



(43) International Publication Date
18 September 2014 (18.09.2014)

(51) International Patent Classification:
F16D 65/09 (2006.01)

(21) International Application Number:
PCT/EP2014/054549

(22) International Filing Date:
10 March 2014 (10.03.2014)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
EP13158741 12 March 2013 (12.03.2013) EP

(71) Applicant: CONTINENTAL TEVES AG & CO. OHG
[DE/DE]; Guerickestr. 7, 60488 Frankfurt (DE).

(72) Inventor: GIRINI, Adriano; Via Praellera 15, I-17014
Cairo Montenotte (IT).

(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, BN, 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, IR, IS, JP, KE, KG, 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, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA,
SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM,
TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM,
ZW.

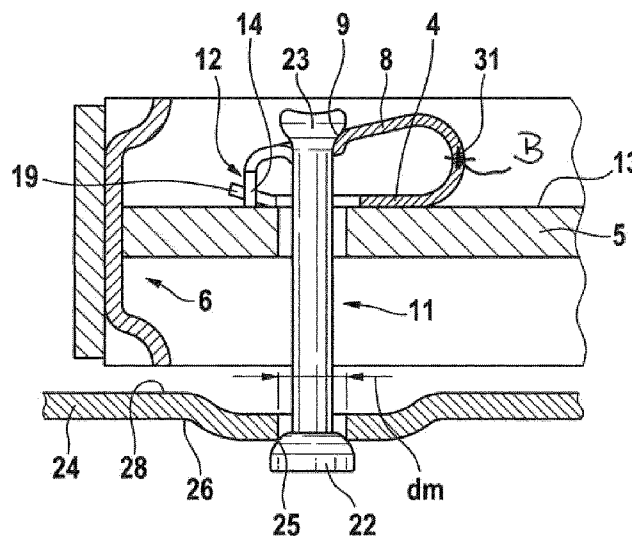
(84) Designated States (unless otherwise indicated, for every
kind of regional protection available): ARIPO (BW, GH,
GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ,
UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ,
TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK,
EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV,
MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM,
TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW,
KM, ML, MR, NE, SN, TD, TG).

Published:

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

(54) Title: BRAKE SHOE HOLDING DOWN SYSTEM FOR A DRUM BRAKE

Fig. 3



(57) Abstract: A brake shoe holding down system for drum brakes that include a u-shape bent clip-spring comprising a first shank (4) that generally rests on a web (5) of a brake shoe and a second shank (8) in lateral distance from web and first shank, the second shank comprising a seat (9) which urges under preload against a locking section of a pin (11) in distance from the web, including claw means (12) essentially in parallel with the pin, wherein a surface of the web is arranged as abutment for the claw means so that the clip-spring deformation is limited under physical contact between the claw means and the web surface. Consequently spring load and deformation of the clip spring is limited under direct physical contact between claw and web. Lifting of the brake shoe is limited and yielding deformation or overload is avoided.



Description**Brake Shoe Holding Down System For A Drum Brake**

5 The invention relates to a brake shoe holding down system for a drum brake according to the features of the preamble of claim 1.

Conventional simplex drum brakes are radial brakes used nowadays basically as a rear wheel brake system in the automotive industry.

10 They comprise generally well known components such as wheel cylinder, anchor plate, brake shoes with linings, adjuster, brake levers and so on. Service brake actuation is performed using hydraulically double-actuated, anchor mounted, wheel cylinder that urge the brake shoes in a direction radially outwards against

15 a friction surface of the rotating brake drum. Both brake shoes are supported by abutments located and attached in the bottom area (clock-6-position) of the anchor plate. In an axial direction (in parallel with the axis of rotation of the drum) the shoes are retained (held down) towards the anchor plate so that they do not

20 rattle. That task is achieved by a holding down system and wherein each shoe comprises at least its own holding down system. It is an important function that these holding down systems balance the forces necessary for keeping the shoes in place and also stable in any condition without rattling noise. Another issue is that

25 the holding down system shall not counter nor weaken brake force during brake actuation. The holding down system shall satisfy without service in use and function even under the natural wear of the brake linings during their lifetime. Consequently each brake shoe shall be arranged radial displaceable in the direction

30 of the brake drum.

The existing, conventional, holding down system (see Fig. 5-7) is essentially composed of the following separate items which cooperate after their assembly together: an anchor plate, a

helical spring, a washer (plate) and a pin of sufficient length. The pin has an intermediate cylindrical section interconnecting pin ends with portions comprising a mushroom shape head portion on one end and a profiled locking portion comprising at least one
5 abutment arranged distal in predefined distance from its end portion. The assembly of the holding down system is as follows. The pin is introduced in the through bore of the anchor plate until its mushroom head portion rests in the anchor plate. The cylinder portion of the pin penetrates through holes in anchor plate and
10 through a web of the brake shoe. The pin end includes its profiled locking portion which protrudes sufficiently over the web surface so that the helical spring can be fed to and also centered by the protrusion. The washer plate comprises a profiled through bore which can receive and fix the locking portion including the
15 abutment as follows. The bore of the washer is placed above and also coupled with the locking portion of the pin in its assembly position so that the spring can be held down under compression below the washer. When the compression force urges upon the washer the helical spring is elastically deformed under the present
20 load. When sufficient deformation of the helical spring is reached the washer plate is turned around its axis in a clockwise or counterclockwise direction respectively, relatively regarding the locking portion with abutment of the pin. The final result of that relative rotational motion is that the abutment
25 of the locking portion finds itself in positive engagement with the profile of the through bore in the washer. Then the worker refrains from compression force so that limited relaxation is allowed. The relaxation of the spring comes to the end when the locking position is reached wherein the abutment section of the
30 pin engages with the washer. As a result the pin takes up the preload of the spring which also urges the brake shoe against the anchor plate. Consequently the holding down system is loaded with predetermined load and also locked. Any disassembly - for example

requested for a change of the brake shoes - requires reverse manipulation of the items in the reverse direction.

