of appearance. After the various guide rails have been fitted and the various components assembled, the spring is tensioned on site by the fitters according to certain prescribed rules. If errors are made in carrying out this work, the screen does not function, or functions insufficiently, and the screen structure may be damaged. For this reason, the setting is usually such that a broad margin is present. Consequently, only a limited part of the spring range is effectively utilized, leading to a spring system which is either longer or slacker than necessary, or both. Spring systems of this nature may be arranged in the guide, the end member or the holder for the roll of cloth.

[0016] The object of the present invention is to avoid this drawback. This object is achieved in the case of a screen structure as described above in that the compensating spring structure is designed in such a manner that when a first movement of that end of the spring structure which is connected to the belt is realized, at tensioning of the said belt the counterforce delivered by the said spring structure is comparatively low, and at a specific point (point of discontinuity) of the said extension of the said belt, the said counterforce immediately increases to a comparatively high level. When the screen is manufactured, all the variables are selected in such a manner that this point of discontinuity is also the optimum setting point for the screen in question. Obviously, as an alternative to a belt it is also possible to use a chain, cable or the like for connecting the roll of cloth to the end member. Moreover, it will be understood that the compensating spring structure described here can also be used in a screen without the hinge part

described above.

[0017] The structure described above makes it particularly simple for a fitter to tension the belt correctly on site, since there is a clear transition between the comparatively low spring force and the rapidly rising, higher spring force. The point of discontinuity is particularly easy for a fitter to determine, and the manufacturer merely prescribes the position where the end member is situated at the moment of tensioning.

[0018] Furthermore, if desired, it is possible to select a comparatively low tension during the first part of the path of the screen. The tension increases, bringing the cloth to the desired level of tautness, only from the desired moment.

[0019] A spring compensating structure of this kind is easy to realize with two springs, a comparatively light spring and a comparatively heavy spring. During the first part of the operation of unrolling the cloth, only the first, lighter spring is active, and during the second part the heavier spring comes into action. If desired, the spring characteristic may be made progressive. This choice is made by the producer by selecting the reel diameter, the cloth thickness, the belt thickness and the diameter of the roll of cloth. In all cases, the operations carried out by the fitter on site remain the same.

[0020] The invention will be explained in more detail below with reference to an exemplary embodiment which is illustrated in the drawings, in which:

Fig. 1 shows a perspective view, partly cut away, of part of a screen according to the invention which is provided with a hinge part according to the invention;

Fig. 2 shows a side view of a detail of the hinge part according to the invention;

Fig. 3 shows a perspective view of the compensating spring structure;

Fig. 4 shows a graph of the force curve of the compensating spring structure, in a first embodiment of the invention; and

Fig. 5 shows the curve of the tension of the screen when it is opened (extended).

[0021] Fig. 1 shows a screen structure comprising a screen (cloth) 1. This can be wound onto and unwound from a roll of cloth 2 arranged on a drum 5 which can be operated with the aid of a motor 34, which is only indicated diagrammatically. Screen 1 is tensioned between roll of cloth 2 and front strip or end member 8. At the sides, this front strip 8 is mounted in guide rails and comprises a closed, preferably extruded section. The drawing shows only one side of this structure. In the present exemplary embodiment, the guide comprises two straight guide rails 25 and 26 and a hinge joint 27 arranged between them. Front strip 8 can be moved through the guides arranged therein from a position where it lies substantially against roll of cloth 2 to as far as the free end of the straight guide part 26.

[0022] In order to tension the cloth optimally, a belt 4 is present which extends from drum 5, via reversing wheel 15, to front strip 8 and can be wound up onto and unwound from reel 35. In order to keep the tension of the screen at the desired level, the front strip 8 contains a compensating spring structure, details of which will emerge from Fig. 3.

