



- (51) International Patent Classification:  
B62K 15/00 (2006.01)
- (21) International Application Number:  
PCT/HU2016/000018
- (22) International Filing Date:  
7 April 2016 (07.04.2016)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:  
P1500155 9 April 2015 (09.04.2015) HU
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- (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,

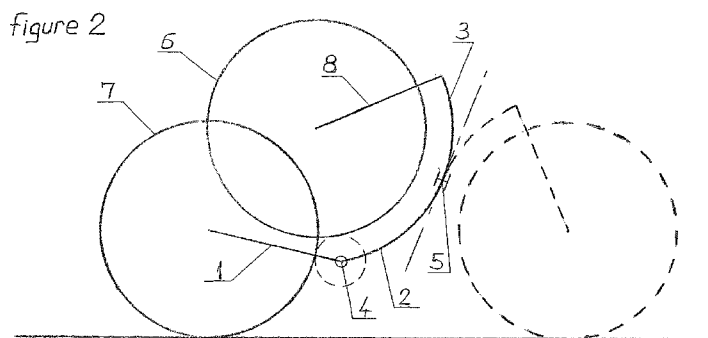
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- (84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, 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).

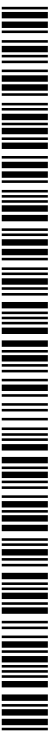
**Published:**

- with international search report (Art. 21(3))
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))

(54) Title: COLLAPSIBLE FLIP-PIVOT BICYCLE



(57) Abstract: The flip-pivot bicycle is a collapsible bicycle, that can be folded by a new method, and belongs into the class of the bicycles foldable about two or more axes. The flip-pivot bicycle consists of a driving-frame-segment (1) comprising the driving-wheel (7), a steering-frame-segment (3), comprising the steering-wheel (6), and a central-frame-segment (2), which connects them. The central-frame-segment (2) and the driving-frame-segment (1) is connected by and can pivot about a pivot-axis (4), which pivot-axis (4) is perpendicular to the plane of the parallelly positioned wheels (6, 7), or forms an angle of maximum 45 degree with this perpendicular. The central-frame-segment (2) and the steering-frame-segment (3) is connected and can pivot by a flip-axis (5), which flip-axis (5) is in the plane of the parallelly positioned wheels (6, 7), or is parallel to this plane, or forms an angle of maximum 45 degree with this plane. The function of the flip-axis (5) is to relocate the wheel distant to the pivot-axis (4) as close (or approximately as close) to the pivot-axis (4) as the other wheel is. Thereby flipping the driving-frame-segment (1) on the central-frame-segment (2) by the flip-axis (5), and offset the original planes of the wheels (6, 7) in the meantime, the two wheels (6, 7) can be folded next to each-other. Beyond the above, the flip-pivot bicycle can be equipped with an extra frame-brace; with central-suspension; with crank-axle with releasable fixing which can be re-fixed also in less than 180 degree to each-other, and/or the with pedals inward; with stem that can be slid into one of the forks or next to it; and with seatpost running out of the plane of the driving wheel.



## PATENT DESCRIPTION

**a) Title of the invention:**

Collapsible flip-pivot bicycle.

**(b) Classification of the invention:**

Bicycle collapsable about two or more axes.

**(c) Relevant existing technical solutions:**

The most common method of collapsing a bicycle is when the bicycle is folded in half about an axis roughly perpendicular to the ground, by the hinge placed on the frame. This method is typically - but not exclusively - applied in the smaller size (20-inch or less wheel-diameter) bicycles. The disadvantage of this method, that it results not the most compact size (since the distance of the folding axis to the periferic of the distant wheel is minimum the half of the distance between the periferics of the wheels), and this method is not optimal in terms of rigidity either, as significant static and dynamic forces arise where the folding hinge is. Lot of manufacturers offer bicycles with this folding method.

The larger bikes are very rarely is offered in collapsable deign. If so, the typical folding method of them is that the complete rear/drinig-wheel assembly can be flipped sideways forward along the axis of the seatpost.

The disadvantage of this method is, that in order to achieve the most compact size the steering-wheel has to be dismounted and re-mounted to the folded frame. (e.g. EP0080792 B1).