For security measure any manipulation in such multi part assemblies of drum brake systems requires significant caution. It is to be performed by very skilled workers. For this reason some other conventional drum brake systems according to WO 1994/16240 A1 employ a spring clip wherein the holding down system combines plate and spring member in one part and wherein the spring slip is designed in a U-shape that comprises two elastic arms which are arranged in parallel to each other.

Significant improvement and flexibility of the holding down system is the object of the present invention. Another object of the present invention is proposing an inexpensive holding down system which is easy in assembly and disassembly and which allows improved spring characteristics by the way. Not only simplex drum brake systems shall be equipped with this brake shoe holding down systems. As a matter of fact the holding down systems shall generally apply to all kinds of brakes that require elastically preloaded brake shoes in the axial direction. These problems are solved together with the features according to the characterizing portion of claim 1. According to the invention, a direct physical contact between a claw of the second shank and a surface of a web of a brake shoe avoids critical deformation of the clip spring member and also allows simplified, space-saving assembly. For the first time automatic and self assured assembly of the holding down system is achieved. Coordinated matched profiles and positive fit contours of the clip spring member, especially its claws, protrusions, recesses, latching means and cavities as integrated in its shanks significantly improve the security of the matched components. Simplified seat and pin design features according to the dependent claims promote error free manipulation or assembly

under critical conditions and also simplified manufacturing of the system components involved.

Brief description of the drawing:

5

Fig. 1 is a front end view of a drum brake incorporating brake shoe holding down clip spring member of the invention as a part of a brake shoe holding down system,

10 Fig. 2 is a cross-section along the line II-II in Figure 1,

Fig. 3 enlarged details showing parts of the brake in Fig. 1,

Fig. 4 in an enlarged perspective view of the spring plate forming
15 part in Figures 1 to 3, and

Fig. 5-7 show a conventional brake shoe holding down system for explanation purpose as a component of a hydraulic drum brake system of conventional type.

20

The conventional holding down system 1 for automotive drum brakes is essentially composed of the following separate items which cooperate after their assembly together: anchor plate 24, helical spring 34, washer (plate) 35 and part-symmetrical pin 36.

25

Each web 5 of a brake shoe 6, 7 stands under preload of the helical spring 34 that urges the brake shoe 6, 7 in axial direction towards the anchor plate 24. The conventional hold down system 1 also comprises the conventional (retaining) pin 36 that is arranged
30 in parallel with the axis of rotation of the not shown rotor or brake drum. The pin 36 reaches through holes of both, anchor plate 24 and web 5 of the brake shoe 6, 7. The pin 36 safeguards the preload of the spring 34 which elastically urges the brake shoes 6, 7 towards the anchor plate 24. That assembly also tolerates

expanding actuation movement of the brake pads 6,7. The pin 36 is anchored with locking portion 10 that contacts outside portion 26 of the anchor plate 24. The pin 36 penetrates through bores in anchor plate 24 and brake shoe web 5. A different designed locking portion 10 cooperates with the spring 34 so that the axial movement of the brake shoe 6,7 - away from the anchor plate 24 - is limited and rattling noise is prohibited. With other words, the brake shoes 6,7 are in the axial direction elastically urged towards the anchor plate 24.

10

In more detail the pin 36 comprises an intermediate cylindrical section interconnecting its different locking portions at distal ends that cooperate with different seats.

15 The assembly of the holding down system 1 is as follows. Cylindrical middle portion of pin 36 penetrates through bores in the anchor plate 24. Locking portion 10 rests in its seat on the outside 26 of anchor plate 24. The pin ends include different profiled locking portions 10 which protrude sufficiently above the web 5 so that the helical spring 34 can be fed to and also centered by the respective pin protrusion. The washer plate 35 comprises a profiled through bore which can receive and fix the locking portion including an abutment of the pin 36 as follows. The bore of the washer 35 is placed above and also coupled with the locking portion of the pin 36 in its assembly position so that the spring 34 can be held down under compression below the washer 35. When the compression force urges upon the washer 35 the helical spring 34 is elastically deformed under the load. When sufficient deformation of the helical spring 34 is reached the washer plate 35 is turned around its axis in a clockwise or counterclockwise direction respectively, relatively to the axial axis of the pin 36. The final result of that relative rotational motion is that the abutment of the locking portion of the pin 36 finds itself in positive engagement with the profile of the

through bore in the washer 35. Then a worker or machine coordinates to refrain from compression force so that limited relaxation of the helical spring 34 is allowed. The relaxation of the spring 34 ends when the locking position is reached. Then
5 the abutment section of the pin 36 is positively engaged with the profile of the washer 35. As a result of that complex process the pin 36 takes up the preload of the spring 34 which urges the brake shoe 6,7 against the anchor plate 24. Consequently the holding down system 1 is loaded with predetermined force and also locked.
10 Any disassembly - for example when a change of the brake shoes 6,7 is requested - requires reverse manipulation of these items in the reverse direction.

The following describes the inventive holding down system 1
15 including its assembly according to fig. 1-4 in detail.