[0023] Since it is often desirable to arrange one or more bends in the path of the screen in the unrolled position, a hinge part 27 is arranged between the two straight parts 25 and 26. This hinge part 27, details of which can be seen from Fig. 2, comprises two side shell parts 28 and 30 between which a central shell part 29 is arranged. It can also be seen from Fig. 2 that the side shell parts 28 and 30 are provided with projecting rims 16 which are curved in shape and, by interacting with the projecting part 22 of the central shell part, close off the space which is enclosed by the shell parts in any position. The space which is enclosed in the top part of Fig. 2 is to accommodate, on the one hand, the movement of the end of the front strip 8 and, on the other hand, the belt with which this strip is attached. The end of the front strip 8 may, for example, be designed as a carriage provided with wheels (cf. Fig. 3). The compartment lying at a lower level, which is denoted by 14, is used for the return guidance of belt 4. It can be seen from Fig. 2 that shell part 29 is provided with a receiving part 18 for accommodating an assembly bearing 40 for support bar 19, over which the screen is bent. The bottom compartment 14 is provided with a closure cover 32 which conceals the assembly bearing 40. Each of the side shell parts is provided with a projecting part 31 which can be accommodated in a correspondingly shaped chamber in the straight parts 25, 26.

[0024] The hinge part 27 is supplied as a ready-to-use structure. The user merely has to connect the straight parts 26 and 25 to one another by fitting the projecting parts 31 into the appropriate chambers in the straight parts 25 and 26. The side shell parts 28 and 30 are provided on the underside with projecting edges 21. These edges interact with the projecting edge 36 of the central shell part and ensure that the underside is completely covered in every position, i.e. the contents of the shell parts are not visible and are protected from the effects of weather. The side shell parts 28 and 30 are coupled with the aid of toothing 17. Via "low-position" hinges 20, the side shell parts 28 and 30 pivot about the central shell part 29. It has been found that a structure of this nature ensures that the angle between each side shell part 28 and 30, respectively, and the central shell part will always be the same for both side shell parts. Owing to the fact that both the arms which provide guidance for front strip 8 execute angular travel in the same way using the structure according to the invention, it is ensured that the angular path is uniform, so that the belt 4 which extends therein, as well as any carriages moving through the said angle, are able to pass through the bend in question with ease.

[0025] Projections 37 are present in order to provide optimum guidance for the returning part of belt 4. Corresponding projections 38, 39 are present in order to guide the incoming part of belt 4.

[0026] The above-described hinge part makes it simple to set any desired angular position. Any angle between 90 and 180° can be realized in a simple manner. By positioning a number of hinge parts in succession as described above, it is possible to realize any desired curvature for, for example, domes, halls and the like.

[0027] The interior of the spring-system holder, for example the front strip 8, will be described with reference to Fig. 3. A spring compensation device is situated in the section, which is preferably closed in order to prevent sagging, of the front strip 8. It is to be understood that a spring compensation device of this nature can also be used in any other screen structure, i.e. screen structures with only straight parts or with bends which are designed in some other way. The spring compensation device may also be located in side guides or a holding case.

[0028] Belt 4, the end of which is attached, at 40, to the front strip, is situated in front strip 8. Via a spring wheel 11, belt 4 runs towards the guide system for the screen. Spring wheel 11 is held in a prestressed state by springs 9 and 10 which are supported, at the other end, on front strip 8. Spring wheel 11 is guided in the section of front strip 8 and, by way of two flanges, engages around a thickened part of the section, so that the belt 4 is enclosed and cannot come off the wheel. It will be understood that the spring tension in the system is determined by fixing the length of the belt, i.e. the position of the belt which is attached at 40.

[0029] In the prior art, it was customary to use a linear coil spring for spring 9. In this case, it is necessary to adjust this spring in such a manner that the screen is under a certain tension under all conditions while, if the length of the belt decreases, the force exerted on the screen increases in linear fashion. Spring 10 is preferably a pneumatic spring. Since all the components are only assembled on site, it will be understood that this spring tension is also fixed on site. In practice it has been found that this involves considerable problems.

