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(54) **A special-purpose bench for the maintenance of axles and/or transmissions and/or differentials**

(57) A special-purpose bench for the maintenance of axles and/or transmissions and/or differentials, comprising a support structure carrying a table and special support means associated with the support structure

and/or the table. The special support means comprise at least two forks mounted on the table and spaced apart in positions such that the forks jointly form a support cradle for an axle.

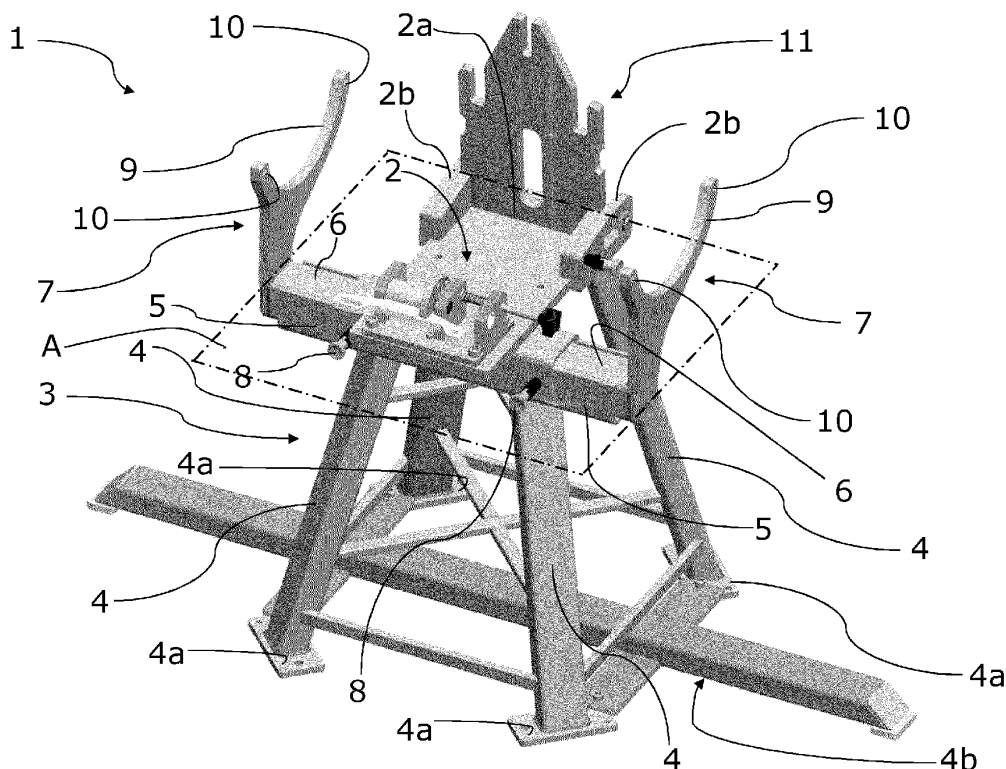


FIG. 1

Description

[0001] The invention relates to a special-purpose bench for the maintenance of axles and/or transmissions and/or differentials.

[0002] It responds to the need for specialist equipment to facilitate the dismantling, re-assembly, maintenance and possibly the running-in of axles of the type with fixed and removable housings, their relative differential units and the transmissions associated therewith. It is known to provide equipment to facilitate operations to assemble and dismantle apparatus in general. This equipment includes work benches designed to receive mechanical components and to support them during the above-mentioned operations. An example of such a bench is disclosed in RU2424862C1. A specific apparatus for the assembly and centring of spoked wheels is involved in this case.

[0003] A specialist apparatus for the maintenance of wheel hubs, in particular for the replacement of their relative bearings, is disclosed in US 7,832,073 (B2). This apparatus cannot be used, however, for maintenance work on axles and/or transmissions.

[0004] At present, therefore, workers employed on the maintenance and repair of axles have to produce their own craft structures or adapt work benches not provided with special-purpose equipment.

[0005] An example of such adapted work benches is described in US 1,556,882 A relating to a work stand for facilitating the making of repairs and renewals on the rear axle systems of automobiles. The stand frame comprises front and rear legs and a top cross-bar of tubular form. On the upper end of the front leg is an integral yoke equipped on the upper ends of its arms with a pair of clamps constituting a vise in which the rear axle assembly can be supported and held.

[0006] Mounted on the top cross-bar is an oil pan to catch the oil drip from the parts supported by the stand.