Outside portion 26 of the anchor plate 24 of a drum brake 2 is fixed to a car and carries an actuating device 27, especially hydraulic cylinder or electric motor, for expanding the brake
20 shoes 6,7 which are held adjacent each other in a position in front 28 of the anchor plate 24. In performing service or parking brake function the brake shoes 6, 7 are each expanded radially towards a rotor (brake drum) which is not shown. Return springs may retract the brake shoes 6, 7 after performing brake actuation.
25 Ends of the shoes 6, 7 find a fixed abutment 29, which is integral with or rigidly secured to the anchor plate 24 and may serve to sustain braking torque arising on a leading brake shoe, depending upon the direction of rotation of the rotor. For duo-servo drum brake applications the abutment 29 may be omitted. An automatic
30 adjuster device 30 may serve to maintain a substantially constant minimum brake shoe to drum clearance during normal wear of the brake shoes 6, 7 in use.

The drum brake 2 employs a brake shoe holding down system 1 that is integrated between anchor plate 24 and brake shoes 6, 7 as follows.

5 Each holding down system 1 comprises α -shape bent clip spring member 3 which is manufactured preferably in chipless cold working. The material is preferably spring steel/sheet metal. The bent clip spring member 3 is shown in detail in figures 3 and 4. It includes a pair of shanks 4, 8 that are connected by the
10 preferably curved middle portion 31. It is disclosed in fig. 3 that free end portions of the two shanks are provided with respective aligned slot passages 21, which receive a cylindrical middle portion of the pin 11. The shanks 4, 8 are designed as follows and they interlock (overlap) in positive fit which
15 stabilizes a rotational bending (see arrow in Fig. 4) of the upper shank 8 around the bending axis B as disclosed in Fig. 3 and 4.

The first shank 4 generally rests on a surface 13 of a web 5 of
20 a brake shoe 6 and a second shank 8 is arranged in lateral distance to the web 5 and also apart from the first shank 4. The second shank 8 comprises a seat 9 which urges under spring preload against a mushroom shaped locking section 10 of the pin 11 which is in distance from the web 5. Unwanted deformation of the clip
25 spring member 3 is avoided in that the second shank 8 comprises claw means 12, 16 arranged essentially in parallel with the pin 11, and wherein a surface 13 of the web 5 is arranged as abutment for these claw means 12, 16 so that clip-spring deformation is limited under direct physical contact between the claw means 12,
30 16 and the web surface 13.

Following the preferred embodiment of the drawings, the second shank 8 is provided with two claws 12, 16 in parallel to each other which are arranged as protrusion of the shank 8 and exceed the

principal free end of the shank 8. A slot passage 21 is arranged in central between these claws 12, 16. The following means are arranged for providing the positive overlapping of the shanks 4, 8 so that their relative position to each other is locked.

5 Recesses 17, 18 are integrated in the first shank 4 so that the claw means 12, 16 of the second shank 8 can pass through those recesses 17, 18. These means allow physical and direct contact between claw and the surface of the web, and locking of the shanks 4, 8 so that no indirect, flexible contact takes place. It

10 improves handling of the clip spring member 3 when its first shank 4 is additionally provided with latching means 19, 20 that laterally encompass the claw means 12, 16 in positive fit. The latching means 12, 16 are provided aside to the central slot-passage 21. These latching means 12, 16 are also arranged

15 in one part integral with the clip spring member 3 as lateral protrusions of the first shank 4. More over this the second shank 8 carries two cavities 32, 33 that are provided in parallel to each other. Each cavity is arranged in lateral, aside to a claw 12, 16 and wherein each cavity serves for reception of a

20 protrusion which is the integral component of the first shank 4. Claw means 12, 16 and latching means 19, 20 are arranged in lateral offset to each other so that the shanks 4, 8 can freely overlap at least when preloading the spring clip member 3 during its assembly.

25

The first shank 4 of the clip spring member 3 comprises integrated inclinations 37 that work as a guiding surface for the pin 11 in the assembly.

30 Manipulation during assembly of the inventive system is simplified because rotational movement is omitted and pure axial movement of the clip spring member 3 is sufficient for preloading and securing the system. Consequently a coordination between

different axial and rotational movements is omitted. The same applies to manipulation for demontage reasons.

Manufacturing and assembly is further simplified when the pin 11
5 is designed completely in symmetry. A very positive pin-end design is provided with essentially identical double mushroom shape locking end portions 22,23 wherein both locking portions 22,23 comprise essentially identical shaped convex profiles (bone-shape/mushroom-shape) comprising identical diameters,
10 convexity and size, which are automatically centered in their respective seats 9,25. The same essentially identical curve feature can apply to the concavity of the seats 9, 25 in shank 8 and anchor plate 24 so that they cooperate in harmony with the bone-/mushroom-shaped locking portions 22,23. Consequently the
15 pin 11 can be used in either direction which is significantly positive because a sorting machine is eliminated, sorting errors are eliminated and also space is saved under disadvantageous mounting conditions. The improved design of the clip spring member 3 also promotes error free assembly as it avoids any
20 confused mating or positioning of the related components.

The holding down system 1 is understood to be both. An easy to assemble component subsystem and also a fundamental part of a drum
25 brake 2 that incorporates such brake shoe hold-down system 1.

The essence of the invention is that the spring load and deformation of the holding down system is limited under direct contact of an upper (second) bent shank 8 of a (leaf) spring clip member 3 which physically and directly contacts a surface 13 of
30 the web 5 of a brake shoe 6, 7 so that lifting of the respective brake shoe 6, 7 is limited and rattling or yielding of the spring system under overload is avoided.