[0030] According to the invention, it is proposed to provide spring 9 with the characteristic shown in Fig. 4, i.e. during the first part of the compression this compression may be executed with a force which increases comparatively little. Then, the point of discontinuity is reached, after which the spring force increases very quickly, then returns to a gradual further rise. A combination of this nature can be achieved, for example, by using two springs 9, 10, namely a comparatively slack spring and a following comparatively strong spring. Other combinations, either special or tensioned springs, may also be conceived of by the person skilled in the art. Using a spring structure of this nature makes it possible for the fitter to tension the spring to the point of dis-

continuity at a location defined by the manufacturer. This point of discontinuity is easy to feel. If such tensioning work has been carried out correctly, given correct dimensioning of the remaining components, the result is the curve shown in Fig. 5 of the outwards movement of the screen, the so-called extension. Since the spring structure according to the present invention can be optimized, it is possible to accurately predetermine its length, so that in most applications it is possible to accommodate the spring structure in the front strip 8. The possibility, as indicated above, of locating the spring structure at different positions in the screen structure is not ruled out.

[0031] Moreover, it is pointed out with regard to Fig. 5 that this figure shows that during the first part of the opening path of the screen the tensioning force decreases and then increases. A characteristic of this nature is particularly desirable under certain circumstances. It will be understood that the tensioning characteristic of the screen cloth is dependent not only on the springs selected but also on the relationships between the roll diameter of the screen cloth and the roll diameter of the belt and the thickness of the belt and the thickness of the screen cloth.

[0032] It will be understood that the spring characteristic shown here may differ considerably from that which is shown in Fig. 4. The only essential feature is that up to a certain load the spring force is at a comparatively low level and then the spring force increases considerably more rapidly at a defined point or within a specific, comparatively narrow range, at which point or within which range the fitter is able to tension the screen. In the example shown, the pneumatic spring 10 is used to obtain the desired effect. This is because the coil spring is comparatively slack and will execute the first part of the movement, while the series-connected pneumatic spring becomes effective from the point of discontinuity.

[0033] By accurately matching the reel diameter of the roll of cloth and using a belt of the correct thickness and with an accurately predictable wind-up behaviour, it is possible to manufacture a screen structure which presents the desired progressive behaviour at any length and with the required cloth tension, combined with minimum installation dimensions for the spring system. The precondition is that the spring system be set with accuracy. By using a two-part spring system, it is merely necessary to pull the belt manually until it reaches the point of discontinuity and to fix it in position 40 in order to obtain the correct setting of the spring system. Moreover, it is possible to obtain a regressive character in the first part of the movement of the screen. Moreover, it is possible, owing to the presence of the comparatively slack spring, to compensate for any creep in the cloth and/or the belt. The invention makes it possible to select a second, heavier pneumatic spring with precisely the required travel so that the installation space is optimally exploited. The system according to the invention does not encounter any problems such as

breakage of the belt or overload of the motor. Further adjustment mechanisms are also unnecessary.

[0034] It should be understood that the invention is described above with reference to preferred embodiments. Modifications to these embodiments which lie within the scope of the appended claims will be obvious to the person skilled in the art.

Claims

1. Screen structure, comprising a screen (1) which can be rolled up onto a drum (5) and is provided, at the free end which is remote from the said drum, with an end member (8), said screen structure comprising two spaced guide rail for accommodating the said end member (8) between them, each guide rail comprising at least two straight parts (25, 26) and an articulated hinge part (27) which lies between them, characterized in that the hinge part (27) comprises a central shell part (29) provided with two spaced hinge points (20) each of which is attached to one side shell part (28, 30), each of which is to be connected to a straight part (25, 26), the total possible angular displacement of the two side shell parts with respect to one another being to at least 45°.
2. Screen structure according to Claim 1, in which the said side shell parts are mechanically connected with one another in order to bring about an essentially equal movement of each side shell part with respect to the said central part.
3. Screen structure according to one of the preceding claims, in which the said side shell parts each comprise protective caps (16, 21) which are designed so as to extend at least partially above the central part in the position of use.
4. Screen structure according to one of the preceding claims, in which the said central shell part comprises at least one protective cap (22, 36).
5. Screen structure according to one of the preceding claims, in which each of the side shell parts is provided with connecting means (31) for connection to the adjoining straight part (25, 26).
6. Screen structure according to one of the preceding claims, in which the central shell part is provided with an attachment (32) for accommodating a support roller (19).
7. Screen according to one of the preceding claims, comprising a support roller (19) which is enclosed, by means of a bearing bush (14), in a receiving part (18) of the central shell part (29) and is secured by a cover fitting (32).