[0007] A tray designed to hold tools is mounted on the stand frame from the opposite side to oil pan, in such a way that clamps does not interfere with such tools. Nevertheless such solution is not versatile since the structure of the yoke with the clamps only allows the use of very small tray, which can be merely used for holding tools, while it would be desirable to use the bench also for other operations, such as the maintenance of axles having different shape or of other parts of the transmission. As a matter of fact, in order to perform different operation on the transmission, the bench discloses US 1,556,882 requires further couples of yoke, positioned adjacent to the clamps for the axle, thus increasing the overall sizes of the work stand. Similar benches are also described in US 4,206,911 A and US 6,322,061 B1. Also in this case the benches have the only purpose of supporting the axle during maintenance and, on the contrary, they are not capable of allowing different operations on other parts of the transmission.

[0008] The technical problem to be resolved by this

invention is one of providing a special-purpose bench for the maintenance and repair of axles and/or transmissions and/or differentials optimized so that work may be carried out on axles of different types in a completely stable and safe manner, while at the same time remedying the drawbacks discussed with respect to the prior art.

[0009] This problem is resolved by the invention by means of a special-purpose bench embodied in accordance with the appended claims.

[0010] The features and advantages of the invention will become clear from the following detailed description of a preferred but not exclusive embodiment thereof, given with reference to the appended drawings which are provided purely by way of non-limiting example and in which:

- Fig. 1 is a perspective view of a special-purpose bench for the maintenance of axles and/or transmissions and/or differentials of the invention;
- Fig. 2 shows a detail of Fig. 1 on an enlarged scale;
- Fig. 3 is a perspective view of an axle with a fixed body supported by the special-purpose bench of the preceding drawings;
- Fig. 4 is a perspective view of the bench of the preceding drawings on which an axle with removable housings is mounted;
- Fig. 5A is a perspective view of the special-purpose bench of the invention equipped for the maintenance of a differential;
- Fig. 5B shows a detail of Fig. 5A in a different operating position;
- Fig. 6 is a perspective view of the special-purpose bench of the preceding drawings equipped for the maintenance of a transmission;
- Fig. 7 is a further perspective view of the special-purpose bench of Fig. 6 for the maintenance of a different type of transmission.

[0011] In the drawings, the basic structure of a special-purpose bench for the maintenance and repair of axles and/or transmissions and/or differentials is shown overall by 1. This basic structure includes a table 2 supported by a support structure 3 by means of legs 4. The legs are provided with plates 4a for fastening to the ground and stabilizer members 4b, 4c may be provided to increase the transverse and longitudinal stability of the bench 1 if the apparatus mounted thereon should make this necessary.

[0012] A pair of tubular and coaxial guides 5, of polygonal section, is provided below the table 2, each of which bears a respective support 6 terminating in a fork 7 for supporting an axle, as better explained in the following. Referring to Figure 1, the combination of the coaxial guides 5, the support 6 and the fork 7 represents a special support means associated with the support structure 3 and/or the table 2. It should be understood that the present invention could also apply to different support means comprising a fork 7 for the support of the axle.

[0013] The coupling between the guides 5 and supports 6 is such as to enable the two components to slide with respect to one another, but to prevent their relative rotation. By means of pin locking members 8, the supports 6 may be locked in the respective guides in at least two positions, a working position in which the forks extend jointly from the table 2 on the opposite side with respect to the support structure 3, i.e. with the forks 7 open upwards, and a rest position in which the forks 7 open downwards. To this purpose, supports 6 can be fully extracted from the guides 5 in order to reverse the forks 7 between the aforesaid positions. In this manner, forks 7 can be locked in both position, in particular in the operative one, in a stable and robust manner, with a simple solution.

[0014] When in rest position, as shown in Fig. 4, the forks 7 extend from the table 2 on the same side with respect to the support structure 3 and entirely below a plane A defined by the planar development of the table 2 and schematically shown in Figs. 5A and 7. In this manner, the forks neither interfere with other equipment disposed on said table, some of which will be described in the following, nor prevent the use of the table for other general purposes.

[0015] In this document, the term "the forks extend entirely below the table" means that the forks 7 are positioned in a space comprised between the table 2 and the ground, i.e. in the space caused by the support structure 3. As shown in Fig. 3, an axle with a fixed body shown by A1 may thus be stably supported between the forks 7, mounted in a spaced manner on the table 2, when both forks face upwards so as jointly to form a support cradle for the axle A1. Through holes 10 are provided at the free end of the prongs 9 of each fork, via which holes the axle A1 may be temporarily locked in the working position on the forks 7.