Beyond the above, there are also folding bicycles flipping over underways (e.g. EP0026800 B1), where the complete rear/driving-wheel assembly can be flipped underways forward along the axis of the crank-shaft (or nearby to it) to beneath the main-frame and right behind the steering-wheel, and the steering-wheel can folded back sideways by a hinge next to the flipped rear-wheel.

Disadvantage is that it can be applied to only with small wheel sizes, and the main-frame has to run relatively high, since the flipped rear-wheel has to fit beneath the main-frame.

An also commonly known collapse method, when the bike frame is an upwardly open arc (possibly bending back on the wheels on one or both ends with inflexion point(s)) with the radius more of the wheels, where the wheels can be flipped up inside the frame arc at the ends of the arc (or at the inflexion point(s)) along two axes which are parallel to the closest section of the wheels' periferics, but offset to each-other in two different planes.

The disadvantage of this method is that flipping axis of the rear/driving-wheel assembly is relatively far from the ergonomically ideal point of the crankshaft, hence the the rear/driving-wheel assembly has to have a bigger own frame where the carnkshaft can positioned ideally, otherwise the construction is suit for electric drive the most. (e.g. WO 2011029750 A1).

In addition to the above common folding methods, there are lot of folding bikes with very complex, complicated and expensive folding mechanisms.

In addition to, in the most of the folding bikes, the frame of the rear/driving-wheel and the headset are connected with a single frame-tube only, which results in less rigidity of the bike, or requires heavy reinforcement with additional weight and cost.

**(d) Challenge of the invention:**

The subject of the invention is a collapsible bicycle, foldable about multiple axes, hereinafter referred as flip-pivot bicycle which is foldable by a new method, and have the following benefits:

- Can be folded simpler and in more compact size, particularly – but not exclusively – in bigger wheeled bicycles (above 20-inch wheel diameter, e.g. in 24-, 26- and 28-inch sizes), making them easier transportable either on public transport vehicles, or in car trunks.
- Collapsible ergonomically/comfortably without the removal of the front wheel.
- The folding method is applicable even with one- or two-side fork wheel-suspension.
- In addition, the bicycle can be equipped with an extra frame-brace without impede the folding process, thus providing higher mechanical strength to the structure without significant additional weight.

**(e) Solution in accordance with claims:**

The collapsible flip-pivot bicycle is a bicycle foldable about multiple axes, which consists of three rigid-itself frame-segments, i.e.

- the steering-frame-segment (3), comprising turnably the steering wheel assembly including i. e. the stem (16), the fork/forks (8) and the steering-wheel (6),
- the driving-frame-segment (1) comprising the driving-wheel (7),
- and the central-frame-segment (2), which connects the driving-frame-segment (1) and the steering-frame-segment (3)

characterized in that

the central-frame-segment (2) and the driving-frame-segment (1) are connected to each-other pivotably above a pivot-axis (4), which pivot-axis (4) is perpendicular to the plane of the parallelly positioned wheels (6, 7), or forms an angle of maximum 45 degree with this perpendicular, and

the central-frame-segment (2) and the steering-frame-segment (3) are connected to each-other turnably along a flip-axis (5), which flip-axis (5) is in the plane of the parallelly positioned wheels (6, 7), or is parallel to this plane, or forms an angle of maximum 45 degree with this plane.

(Figures 1-3 and Figures 4-7)

The function of the flip-axis (5) is to relocate the wheel distant to the pivot-axis (4) (Typically the steering wheel (6)) as close (or approximately as close) to the pivot-axis (4) as the other wheel (Typically the driving-wheel (7)) is. (Figure 2)

Consequently, the flip-axis (5) is approximately the median-perpendicular of the centers of the unfolded and desired folded positions of the flipped wheel (Typically the steering wheel (6)).

Based on the above, theoretically the flipped wheel can be relocated anywhere on a circle concentric to the pivot-axis (4) with the radius equal (or close to equal) to the distance of the other wheel, as can have infinite position on this circle.

However in the most ideal case, the folded and the unfolded positions of the flipped wheel do not intersect each-other, but are the closest to each other as much as possible, thus the flip-axis (5) is the closest to the periferic of the wheel, resulting the most compact folded dimension.

