

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
20 May 2010 (20.05.2010)

PCT

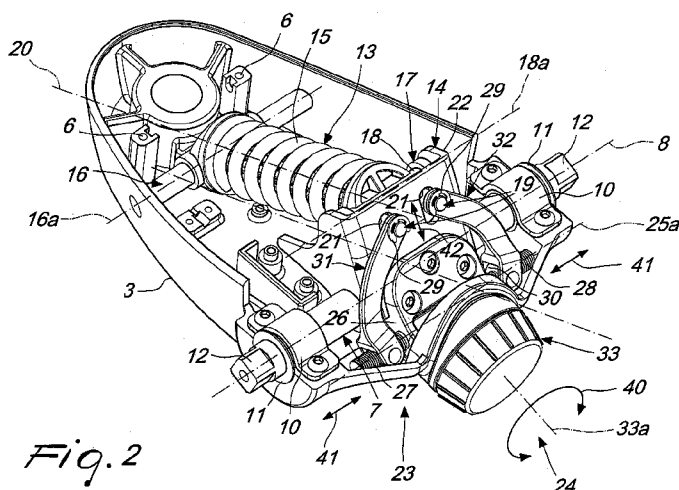
(10) International Publication Number
WO 2010/056838 A1

- (51) International Patent Classification:
A47C 3/026 (2006.01)
- (21) International Application Number:
PCT/US2009/064176
- (22) International Filing Date:
12 November 2009 (12.11.2009)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
TV2008A000144 12 November 2008 (12.11.2008) IT
- (71) Applicant (for all designated States except US): L & P
PROPERTY MANAGEMENT COMPANY [US/US];
4095 Firestone Boulevard, South Gate, CA 90280 (US).
- (72) Inventor; and
- (75) Inventor/Applicant (for US only): COSTAGLIA, Mas-
simo [IT/IT]; Via Rio Orcone, 06, I-35010 Santa Giustina
In Colle (PD) (IT).
- (74) Agents: MOGA, Thomas, T. et al.; Shook, Hardy & Ba-
con L.L.P., 2555 Grand Blvd., Kansas City, MO
64108-2613 (US).

- (81) Designated States (unless otherwise indicated, for every
kind of national protection available): AE, AG, AL, AM,
AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ,
CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO,
DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT,
HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP,
KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD,
ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI,
NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD,
SE, SG, SK, SL, SM, ST, SV, SY, TJ, TM, TN, TR, TT,
TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.
- (84) Designated States (unless otherwise indicated, for every
kind of regional protection available): ARIPO (BW, GH,
GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM,
ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ,
TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE,
ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV,
MC, MK, MT, NL, NO, PL, PT, RO, SE, SI, SK, SM,
TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW,
ML, MR, NE, SN, TD, TG).

Published:
— with international search report (Art. 21(3))

(54) Title: DEVICE FOR ADJUSTING THE THRUST OF A MECHANISM, PARTICULARLY FOR ADJUSTABLE CHAIRS



(57) Abstract: A device for adjusting the thrust of a mechanism, particularly for adjustable chairs, comprising a box-like body (2) that can be fixed to a seat or to the back of an adjustable chair and supports a rotating pivot (7) that forms a pivoting axis (8) between the adjustable seat and the support frame of said seat. The pivot (7) can rotationally oscillate with respect to the pivoting axis (8) balanced by an elastic mechanism (13) functionally connected to a lever (14) which are connected for rotation to the pivot (7) in order to exert a thrust that acts on the pivot (7) in order to maintain a balanced position. The particularity of the invention resides in that it comprises a mechanism (23) for adjusting the arm of the lever (14), which can be actuated by a handle (24) for varying the position of the center of thrust of the elastic mechanism (13) with respect to the pivot (7), with consequent setting of the thrust applied to the pivot (7).



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DEVICE FOR ADJUSTING THE THRUST OF A MECHANISM, PARTICULARLY FOR ADJUSTABLE CHAIRS

DETAILED DESCRIPTION OF THE INVENTION

5 The present invention relates to a device for adjusting the thrust of a mechanism, particularly for adjustable chairs.

 As is known, many adjustment devices are commercially available which are applied to adjustable chairs. In some cases, these devices perform the function of adjusting the inclination and relative position between the back and the seat of the chair on which they
10 are installed. In other cases, these devices perform the function of adjusting the extent of the thrust applied for example to the seat in order to make it return to a preset position with respect to the fixed support frame when said seat is moved from said position.

 The use of adjustment devices capable of making the seat return elastically from a deviated position to a preset position with respect to the fixed frame is widespread in
15 some chairs, particularly office chairs.

 In principle, the thrust generated by the mechanism suitable to turn the seat should be proportional to the weight and height of the user who is using the chair at that moment, so as to allow for the balanced oscillation of the chair itself.

 Known types of adjustment devices are not free from drawbacks, which
20 include the fact that they comprise very complex mechanisms that require rather substantial efforts on the part of the user to perform the desired adjustment.

 Another drawback of the known types of adjustment devices is that it requires many turns of the adjustment knobs to make an adjustment, which means the user must spend more time adjusting the chair.

25 The aim of the present invention is to provide a device for adjusting the thrust of a mechanism, particularly for adjustable chairs, which allows the user to customize the seat's return thrust setting with respect to its fixed frame, so that the chair fits the user's anthropometric characteristics.