List of references:

- 1 Holding Down System
- 2 Drum brake
- 5 3 clip spring member
- 4 first shank
- 5 web
- 6 brake shoe
- 7 brake shoe
- 10 8 second shank
- 9 seat
- 10 locking section
- 11 pin
- 12 claw means
- 15 13 surface
- 14 protrusion
- 15 protrusion
- 16 claw means
- 17 recess
- 20 18 recess
- 19 latching means
- 20 latching means
- 21 slot passage
- 22 end portion
- 25 23 end portion
- 24 anchor plate
- 25 seat
- 26 outside portion
- 27 actuating device
- 30 28 front
- 29 abutment
- 30 adjuster
- 31 middle portion
- 32 cavity

33 cavity

34 spring

35 washer

36 pin

5 37 inclination

ax axial direction

B axis

d distance

10 dm diameter

o offset

r radial direction

t tangential direction

15

20

25

Patent claims

1. Brake shoe holding down system (1) for a drum brake system and drum brake (2) including the respective brake shoe holding down system (1) which elastically urges a brake shoe (6,7) against an anchor plate (24), comprising a preloaded bent clip-spring member (3) that comprises a first shank (4) which generally rests on a web (5) of a brake shoe (5,6) and a second shank (8) in lateral distance from the web (5), the second shank (8) comprises a seat (9) which urges under the preload against a locking section (10) of a pin (11) which is clamped under the same preload in between the anchor plate (24) and the web (5), the pin (11) comprises a locking section (10) in distance above the web (5), and including means for limited deformation of the clip-spring member (3), **characterized** in that the second shank (8) comprises claw means (12,16) that are arranged essentially in parallel with the pin (11), wherein a surface (13) of the web (5) is arranged as abutment for the claw means (12,16) so that clip-spring deformation is limited under direct physical contact between the claw means (12,16) and the surface (13) of the web (5).

2. Brake shoe holding down system (1) according to claim 1 for a drum brake (2), **characterized in that** each claw means (12,16) is arranged as protrusion (14,15) of the second shank (8).

3. Brake shoe holding down system (1) according to claim 2 for a drum brake (2), **characterized in that** two claw means (12,16) are arranged in parallel to each other in the shank (8) next to a slot passage (21) for the pin (11).

4. Brake shoe holding down system (1) according to claim 1 and 2 for a drum brake (2), **characterized in that** a recess (17,18) is integrated in the first shank (4) that receives the claw means (12,16).

5. Brake shoe holding down system (1) according to claim 1 - 4 for a drum brake system, **characterized in that** the first shank (4) comprises laterally to the recess (17,18) a latching means (19,20) that laterally encompass the claw means (12,16) in positive fit.

6. Brake shoe holding down system (1) according to claim 5 for a drum brake system, **characterized in that** each latching means (19,20) is arranged as lateral protrusion of the first shank (4).

10

7. Brake shoe holding down system (1) according to claim 5 for a drum brake system, **characterized in that** the first shank (4) is provided with inclinations (37) that serve as a mounting guide for the pin (11).

15

8. Brake shoe holding down system (1) according to claim 6 for a drum brake system, **characterized in that** cavities (32,33) are integrated in the second shank (8) each cavity (32,33) arranged in lateral distance (d) aside to a claw means (12,16) and wherein each cavity (32,33) receives the protruded latching means (19,20).

9. Brake shoe holding down system (1) according to claim 1 for a drum brake system, **characterized in that** the claw means (12,16) and the latching means (19,20) are arranged in lateral offset (o) to each other so that they overlap at least in part and at least during assembly of the brake shoe holding down system (1).

10. Brake shoe holding down system (1) according to claim 1-9 for a drum brake system, **characterized in that** each shank (4,8) is provided with a slot-passage (21) for reception of the pin (11).

11. Brake shoe holding down system (1) according to claim 1-10 for a drum brake system, **characterized in that** each pin (11)