[0016] A first accessory applied to the table 2 comprises a fold-down support 11 for axles with removable housings A2. This support includes, as shown in Fig. 2, a plate 12 with a tapered portion 13 having mask holes represented by three grooves 14, 15 and 16 positioned respectively at the central apex of the tapered portion 13 and at both vertices of the base of the said zone. These grooves are open on the side opposite the table 2 and a throat 17 located as a prolongation of the groove 14 is provided.

[0017] The support 11 is articulated about an axis 18 so that it can be folded down from the table 2 and is self-supported in the upright working position of Fig. 2 by means of two arms 19 which, in this position, keep the plate 12 slightly inclined with respect to vertical on the same side as the table 2 for a self-supporting coupling with the table 2.

[0018] The support 11 may in particular be rotated about the axis 18 which extends parallel to an edge 2a of the table 2 and is held in a rotary manner between opposing plates 2b of said table.

[0019] With reference to Fig. 4, in order to mount an axle with removable housings A2 on the fold-down sup-

port 11, when it is not desired or possible to use the forks 7, the retention screws A21 of the differential housing (i.e. the central part of the axle body) are used and are inserted in the grooves 14, 15 and 16 in order to lock the axle A2 in the position shown. As an alternative, the axle A2, after removing the cover of the differential housing, may be secured to said grooves by using the screws of the removed cover or the fastening screws of the removable housings. The throat 17 may house a possible pinion shaft of the differential.

[0020] When it is not in use, i.e. in the rest position, the fold-down support 11 may be rotated below the table 2 about the axis 18 so as not to interfere with other equipment disposed on said table.

[0021] A second accessory of the bench of the invention is a device 20 for the maintenance of differentials. With reference to Fig. 2, the device 20 comprises a base 21 by means of which it is detachably coupled to the table 2 and on which a bracket system 22 for a differential shown overall by D is secured.

[0022] The bracket system 22 includes a support 23 rotating about an axis parallel to and spaced from the base 21 which may be locked in angularly spaced positions by means of a drilled disc 24 in whose holes a spindle 25 urged by a spring 26 may be selectively engaged. The disc 24 bears a bracket 27 extending parallel to the axis of rotation of the bracket system 22 with a first hole 28 at an axial end and a slot 29 at the axially opposite end. As shown in Figs. 5A-5B, the differential D is secured by means of screws to the bracket system 22, by inserting and locking these screws in the hole 28 and the slot 29.

[0023] As the slot 29 has a development parallel to the axis of rotation of the bracket system 22, it enables the fastening of differentials of different dimensions.

[0024] Subsequently, as shown by Fig. 5B, the rotation of the bracket system 22 with respect to the base 21 enables the differential D to be moved into a plurality of angular positions in order to facilitate its maintenance.

[0025] A third accessory of the bench of the invention is a device 30 for the maintenance of transmissions. With reference to Figs. 6 and 7, the device 30 comprises a base 31 by means of which it is detachably coupled to the table 2 and on which a support 32 with a sleeve 33 is secured. A shaft 34 bearing, at one end, a flange 35 having mask holes 36 and, at the opposing end, a hole 37 for the insertion of a radial lever 38 in order more readily to manoeuvre the shaft 34 and the transmission mounted thereon in rotation, is inserted in the sleeve 33.

[0026] The shaft 34 may be locked in angularly spaced positions by means of screws 39 which may be inserted in openings provided in the sleeve 33.

[0027] As shown in Figs. 6 and 7, the transmission T is secured by means of screws to the flange 35, these screws being inserted and locked in the mask holes 36.

[0028] It will be appreciated that the rotation of the lever 38, inserted in the hole 37 of the shaft 34, makes it possible to position the transmission T in a plurality of operating positions in order to facilitate its maintenance.

[0029] The invention thus resolves the stated problem by facilitating the maintenance of mechanical components as illustrated above and with a greater degree of safety. In particular, the possibility of positioning the forks in a position in which they extend entirely below the table allows to use the table and, more in general, the work-bench, also for performing different operations on other parts of the transmission, since the volume above the table is completely free and thus capable of receiving other equipment for fixing such parts of the transmission. Furthermore, since the same table can be used as a basis for performing different operations, the work bench allows an improved exploitation of space, thus making the bench particularly compact and versatile.

[0030] Moreover, by applying a known electric motor to the members being maintained, it is possible to carry out a controlled and particularly precise running-in of those members.