Within the scope of this aim, an object of the present invention is to provide a device for adjusting the thrust of a mechanism, particularly for adjustable chairs, that does not require particularly arduous efforts on the part of the user to perform its setting.

Another object of the present invention is to provide a device for adjusting the thrust of a mechanism, particularly for adjustable chairs, that is constructively simple, so as to have competitive production costs.

This aim and these and other objects, which will become better apparent hereinafter, are achieved by a device for adjusting the thrust of a mechanism, particularly for adjustable chairs, which comprises a box-like body that can be fixed to a seat or to the back of an adjustable chair, said box-like body supporting a rotating pivot that forms a pivoting axis between said seat and the support frame of said seat and being able to rotationally oscillate with respect to said pivoting axis balanced by an elastic mechanism functionally connected to a lever which are connected for rotation to said pivot in order to exert a thrust that acts on said pivot in order to maintain a balanced position, characterized by a mechanism for adjusting the arm of said lever, which can be actuated by a handle for varying the position of the center of thrust of said elastic mechanism with respect to said pivoting axis, with consequent setting of said thrust applied to said pivot.

Further characteristics and advantages of the present invention will become better apparent from the description of a preferred but not exclusive embodiment of a device for adjusting the thrust of a mechanism, particularly for adjustable chairs according to the invention, illustrated by way of non-limiting example in the accompanying drawings, wherein:

Figure 1 is a perspective view of an embodiment of a device for adjusting the thrust of a mechanism, particularly for adjustable chairs, according to the present invention;

Figure 2 is a perspective view of the adjustment device shown in Figure 1, with the covering element removed;

Figure 3 is a front perspective view of the assembly of the internal components of the adjustment device shown in Figure 1;

Figure 4 is a rear perspective view of the assembly of the internal components of the adjustment device shown in Figure 1;

Figure 5 is a sectional side elevation view of the adjustment device shown in Figure 2 in the configuration for maximum thrust;

Figure 6 is a sectional side elevation view of the adjustment device shown in Figure 2 in the configuration for minimum thrust.

5 With reference to the cited figures, the device for adjusting the thrust of a mechanism, particularly for adjustable chairs, generally designated by the reference numeral 1, comprises a box-like body 2, which can be fixed to a seat or back of an adjustable chair, not shown, and contains the internal components of the device 1.

10 More particularly, the box-like body 2, which is constituted by a lower footing 3 that can be fixed to the seat or to the back, and by a covering element 4, which is fixed detachably to the lower footing 3 for free access to the internal components of the device 1, supports rotatably a pivot 7 that forms a pivoting axis 8 between the hypothetical seat and the hypothetical back.

15 As described in greater detail hereinafter, the pivot 7 can undergo angular oscillations with respect to the pivoting axis 8 about a balanced position, without undergoing translational motions, because it comprises respectively two bearing tracks 9 fixed by straps 10 connected to the lower footing 3 and two shoulders 11 formed by said bearings 9 that abut against two abutment planes formed by said lower footing 3.

20 In one possible application, the pivot 7 can receive additional supports, not shown, at its ends 12, in order to fix the seat of the chair or the back. The pivot 7 therefore constitutes the fulcrum about which the entire chair oscillates.

25 As for known types of adjustment devices, oscillation of the pivot 7 can occur against the elastic mechanism 13, which is functionally connected to the lever 14 which are connected for rotation to the pivot 7 in order to exert a thrust that acts on the pivot 7, formed by the vector product between the elastic reaction of the elastic mechanism 13 and the arm of the lever 14.

30 More precisely, the elastic mechanism 13 comprises at least one helical spring element 15, which is pivoted at its ends respectively to the box-like body 2, by means of a pivot 16 with an axis 16a that is substantially parallel to the pivoting axis 8, and to a supporting element 17 on bearings, which is functionally connected to the lever 14 and also comprises a pivot 18 with an axis 18a that is substantially parallel to the pivoting axis 8 and

from which two cylinders 19 protrude which are substantially parallel to each other and to the line of action 20 of the helical spring element 15.

Alternatively, the elastic mechanism 13 could also comprise a polyurethane cylinder or any other similar element.

5 The two cylinders 19 are inserted respectively in two slots 21 provided in a plate 22 that is connected for rotation to the pivot 7 and defines the lever 14.

More particularly, the slots 21 lie substantially parallel to each other and substantially perpendicular to the pivoting axis 8.

10 According to the invention, there is a mechanism 23 for adjusting the arm of the lever 14, which can be actuated by a handle 24 in order to vary the position of the center of thrust of the elastic mechanism 13 with respect to the pivoting axis 8, with consequent setting of the thrust applied to the pivot 7.

15 More particularly, the adjustment mechanism 23 comprises a shaft 25, which is arranged on the opposite side of the helical spring element 15 relative to the pivot 7 so that the axis 25a is substantially parallel to the pivoting axis 8 and is supported by the box-like body 2, or by a supporting element 26 that is separate from the box-like body 2, near the pivot 7 for the coupling of two threaded ends 27 and 28 thereof, respectively, with two threaded pawls 30.

20 The two threaded pawls 30 are each pivoted to an arm 31 or 32, which in turn is pivoted to one of the cylinders 19, retained for example by two Seeger rings 29, so that the two threaded pawls 30 are functionally connected to the adjustment mechanism 23 in order to allow, as explained hereinafter, their translational motion within the slots 21.