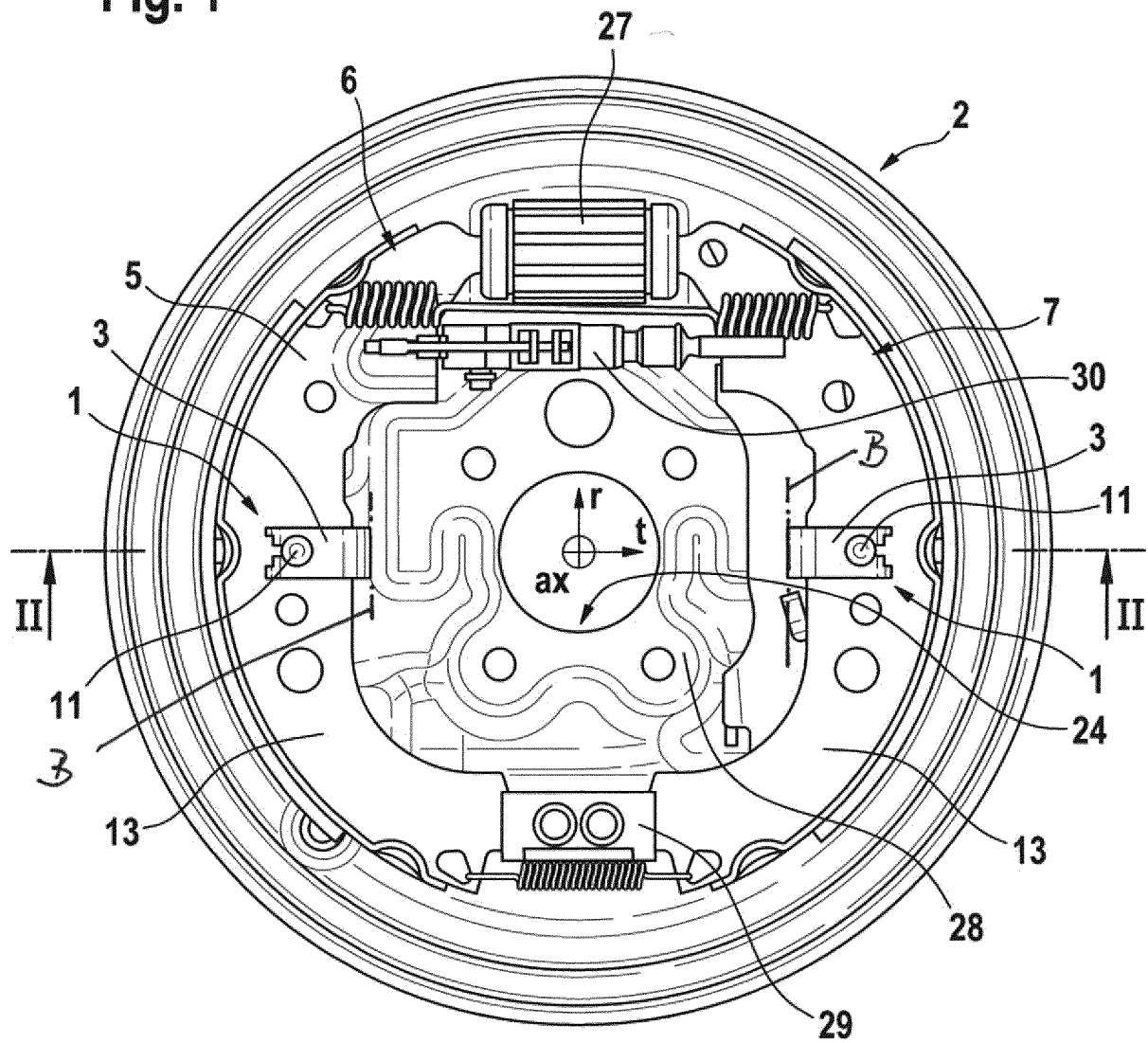
comprises two mushroom shape locking portions (10;22,23) of essentially identical diameter and of essentially identical convex-curved shape for cooperation with seat (9) and anchor plate (24).

5

12. Brake shoe holding down system (1) according to claim 11 for a drum brake system, **characterized in that** anchor plate (24) and second shank (8) comprise at least partially identical seats (9,25) in concave-curved shape that comprise essentially
10 identical diameters (dm) in their cavities and the shape of these seats (9,25) is at least partially harmonized with the mushroom shape end (locking) portion (22,23) of the pin (11).

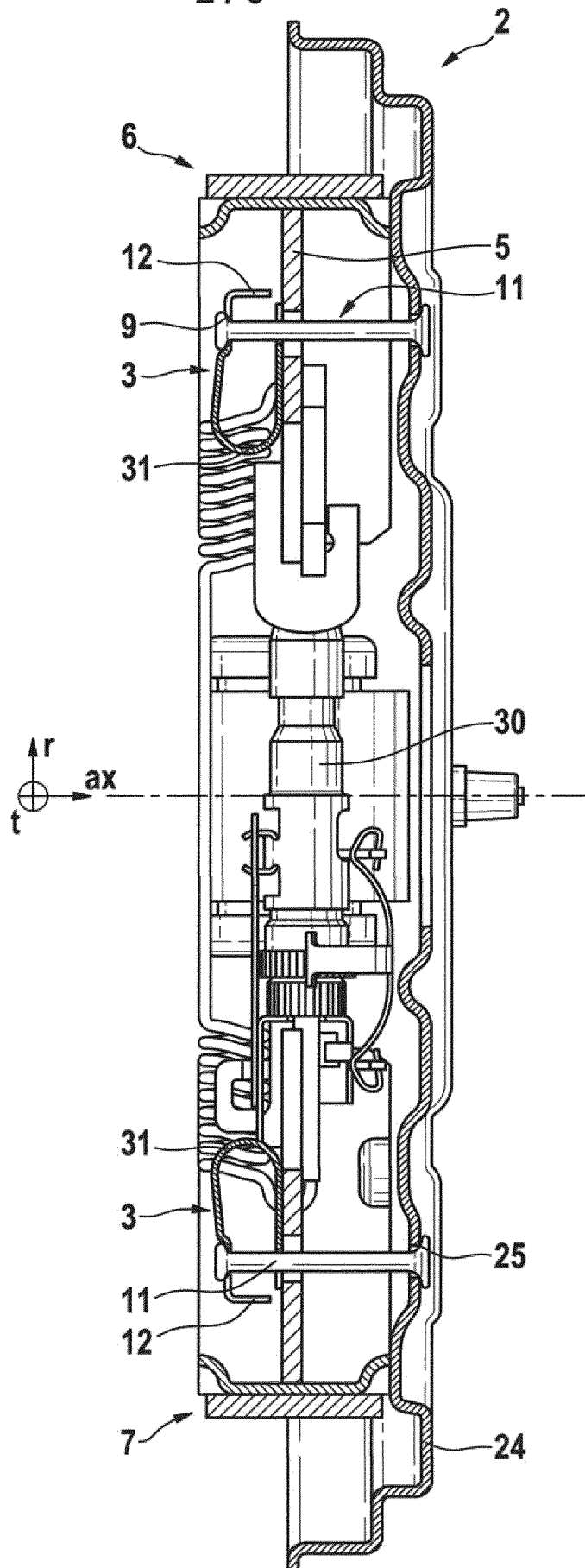
13. Brake shoe holding down system (1) according to at least one
15 of claims 1-12, **characterized in that** the shanks (4,8) interlock in positive fit for stabilizing the bending of the upper shank (8) around its bending axis (B).