8. Screen structure according to one of the preceding claims, comprising compensating spring structure which, on the one hand, is connected to a belt (4), which is connected to the said drum (5), and, on the other hand, is supported on part of the screen structure, said compensating spring structure being embodied in such that when a first movement of that end of the spring structure which is connected to the belt is realized, at tensioning of the said belt the counterforce delivered by the said spring structure is comparatively low, and at a specific point (point of discontinuity) of the said extension of the said belt, the said counterforce immediately increases to a comparatively high level.
9. Screen structure according to Claim 7, in which the belt (4) is guided, by the compensating spring system, over a wheel (11) which, by way of its two flanges, moves around two projections formed in the end member.
10. Screen structure according to Claim 8 or 9, in which the compensating spring system is arranged in the end member (8), which end member (8) comprises a closed section.
11. Hinge part as set forth in one of the preceding claims for use in a screen structure.

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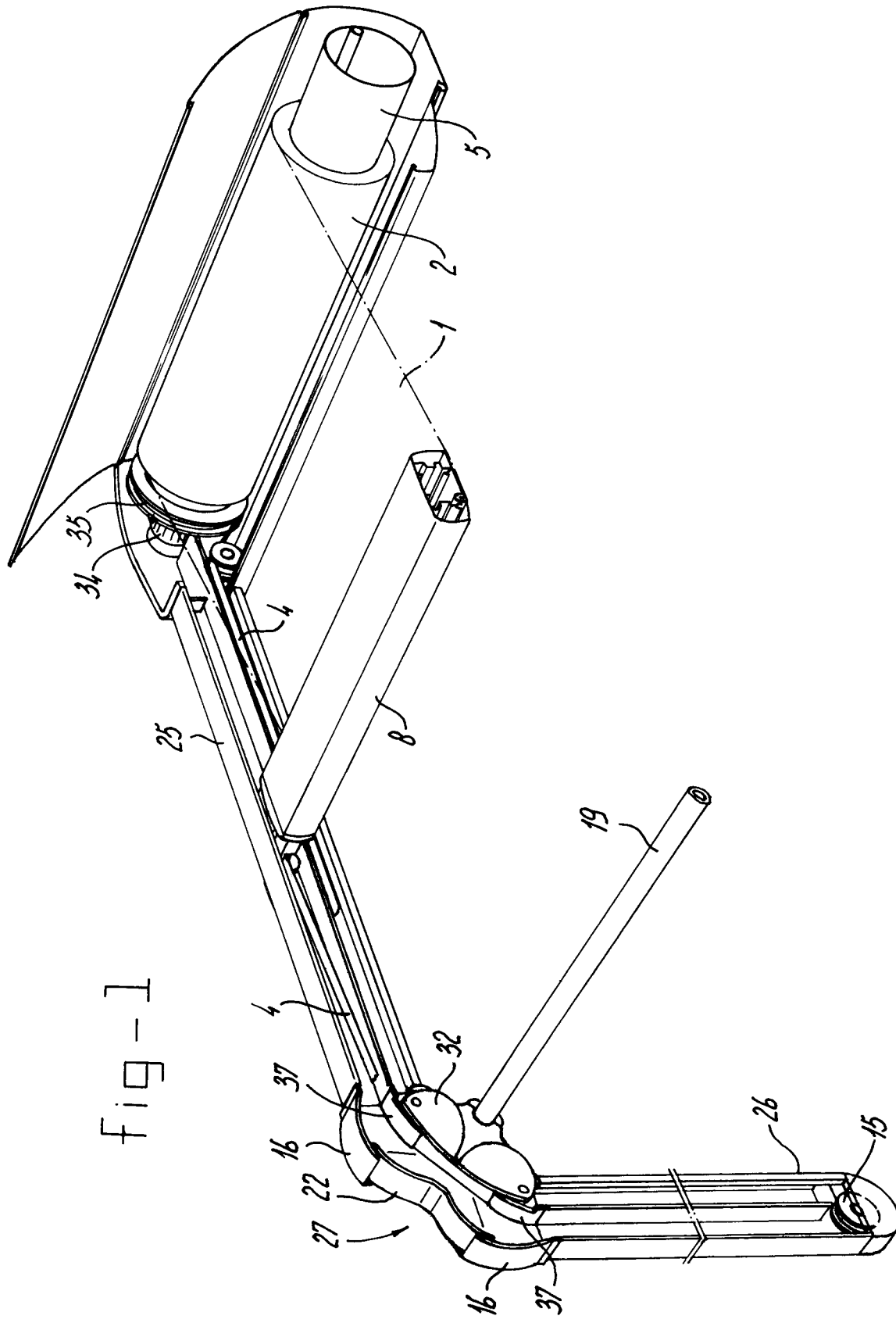
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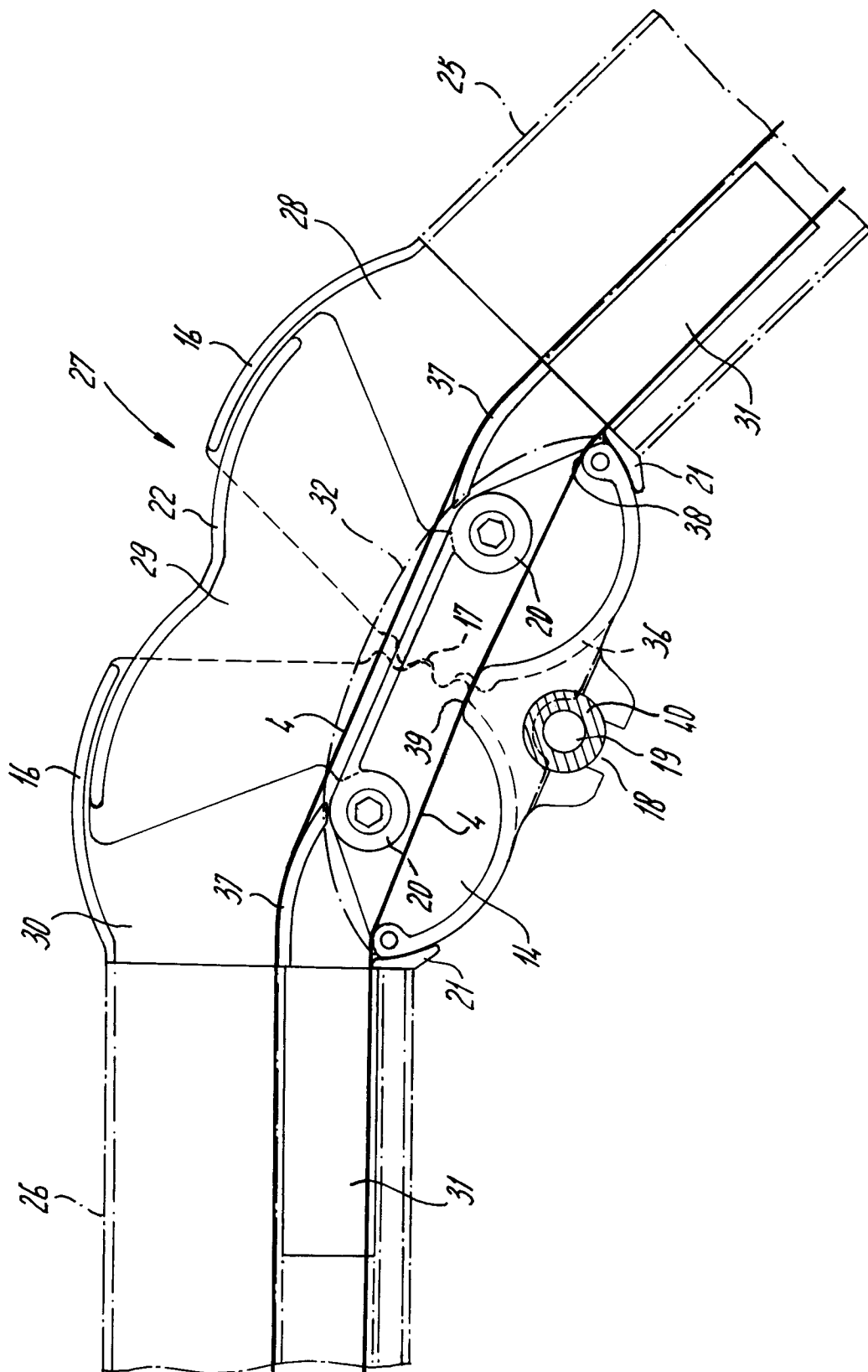