25 The handle 24 comprises an adjustment handwheel 33, which rotates within and is supported by the box-like body 2, or by the supporting element 26, at the shaft 25 and so that its axis 33a is substantially perpendicular to the axis 25a of said shaft 25.

The adjustment handwheel 33 is connected for rotation to a first gear 34, which engages a second gear 35, which is connected for rotation to the shaft 25 by the rotation of said second gear about its axis 25a, for the simultaneous translational motion of the threaded pawls 30 along the axis 25a of the shaft 25 and for the rotation of the arms 31

and 32 with respect to the threaded pawls 30, with consequent translational motion of the cylinders 19 in the slots 21.

As will be described in greater detail hereinafter, the movement of the kinematic system described above is made possible by virtue of the fact that the cylinders 19, the arms 31 and 32 and the threaded pawls 30 are mutually pivoted substantially parallel to the line of action 20.

Operation of the adjustment device 1 according to the present invention is as follows.

Actuating the adjustment handwheel 33 turns the gear system composed of the gears 34 and 35, which are connected respectively to the adjustment handwheel 33 and to the shaft 25.

The rotation of the shaft 25, by virtue of the two ends 27 and 28, which have respectively two threads, one on the right and one on the left, determines the movement of the two threaded pawls 30.

With reference to the embodiment shown, by turning the adjustment handwheel 33 counterclockwise, along the direction of rotation 40 about the axis 33a, the two arms 31 and 32 move closer to one another, along the direction 41, and accordingly the supporting element 17 rises, along the direction 42, reaching the maximum thrust configuration as shown in Figure 5.

Vice versa, by turning the adjustment handwheel 33 clockwise, again along the direction of rotation 40, the arms 31 and 32 move apart, again along the direction 41, and descend along the direction 42, so that the supporting element 17 reaches the minimum thrust configuration as shown in Figure 6.

Advantageously, said movement of the supporting element 17 determines a different position thereof and in particular a different distance between the pivoting axis of the pivot 7 and the center of thrust of the elastic mechanism 13. In this manner, the arm of the lever applied by the spring element 15 is changed.

Accordingly, a different setting of the mechanism's thrust is achieved.

It must be stressed that the internal components of the adjustment device 1, i.e., the elastic mechanism 13, the lever 14 and the pivot 7, are adjusted and arranged inside

the box-like body 2 so that the path that the supporting element 17 traces as a consequence of the rotation of the adjustment handwheel 33 lies on a circular path 44 that has a constant radius R and whose center lies on the axis 16a of the pivot 16.

This particular construction is significant because it allows for the movement of the spring element 15 without having to compress or extend said element and, therefore, without varying the value of the elastic reaction which causes the thrust.

The fact that the spring element 15 does not undergo length variations during adjustment ensures that no additional loads occur on the adjustment handwheel 33.

All this leads to an easy adjustment for the user, which requires only minimal effort in order to overcome the frictions of the adjustment device 1 instead of efforts to compress the elastic mechanism 13.

The torque adjustment principle is in fact based exclusively on the variation of the geometry of the adjustment device 1, i.e., of the arm of the lever 14, not on the variation of the force of the elastic mechanism 13.

In practice it has been found that the device for adjusting the thrust of a mechanism, particularly for adjustable chairs, according to the present invention fully achieves the intended aim and objects in that it allows for the adjustment of the relative thrust between the adjustable seat and the support frame of the seat itself, adapting the seat to the anthropometric characteristics of the user.

Another advantage of the adjustment device according to the present invention consists in that it can be used without particular strain on the part of the user.

A further advantage of the adjustment device according to the present invention consists in that it comprises simple components that have a modest cost.

Another advantage of the adjustment device according to the present invention is that it requires a low number of turns of the adjustment handwheel in order to make the desired adjustment, so the adjustment can be made quickly.

The device for adjusting the thrust of a mechanism, particularly for adjustable chairs, thus conceived is subject to numerous modifications and variations, all of which are within the scope of the accompanying claims.

All the details may furthermore be replaced with other technically equivalent elements.

In practice, the materials used, so long as they are compatible with the specific use, as well as the contingent shapes and dimensions, may be any according to the
5 requirements and the state of the art.

CLAIMS

What is claimed is:

1. A device for adjusting the thrust of a mechanism, particularly for adjustable chairs, comprising a box-like body (2) that can be fixed to a seat or to the back of an adjustable chair, said box-like body (2) supporting a rotating pivot (7) that forms a pivoting axis (8) between said adjustable seat and the support frame of said adjustable seat and being able to rotationally oscillate with respect to said pivoting axis (8) balanced by an elastic mechanism (13) functionally connected to a lever (14) which are connected for rotation to said pivot (7) in order to exert a thrust that acts on said pivot (7) in order to maintain said balanced position, characterized by a mechanism (23) for adjusting the arm of said lever (14), which can be actuated by a handle (24) for varying the position of the center of thrust of said elastic mechanism (13) with respect to said pivoting axis (8), with consequent setting of said thrust of said pivot (7).

2. The adjustment device according to claim 1, characterized in that said elastic mechanism (13) comprises at least one helical spring element (15), which is pivoted at its ends respectively to said box-like body (2) and to a supporting element (17), which is functionally connected to said lever (14).