Coaxiality of the wheels when folded:

Depending on whether the flip-axis (5) relocates the wheel distant to the pivot-axis (4) exactly as close to the pivot-axis (4) as the other wheel is, or just near as close, the axes of the wheels in folded state are coincident or not.

The coaxiality of the folded wheels results better maneuverability, but less compact size due to that the widest point of a bicycle wheel is typically at its axis.

Therefore, the slightly not coaxial position of folded wheels is also a considerable design solution. (Figure 14.)

### Offset of the plane of the wheels during folding:

If the flip-axis (5) were in the plane of the parallelly positioned wheels (6, 7), and the pivot-axis (4) were perpendicular to it, and the central-frame-segment (2), were not possible to be offset to the driving-frame-segment (1) along the pivot-axis (4), then the bicycle could not be folded, as in the folded position the wheels were in the same plane.

To eliminate this above coincidence, one of the following solutions or a combination of them is needed:

- One of the fundamental solution is to offset the flip-axis (5) from the plane of the parallelly positioned wheels (6, 7). For this purpose the following solutions or a combination of them is needed:
  - The flip-axis (5) is inside the frame segments (2, 3), but the frame segments (2, 3) or the section of them where the flip-axis (5) is located is outside of the plane of the parallelly positioned wheels (6, 7). This asymmetrical design imply some torsion load on the frame but it is not significant. (Figures 4-7)
  - The flip-axis (5) is out of the plane of the parallelly positioned wheels (6, 7), and the frame segments (2, 3) or the section of them where the flip-axis (5) is located is duplicated, and one of the frame-branches incorporates the pivoting flip-axis (5), while while the other frame-branch is designed with releaseably fixed connection (e.g. with releasable fast-lock or releasable latch) at the connection of the frame segments (2, 3). (Figures 8 and 9)
  - The flip-axis (5) is out of the plane of the parallelly positioned wheels (6, 7), but where the central-frame-segment (2), and the steering-frame-segment (3) are align with that plane. (The flip-axis (5) does not have statical role when the bicycle is unfolded, and when the statical and dynamic loads are beared by the releaseably fixed connection (e.g. with releasable fast-lock or releasable latch) which connets the central-frame-segment (2) and the steering-frame-segment (3) . This case the flip-axis (5) should be designed only for the statical loads arising during the folding of the bike. (Figures 10 and 11)
- The central-frame-segment (2) and the driving-frame-segment (1) which are connected by and can pivot above the pivot-axis (4), can be offset along the pivot-axis (4). (Figures 12-13)
- The flip-axis (5) forms an angle of 0-45 degree with the plane of the parallelly positioned wheels (6, 7) and/or pivot-axis (4) forms an angle of 0-45 degree with the perpendicular of this plane, thus the plane of the steering-wheel (6) will move out of the plane of the driving-wheel (7) during the folding process. (Figures 15 and 16)
- The steering-wheel (6) is designed to be pivotable along an axis which is out of the plane of the steering-wheel (6) itself, which axis can be e.g. one of the forks (8), when the fork-crown item which connects the forks (8) to the stem (16) consist of two releaseably fixed parts splitted horizontally. (Figures 17 and 18)

Naturally the one-side fork (8) suspension results more compact folded size. (Figures 4-7)

### Extra frame-brace (9)

The rigidity of the flipping-pivoting bicycle can be enhanced by an extra frame-brace (9) which connects the driving-frame-segment (1) either with the central-frame-segment (2), or with the steering-frame-segment (3), with hinge or tenon connection on the one end, and releaseably fixed connection (e. g. releasable fast-lock or releasable latch) on the other or on both ends.

The complementary frame-brace (9) can be fixed to the driving-frame-segment (1) in multiple positions on the alternative frame-brace fixing points (10), and/or can consist of two or more longitudinally telescoping pieces sliding into or side-by each-other. Thus the distance between the seatpost (15) and the stem (16) can be varied in wide range giving significant flexibility to set the most comfortable seating position.