Fig. 1



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Fig. 2



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Fig. 3

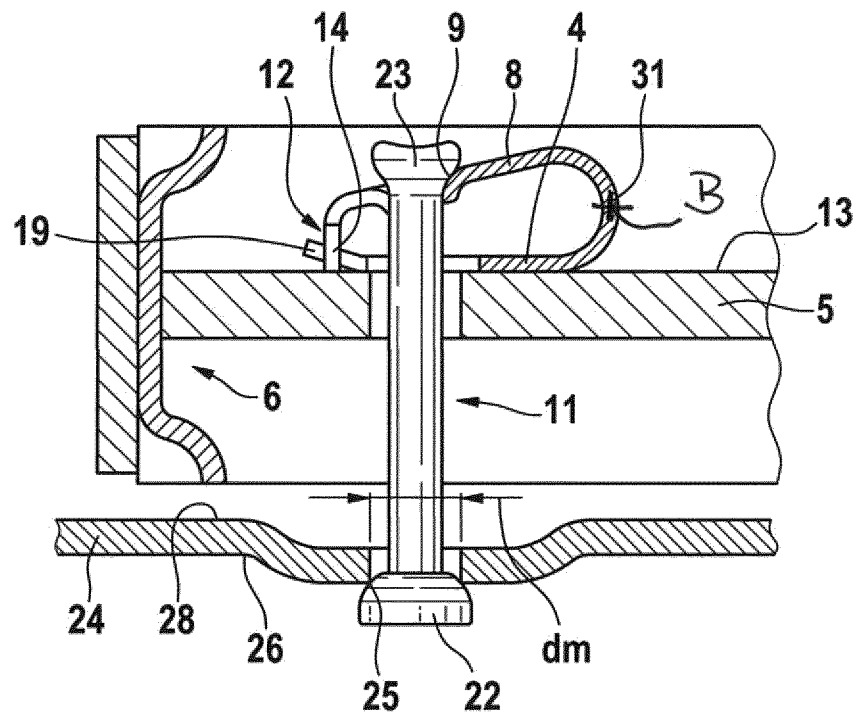
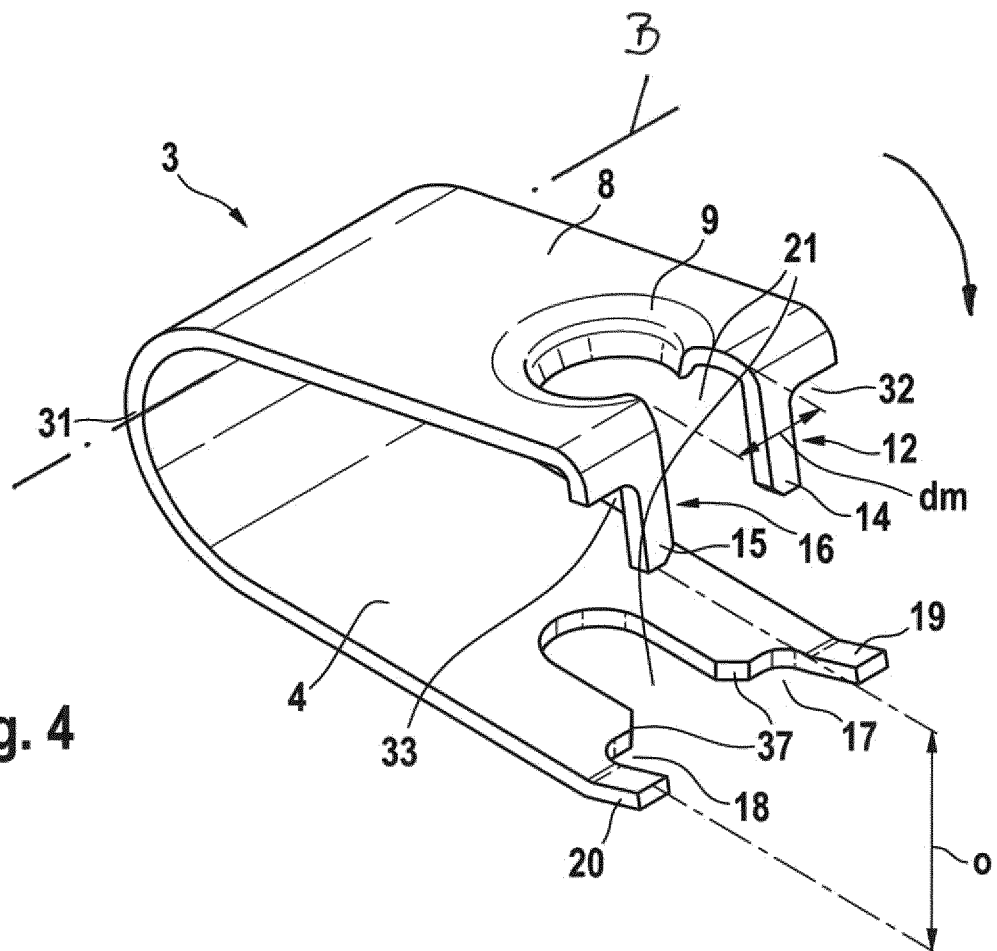
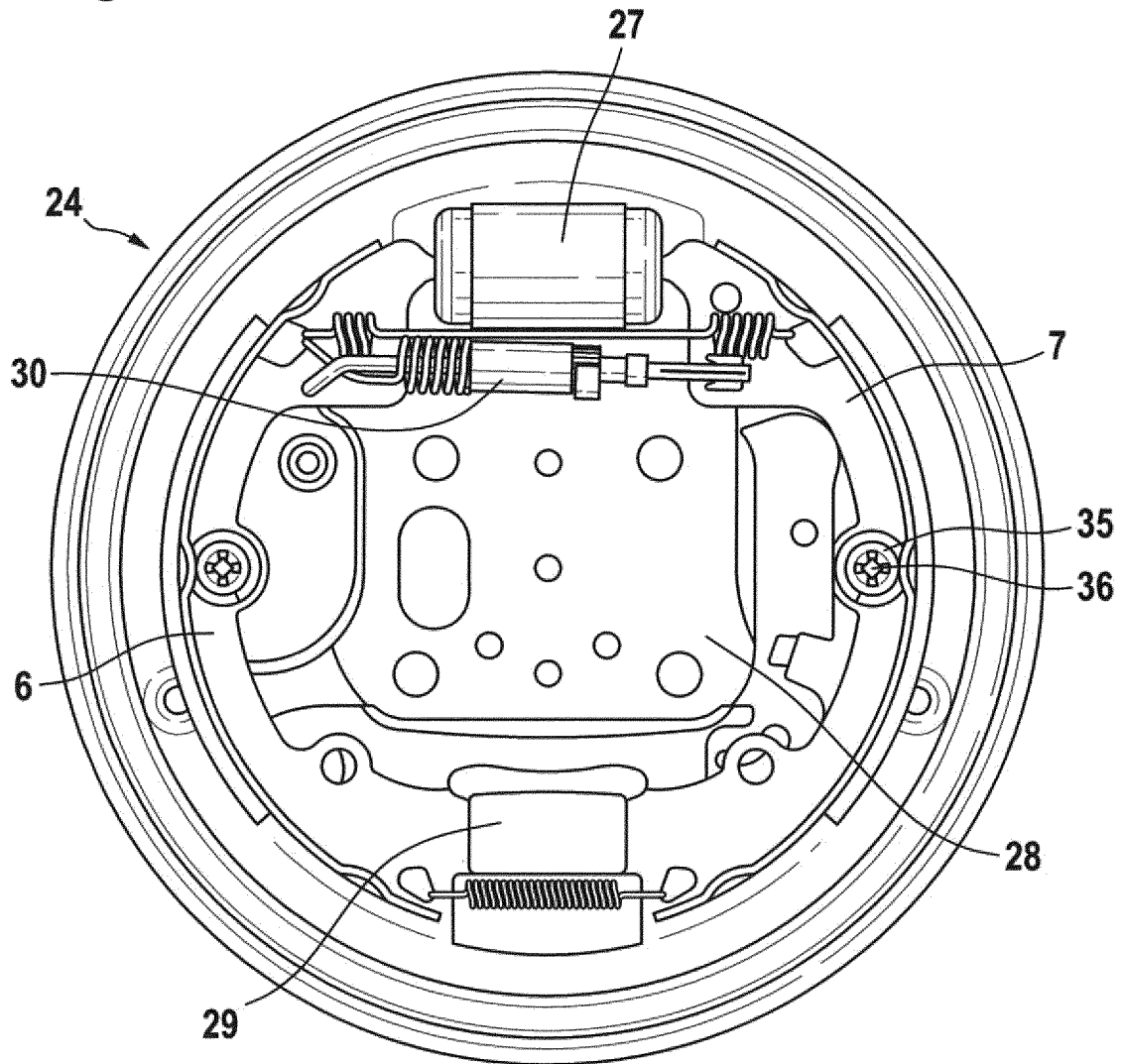