Claims

1. A special-purpose bench for the maintenance of axles and/or transmissions and/or differentials, comprising a support structure (3) carrying a table (2) and special support means associated with the support structure (3) and/or the table (2), **characterized in that** the special support means comprise at least two forks (7) mounted on the table (2) and spaced apart in positions such that the forks (7) jointly form a support cradle for an axle, wherein the forks (7) are selectively fastened to the table (2) in at least two operative positions, namely a working position in which the forks (7) extend from the table (2) by projecting from the opposite side to the support structure (3) and a rest position in which the forks (7) extend entirely below a plane (A) defined by a planar development of the table (2).
2. A special-purpose bench for the maintenance of axles and/or transmissions and/or differentials according to claim 1, wherein the forks (7) can be reversed between the aforesaid positions.
3. A special-purpose bench for the maintenance of axles and/or transmissions and/or differentials according to claim 2, wherein locking means (8) are provided on each fork (7) for locking an axle in the working position.
4. A special-purpose bench for the maintenance of axles and/or transmissions and/or differentials according to any one of the preceding claims, including a fold-down support (11) for axles with removable housings, the fold-down support (11) being mounted on the table (2) in such a way that it can be swung between a first working position in which the fold-down support (11) is kept in an upright position and

a rest position in which the fold-down support (11) is rotated so as to be placed underneath the table (2), the fold-down support (11) being provided with mask holes for attaching the aforesaid axle to it.

5. A special-purpose bench for the maintenance of axles and/or transmissions and/or differentials according to claim 4, wherein the fold-down support (11) can be swung about an axis (18) parallel to the table (2) and spaced apart therefrom.
6. A special-purpose bench for the maintenance of axles and/or transmissions and/or differentials according to claim 4 or 5, wherein the fold-down support (11) is provided with means (19) for providing a self-supporting coupling to the table (2) when in a working position.
7. A special-purpose bench for the maintenance of axles and/or transmissions and/or differentials according to any one of the preceding claims, comprising an attachment for a device (20, 30) for the maintenance of transmissions and/or differentials.
8. A special-purpose bench for the maintenance of axles and/or transmissions and/or differentials according to claim 7, wherein the device (20) for the maintenance of differentials comprises a bracket system (22) which can be orientated in a plurality of predetermined angular positions.
9. A special-purpose bench for the maintenance of axles and/or transmissions and/or differentials according to claim 7, wherein the device for the maintenance of transmissions (30) comprises a rotatable support (32, 33, 34, 35) for a transmission.
10. A special-purpose bench for the maintenance of axles and/or transmissions and/or differentials according to any one of the preceding claims, wherein said forks (7) are fixed to respective supports (6) slidably coupled to guides (5) provided below said table (2).
11. A special-purpose bench for the maintenance of axles and/or transmissions and/or differentials according to claim 10, wherein said guides (5) have a polygonal section.
12. A special-purpose bench for the maintenance of axles and/or transmissions and/or differentials according to claim 11, wherein said supports (6) can be extracted from said guides (5) in order to reversed said forks (7) between the aforesaid positions.