The extra frame-brace (9) can serve for fixing of the saddle (14), or of the structure incorporating the saddle (14), or of the seatpost (15). (Figures 19-20)

#### Central suspension

Beside the basic rigid connection of the central-frame-segment (2) and the driving-frame-segment (1) of the unfolded bicycle, the bicycle can be equipped with central suspension, where the flexible-item can be either at the pivot-axis (4) or incorporated in the extra frame-brace (9), and this flexible-item can be de-activated during the folding of the bike above the pivot-axis (4).

The central suspension can substitute and eliminate the necessity of the normal spring item(s) in the fork(s) (8) of the steering-wheel (6).

#### Location of the Drive shaft (11)

Ideally the crank-shaft (11) is located on the driving-frame-segment (1) even – but not necessarily - in align with the pivot-axis, as in this case the crank-shaft (11) distance to the axis of the driving-wheel (7) does not change during the folding. (Figures 4 to 7 and Figures 19-20).

If the crank-shaft (11) is located on the central-frame-segment (2) it's distance to the axis of the driving-wheel (7) varying during the folding, which can be compensated with one of the following solutions:

- In case of chain drive, the drive can be transmitted in two stages through an anciliary chain-wheel which axis is coaxial with the pivot-axis (4).
- In case of chain drive, the other solution is to apply a derailleur with the necessary flexibility to compensate the varying distance during the folding.
- In case of Cardan-shaft drive the shafts have to be telescopic, and is preferred to be inline with each-other when the bicycle is unfolded to eliminate the sinusoidal transmission of the Cardan-drive when the shafts are in angle.

#### Shape of the frame-segments (1, 2, 3)

Ideally in order of the most compact collapsed size, the frame-segments (1, 2, 3) in the collapsed state should follow (lean on) as closely as possible the arc of the wheels.

Of course, the frame-segments (1, 2, 3) can be straight/angular as well, while keeping in mind the ideal position of the flip-axis (5).

#### Pedals (13) and crank-arms (12)

In normal condition, the crank-arms (12) mounted on two sides of the common crank-shaft (11), are in 180 degrees to each-other, and the pedals are mountes outward on the outside of their respective crank-arm (12).

However, more compact folding size is achievable when the crank-arms (12) can be mounted to the crank-shaft (11) even in less than 180 degrees to each-other, by using releasable fast-lock fixing.

It is also expedient in order of the most compact size, when one or both crank-arms (12) can be mounted to the crank-shaft (11) even with pedals (13) inward, and/or one or both pedals (13) can be re-fixed on the inside of the respective crank-arm (12) by using releasable fast-lock fixing. (Figures 6 and 7)

#### Saddle (14) and its fixing

In order to further decrease the folded size of the bicycle, the seatpost (15) may run even out of the plane of the parallely positioned wheels (6, 7), and can be fixed to the driving-frame-segment (1), and/or to the central-frame-segment (2), and/or to the extra frame-brace (9).

#### Collapse of the stem (16)

In order of the compact size the stem (16) either

- can be folded down side by the wheel in the usual way by a hinge approximatelly perpendicular to the stem (16) and in an angle of 45-degree to the plane of the steering-

- wheel (6), or
- if the stem (16) is running out of the plane of the steering-wheel (6) it is slidable by along its own axis into one fork (8) of the steering-wheel (6) or next to it. (figures 21-24)

**(f) List of the attached figures with denomination of the tags:**

The item numbers in drawing names:

1. Driving-frame-segment
2. Central-frame-segment
3. Steering-frame-segment
4. Pivot-axis
5. Flip-axis
6. Steering-wheel
7. Drive-wheel
8. Fork
9. Frame-brace (fixed or variable length)
10. Frame-brace-alternative-fixing-points
11. Crank-shaft
12. Crank-arm
13. Pedal
14. Saddle
15. Seatpost
16. Stem

Attached figures:

Figure 1, 2, 3: Schematic figure showing the collapsing method of the bike (the main claim).

Figure 4, 5, 6, 7: Example for a complete bicycle showing the main and some sub-claims.

Figure 8, 9: Schematic figure showing a sub-claim about one possible way of offset the plains of the wheels.

Figure 10, 11: Schematic figure showing a sub-claim about one possible way of offset the plains of the wheels.

Figure 12, 13: Schematic figure showing a sub-claim about one possible way of offset the plains of the wheels.

Figure 14: Schematic figure showing the benefit of the non-coaxially positioned wheels in collapsed status.