fig-3

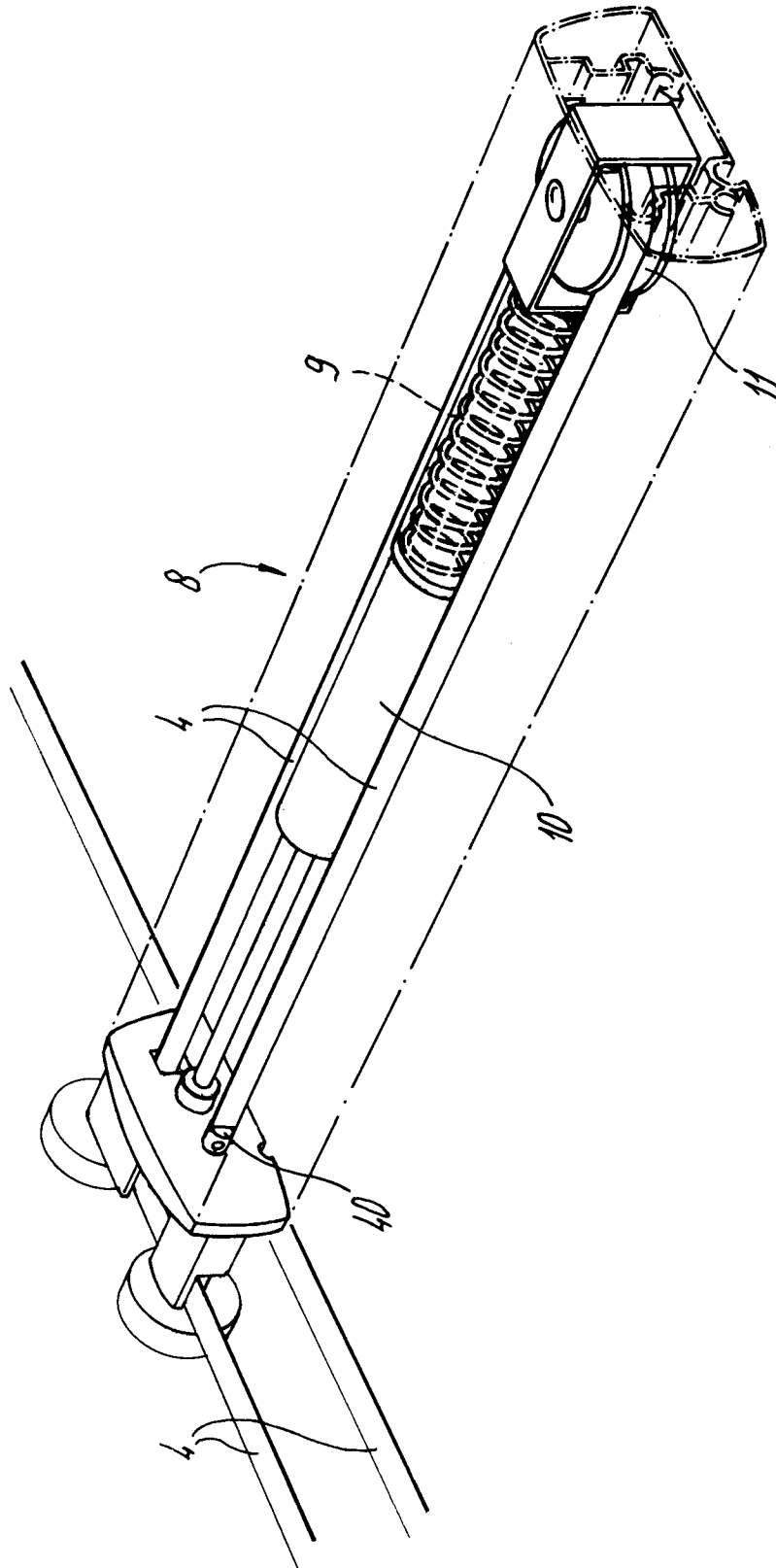


fig - 4

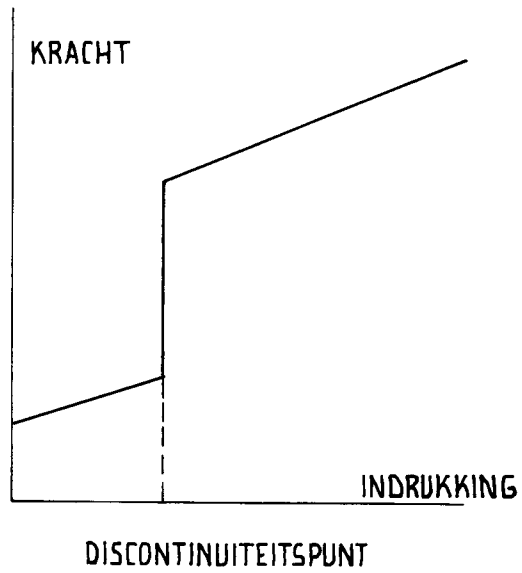
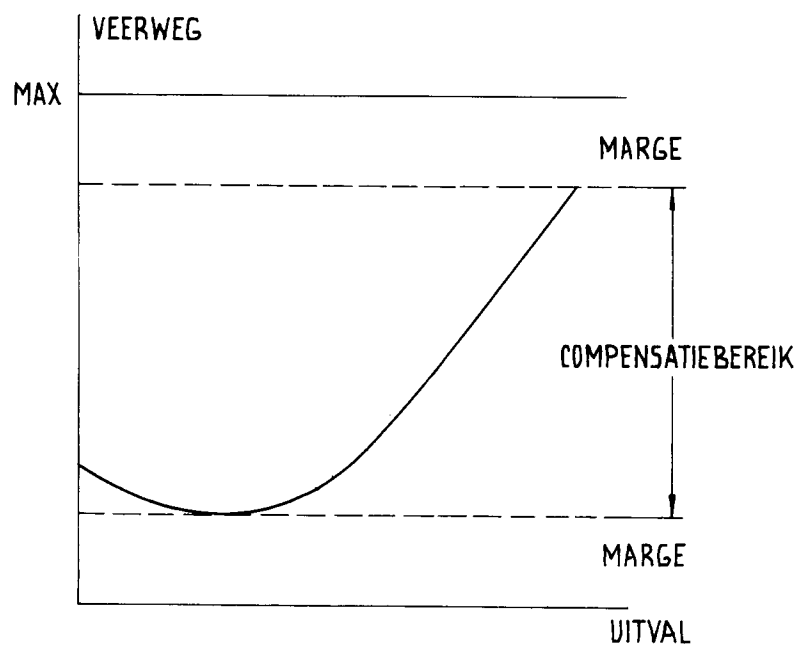


fig - 5





European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 98 20 3922

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Place of search THE HAGUE		Date of completion of the search 17 February 1999	Examiner Ayiter, J
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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EP 98 20 3922

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