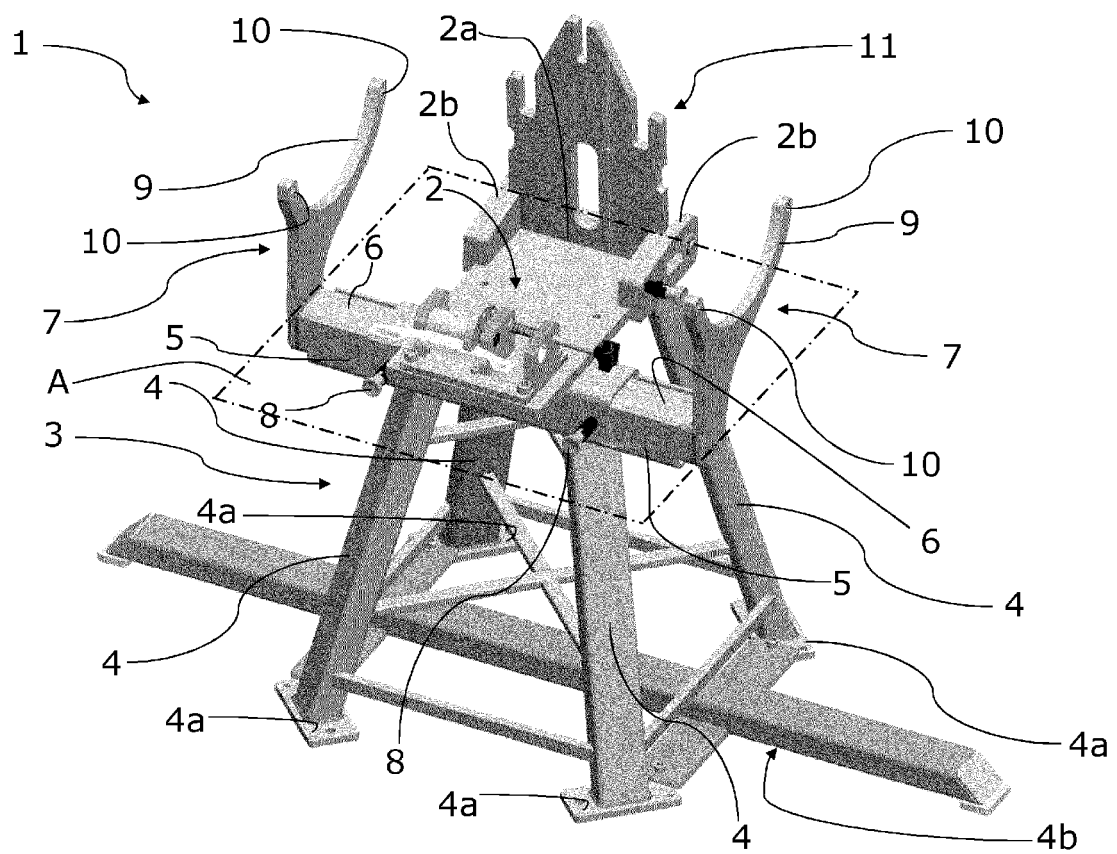


FIG. 1

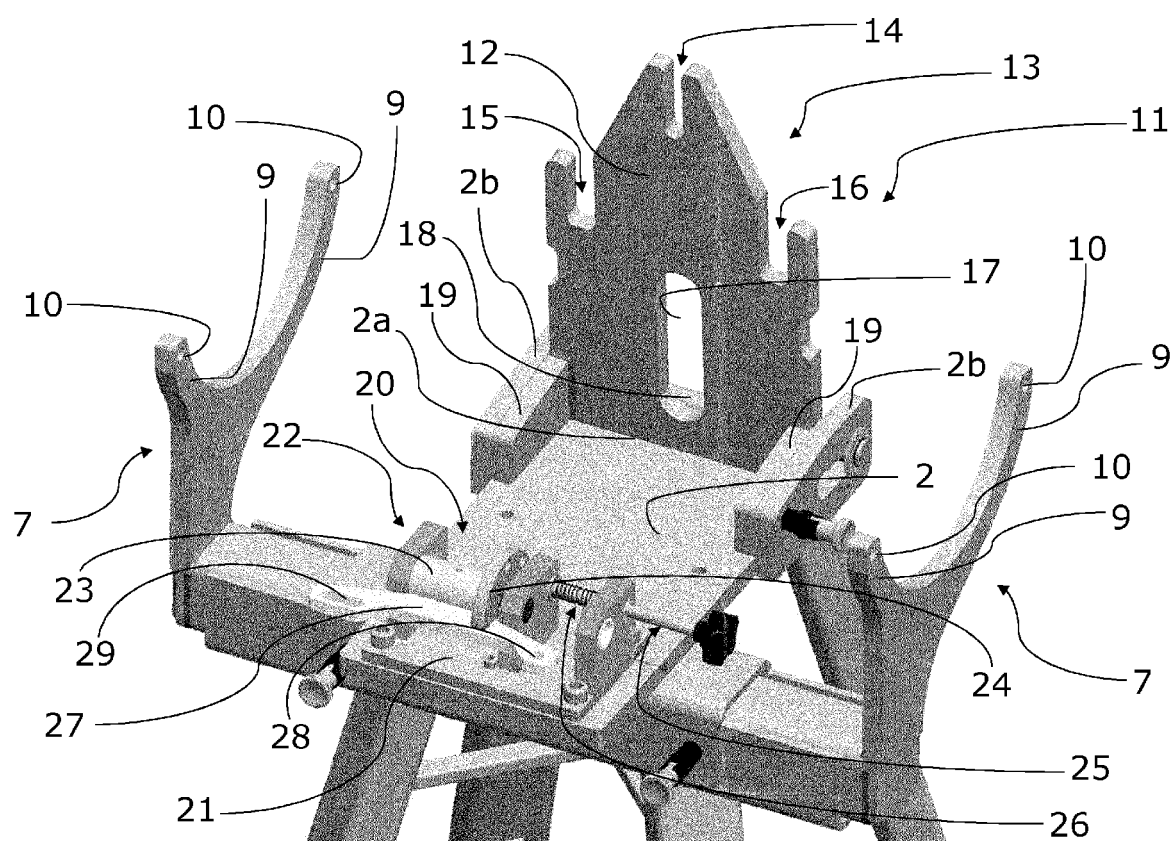


FIG. 2

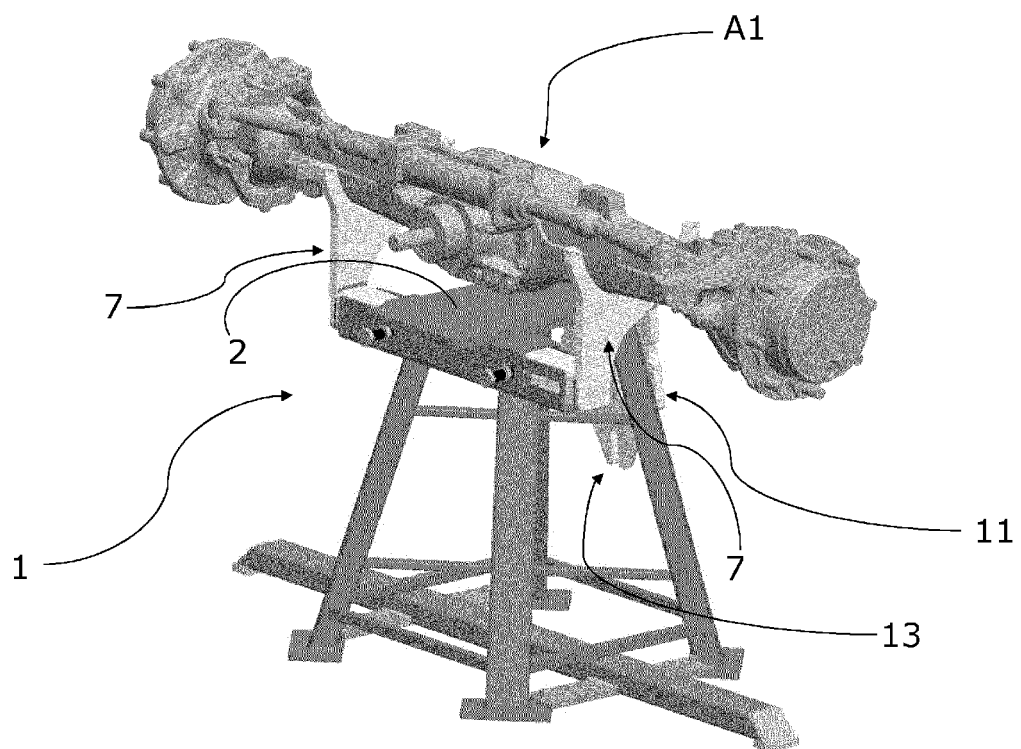


FIG. 3

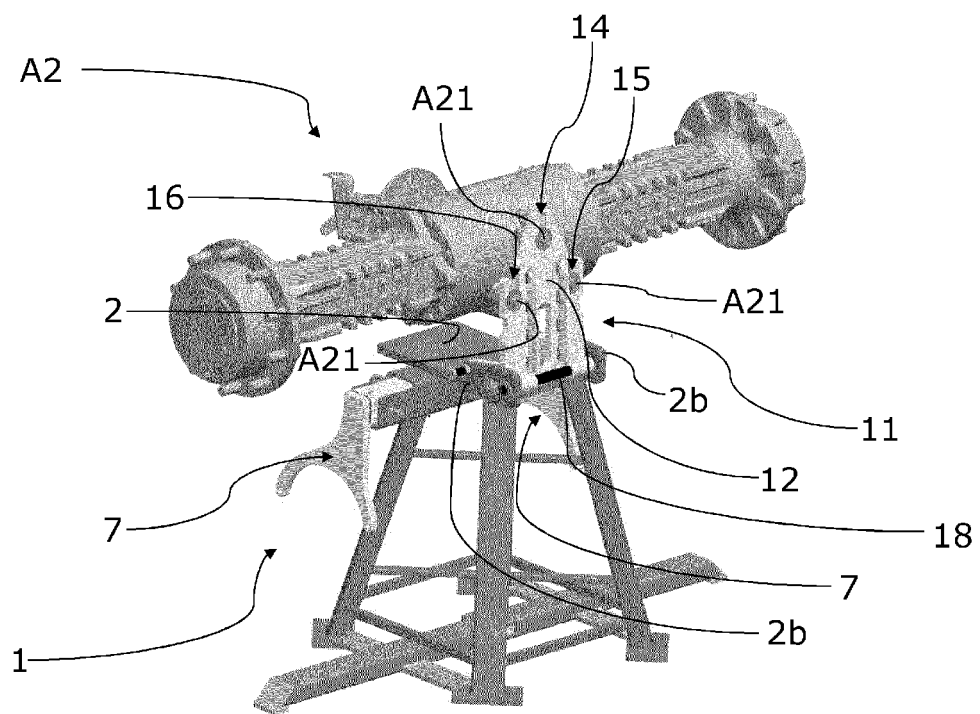


FIG. 4

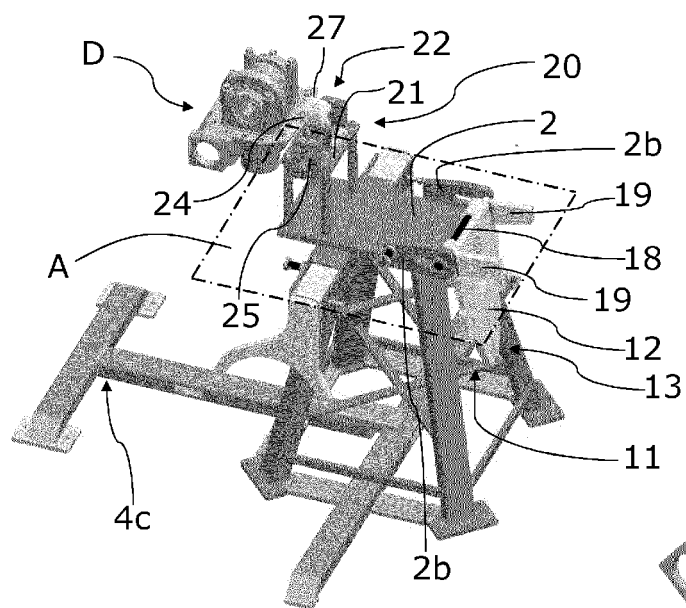


FIG. 5A

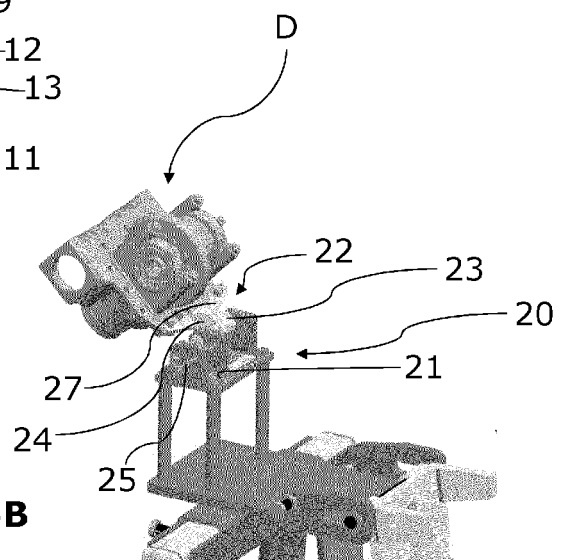


FIG. 5B

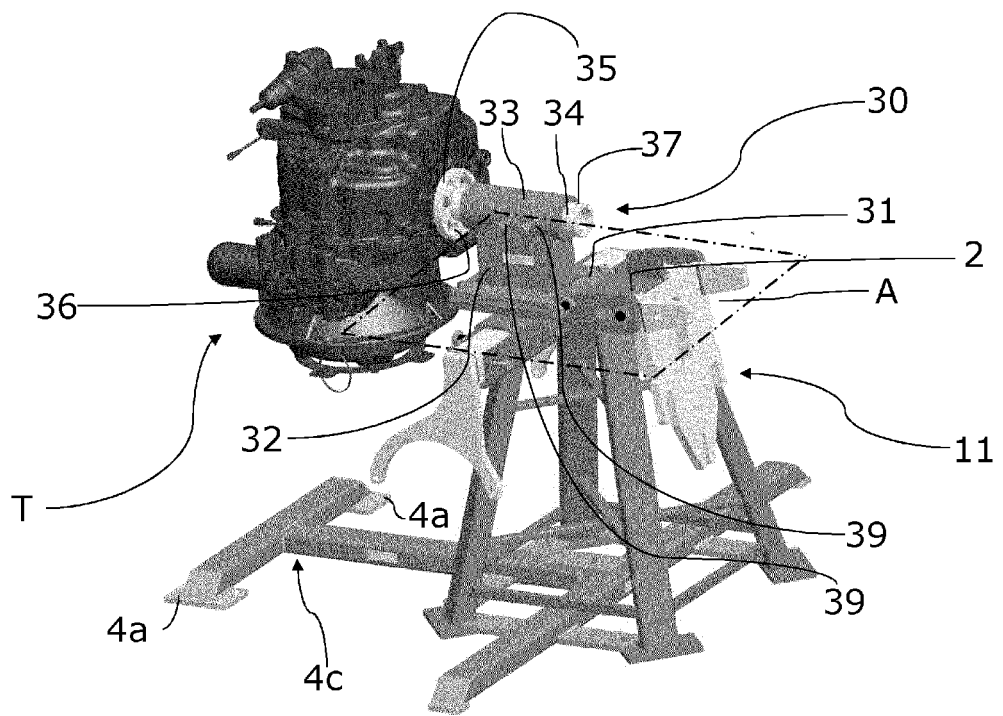


FIG. 6