3. The adjustment device according to one or more of the preceding claims, characterized in that said supporting element (17) comprises two cylinders (19), which are substantially parallel to each other and to the line of action (20) of said helical spring element (15) and are inserted respectively in two slots (21), which are formed in a plate (22) that is connected for rotation to said pivot (7) and forms said lever (14), said slots (21) being arranged substantially parallel to each other and substantially perpendicular to said pivoting axis (8) and said cylinders (19) being functionally connected to said adjustment mechanism (23) for their translational motion in said slots (21).

4. The adjustment device according to one or more of the preceding claims, characterized in that said adjustment mechanism (23) comprises a shaft (25), which is arranged on the opposite side of said helical spring element (15) relative to said pivot (7), with an axis (25a) which is substantially parallel to said pivoting axis (8) and rotates in and is supported by said box-like body (2) near said pivot (7) for the coupling of two threaded ends (27, 28) thereof respectively with two threaded pawls (30), each of which is pivoted to an arm (31, 32), which in turn is pivoted to one of said cylinders (19), said cylinders (19), said arms (31, 32) and said threaded pawls (30) being mutually pivoted substantially parallel to said line of action (20).

10

5. The adjustment device according to one or more of the preceding claims, characterized in that said handle (24) comprises an adjustment handwheel (33), which rotates in and is supported by said box-like body (2) at said shaft (25) and so that its axis (33a) is substantially perpendicular to said axis (25a) of said shaft (25), said adjustment handwheel (33) being rotationally connected to a first gear (34), which engages a second gear (35) that is rotationally connected to said shaft (25) by the rotation of said second gear about said axis (25a) of said shaft (25), for the simultaneous translational motion of said threaded pawls (30) along said axis (25a) of said shaft (25) and for the rotation of said arms (31, 32) with respect to said threaded pawls (30), with the consequent translational motion of said cylinders (19) in said slots (21).

20

6. The adjustment device according to one or more of the preceding claims, characterized in that said box-like body (2) comprises a lower footing (3), which can be fixed to said seat or to said back, and a covering element (4), which is fixed detachably to said lower footing (3) for free access to said elastic mechanism (13), to said lever (14), to said adjustment mechanism (23) and to said handle (24) being coupled with said lower footing (3).