Fig. 4



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Fig. 5



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Fig. 6

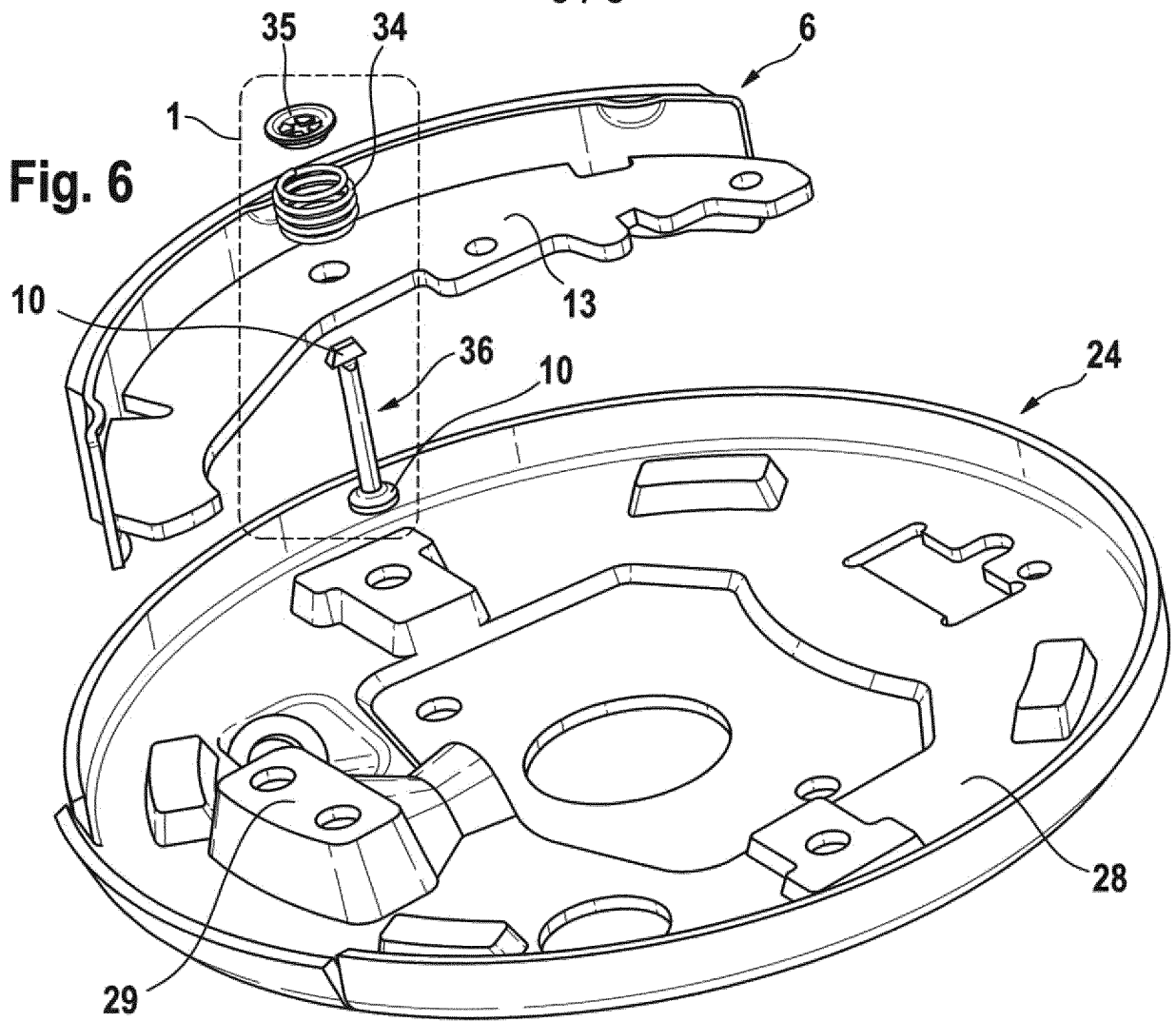
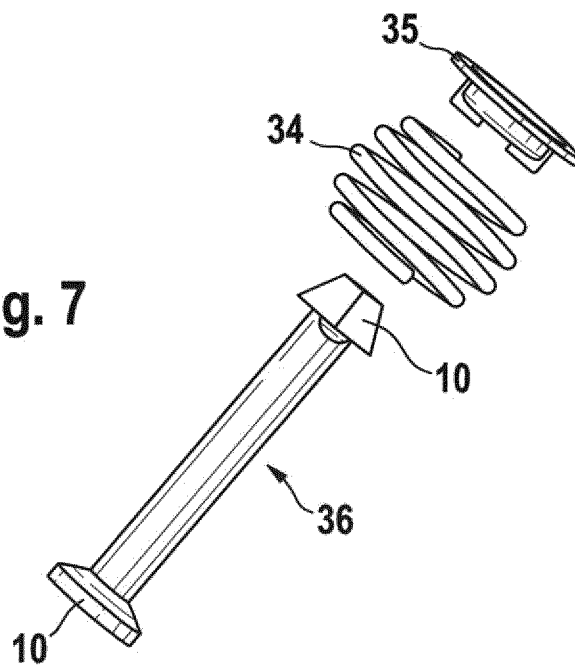


Fig. 7



INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2014/054549

A. CLASSIFICATION OF SUBJECT MATTER

INV. F16D65/09

ADD.

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)

F16D

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)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 93 00 423 U1 (LUCAS IND PLC [GB]) 19 May 1994 (1994-05-19) page 6, paragraph 2 - page 7, line 1; figures 1-8 -----	1-13
A	DE 28 34 451 A1 (TEVES GMBH ALFRED) 28 February 1980 (1980-02-28) page 8, line 17 - page 9, line 9; figure 3 -----	1
A	EP 1 136 717 A2 (AKEBONO CORP NORTH AMERICA [US]) 26 September 2001 (2001-09-26) abstract; figure 2 -----	1



Further documents are listed in the continuation of Box C.



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Date of the actual completion of the international search

22 May 2014

Date of mailing of the international search report

02/06/2014

Name and mailing address of the ISA/

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NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040,
Fax: (+31-70) 340-3016

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2014/054549

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 9300423	U1	19-05-1994	DE 9300423 U1 19-05-1994
			EP 0679232 A1 02-11-1995
			ES 2091133 T3 16-10-1996
			US 5540310 A 30-07-1996
			WO 9416240 A1 21-07-1994

DE 2834451	A1	28-02-1980	NONE

EP 1136717	A2	26-09-2001	AT 340315 T 15-10-2006
			DE 60123148 T2 20-09-2007
			EP 1136717 A2 26-09-2001
			JP 3761413 B2 29-03-2006
			JP 2001295872 A 26-10-2001
			US 6343678 B1 05-02-2002