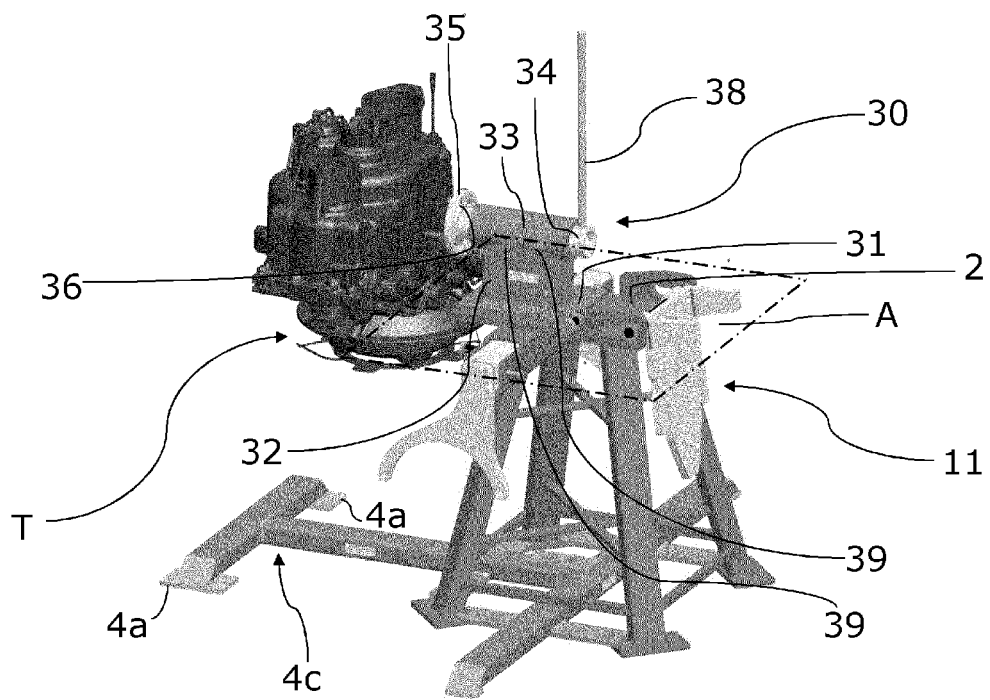


FIG. 7



EUROPEAN SEARCH REPORT

Application Number
EP 13 18 8124

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 1 556 882 A (WEAVER GAILARD E) 13 October 1925 (1925-10-13) * pages 1,2; figures * -----	1-12	INV. B25H1/00
A	US 4 206 911 A (HARRISON RONALD P [US]) 10 June 1980 (1980-06-10) * columns 3-5; figures * -----	1-12	
A	US 6 322 061 B1 (MASER GREGORY JAMES [US] ET AL) 27 November 2001 (2001-11-27) * columns 2,3 * -----	1-12	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
			B25H
Place of search		Date of completion of the search	Examiner
The Hague		25 October 2013	David, Radu
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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 13 18 8124

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25-10-2013

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 1556882	A	13-10-1925	NONE	
US 4206911	A	10-06-1980	NONE	
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REFERENCES CITED IN THE DESCRIPTION

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