25

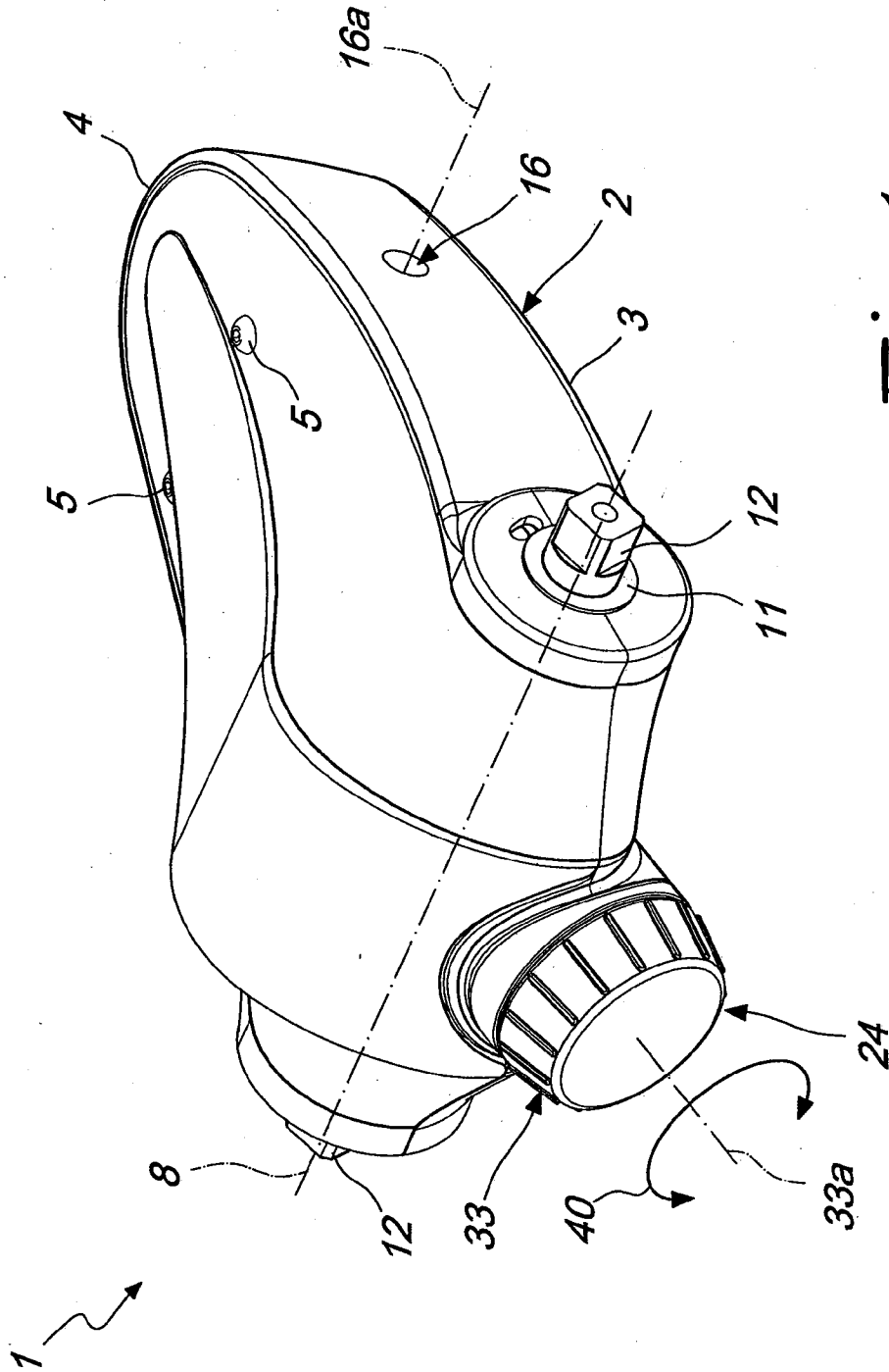


Fig. 1

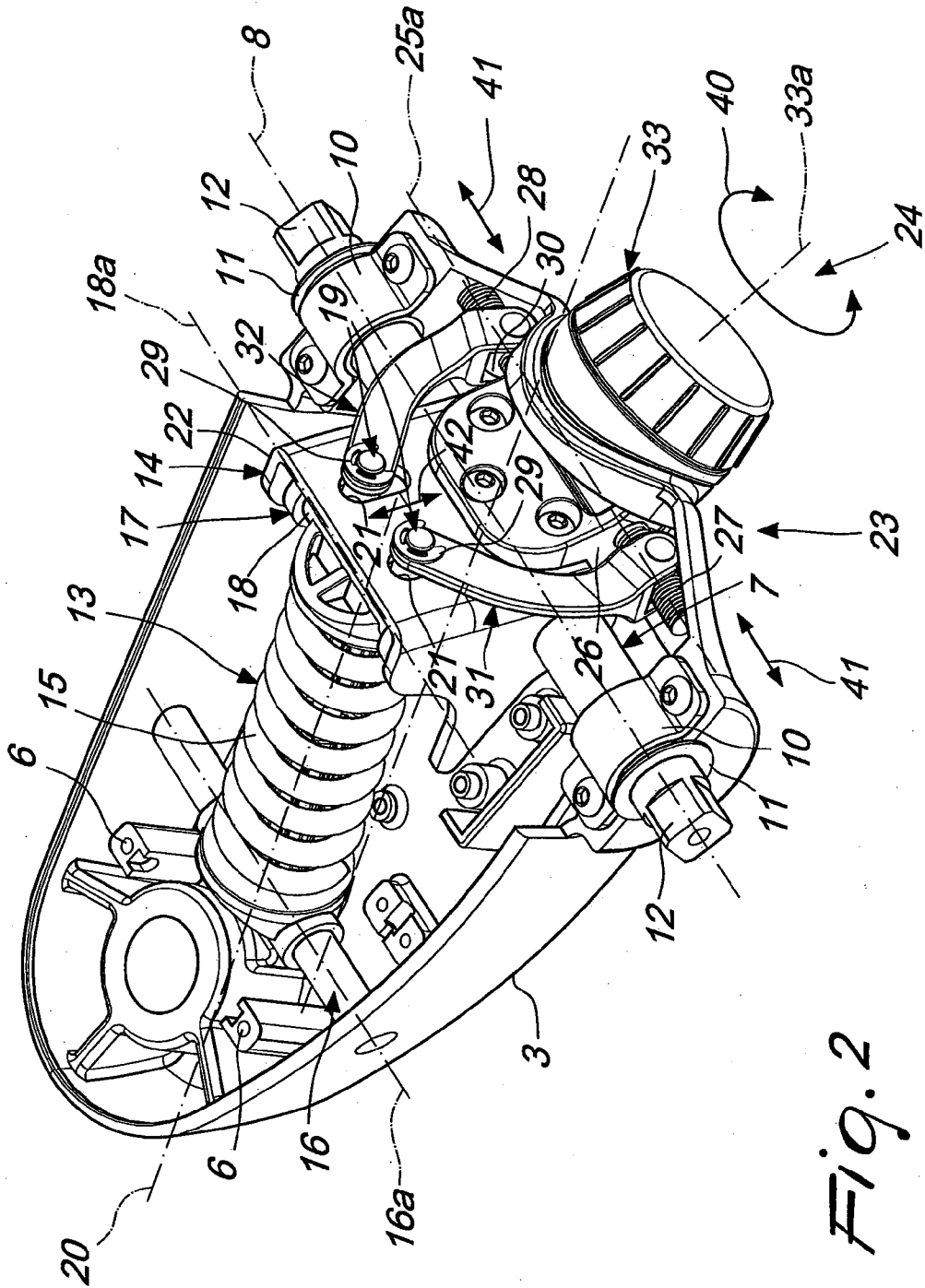


Fig. 2

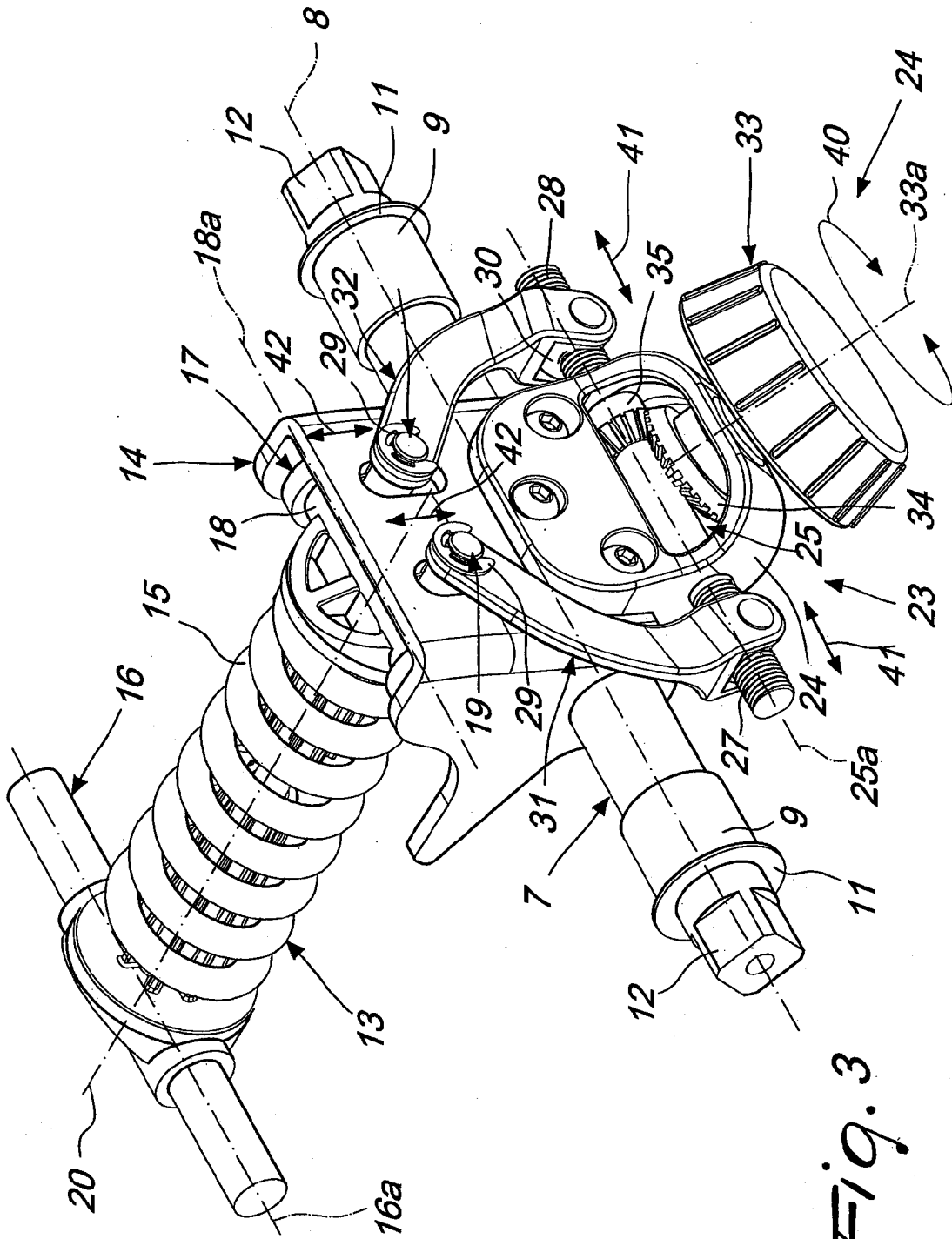


Fig. 3

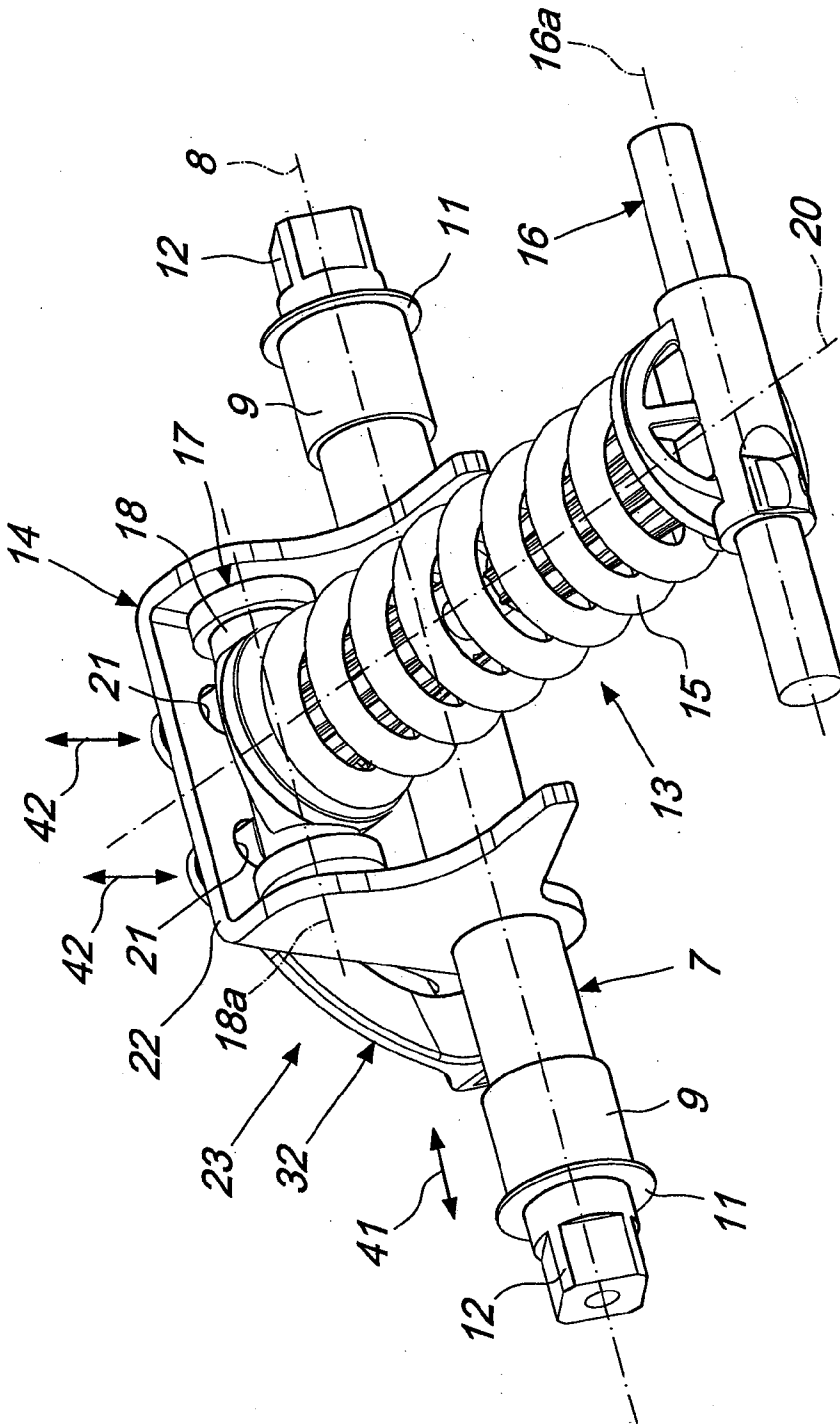


Fig. 4

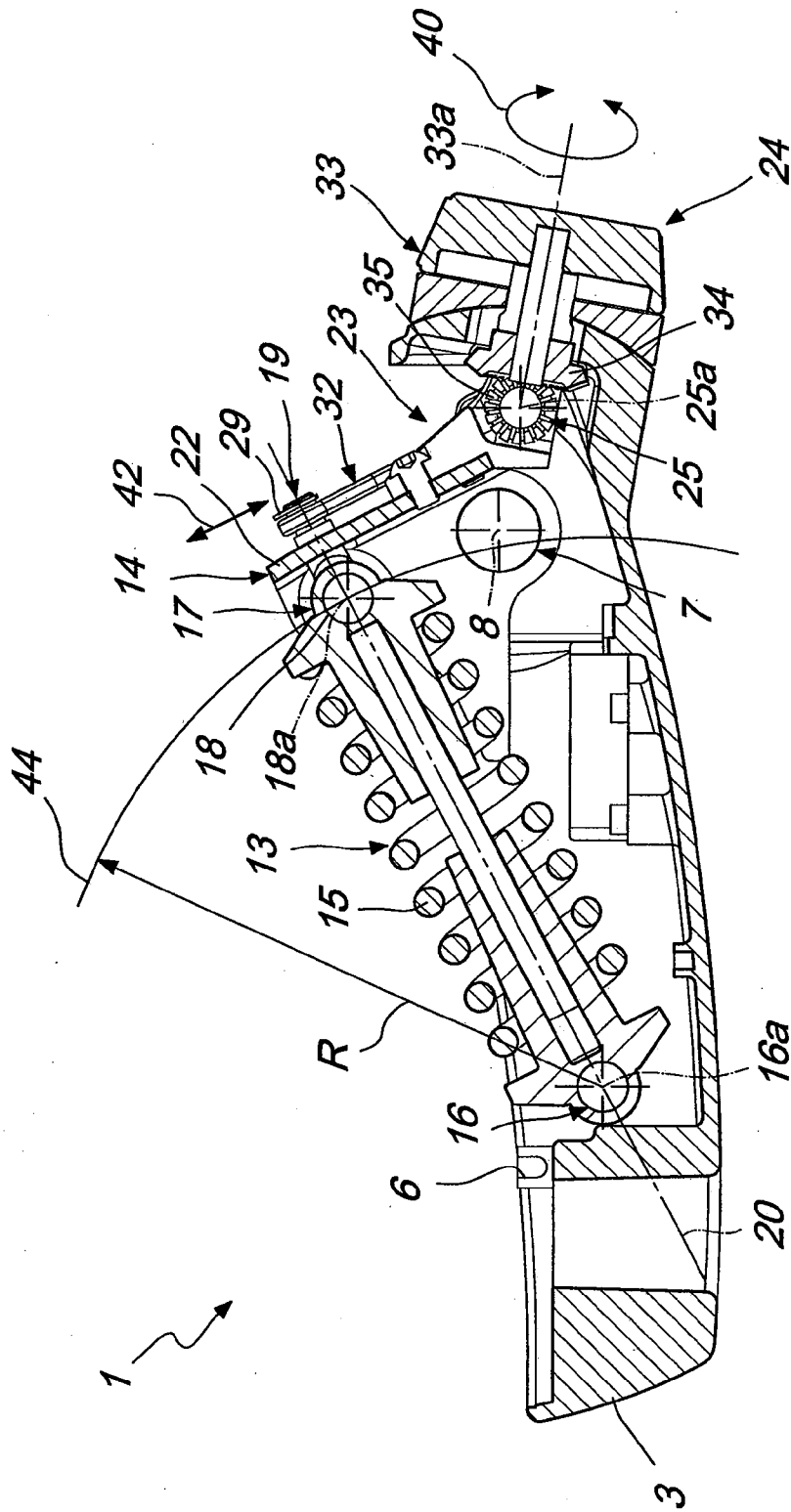


Fig. 5

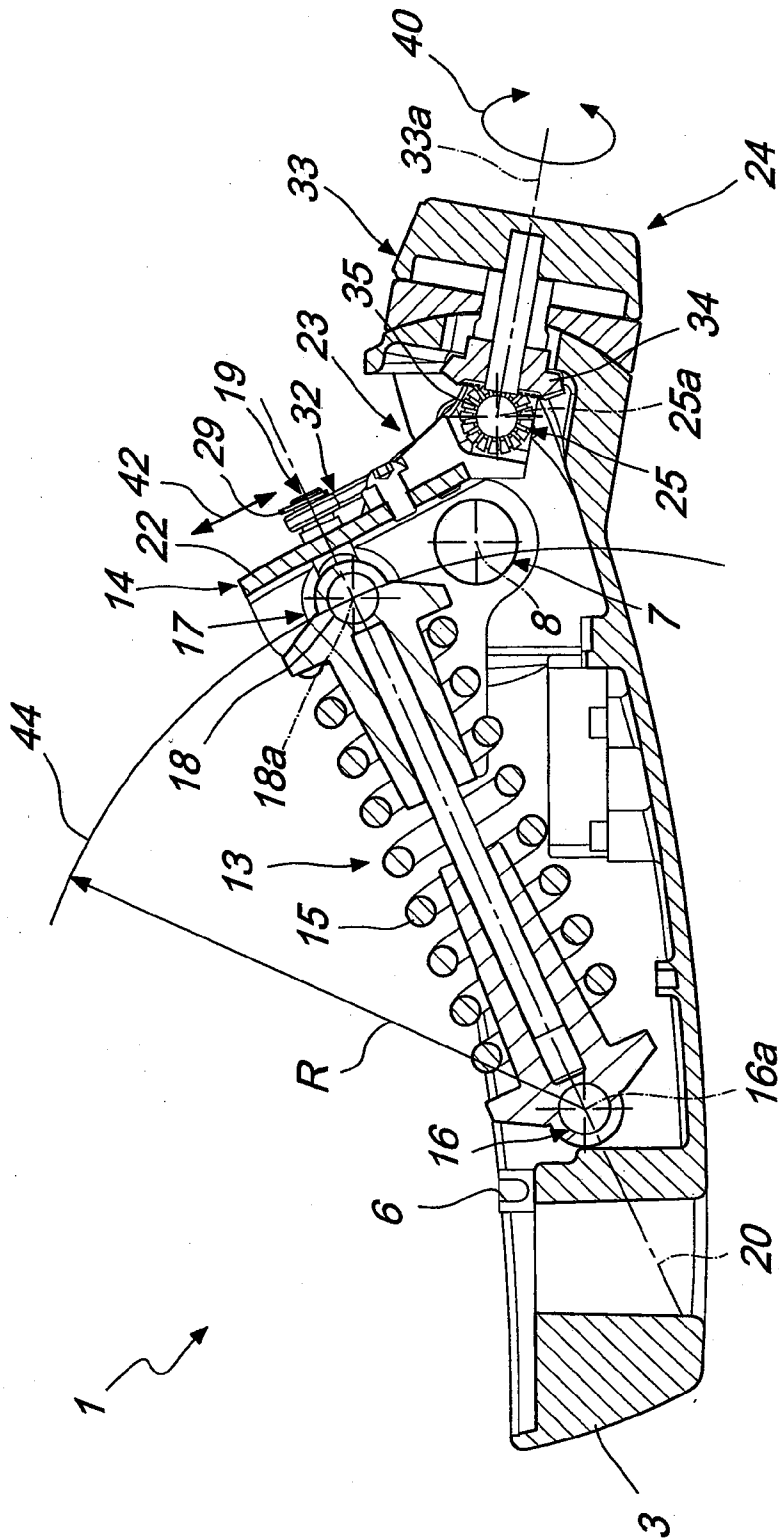


Fig. 6

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2009/064176

A. CLASSIFICATION OF SUBJECT MATTER IPC(8) - A47C 3/026 (2009.01) USPC - 297/302.4 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) IPC(8) - A47C 3/026, 1/032, 1/022 (2009.01) USPC - 297/303.4, 302.7, 302.6, 302.4, 302.3, 300.8, 300.7, 300.5, 300.2, 300.1, 291, 289, 285, 284.7, 284.2 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 practicable, search terms used) PatBase		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2008/124070 A1 (COSTAGLIA et al) 16 October 2008 (16.10.2008) entire document	1, 2
A	US 2006/0255636 A1 (DONATI) 16 November 2006 (16.11.2006) entire document	1-3
A	US 2005/0236878 A1 (ROSSETTO et al) 27 October 2005 (27.10.2005) entire document	1-3
<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/>		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search 15 December 2009		Date of mailing of the international search report 29 DEC 2009
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201		Authorized officer: Blaine R. Copenheaver PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2009/064176

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. Claims Nos.: 4-6
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3. As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- No protest accompanied the payment of additional search fees.