Figure 15, 16: Schematic figure showing a sub-claim about one possible way of offset the plains of the wheels.

Figure 17, 18: Schematic figure showing a sub-claim about one possible way of offset the plains of the wheels.

Figure 19, 20: Shows one of the sub-claims the frame-brace (9).

Figure 21, 22, 23, 24: Shows one of the sub-claims the slidable stem (16).

## PATENT CLAIMS

1. Bicycle collapsible about multiple axes, and consists of three frame-segments, i.e.
  - the steering-frame-segment (3), comprising turnably the steering wheel assembly including the stem (16), the fork/forks (8) and the steering-wheel (6),
  - the driving-frame-segment (1) comprising the driving-wheel (7),
  - and the central-frame-segment (2), which connects the driving-frame-segment (1) and the steering-frame-segment (3)**characterized** in that  
the central-frame-segment (2) and the driving-frame-segment (1) are connected to each other pivotably above a pivot-axis (4), which pivot-axis (4) is perpendicular to the plane of the parallelly positioned wheels (6, 7), or forms an angle of maximum 45 degree with this perpendicular, and  
the central-frame-segment (2) and the steering-frame-segment (3) are connected to each other turnably along a flip-axis (5), which flip-axis (5) is in the plane of the parallelly positioned wheels (6, 7), or is parallel to this plane, or forms an angle of maximum 45 degree with this plane.
2. Collapsible bicycle according to claim 1, characterized in that the connection of both the central-frame-segment (2) with the driving-frame-segment (1) and the connection of the central-frame-segment (2) with the steering-frame-segment (3) is releasable or releaseably fixed connection.
3. Collapsible bicycle according to claim 1 or 2, characterized in that the steering wheel assembly incorporating i. e. the stem (16), the fork/forks (8) and the steering-wheel (6) is connected to the steering-frame-segment (3) by articulated (e.g. hinge) or by pinned (e.g. spigot) joints.
4. Collapsible bicycle according to any of the preceding claims 1-3, characterized in that either the driving-wheel (7) or the steering-wheel (6) or both can have one or two sided suspension.
5. Collapsible bicycle according to any of the preceding claims 1-4, characterized in that saddle (14) is connected to the driving-frame-segment (1) e.g. by a seatpost (15) expediently.
6. Collapsible bicycle according to any of the preceding claims 1-4, characterized in that saddle (14) is connected to the central-frame-segment (2) e.g. by a seatpost (15) expediently.
7. Collapsible bicycle according to any of the preceding claims 1-6, characterized in that crank-shaft (11), with the crank-arms (12) and pedals (13) are comprised by the driving-frame-segment (1).
8. Collapsible bicycle according to any of the preceding claims 1-6, characterized in that crank-shaft (11), with the crank-arms (12) and pedals (13) are comprised by the central-frame-segment (2).
9. Collapsible bicycle according to any of the preceding claims 1-8, characterized in that either the pivot-axis (4) or the flip-axis (5) or both can be either articulated (e.g. hinge) or pinned (e.g. spigot) designed.
10. Collapsible bicycle according to any of the preceding claims 1-9, characterized in that the flip-axis (5) is inside the frame segments (2, 3), but the frame segments (2, 3) or the section of them where the flip-axis (5) is located are outside of the plane of the parallelly positioned wheels (6, 7).
11. Collapsible bicycle according to any of the preceding claims 1-9, characterized in that the frame section where the flip-axis (5) is running is out of the plane of the parallelly positioned wheels (6, 7), and the frame segments (2, 3) or the section of them where the flip-axis (5) is located is

11. Collapsible bicycle according to any of the preceding claims 1-10, characterized in that the frame-branches are duplicated, and one of the frame-branches incorporates the pivoting flip-axis (5), while the other frame-branch is designed with releaseable fixing at the connection of the frame segments (2, 3).

12. Collapsible bicycle according to any of the preceding claims 1-9, characterized in that the frame section where the flip-axis (5) is running is out of the plane of the parallelly positioned wheels (6, 7), but where the central-frame-segment (2), and the steering-frame-segment (3) are align with that plane.

13. Collapsible bicycle according to any of the preceding claims 1-12, characterized in that the central-frame-segment (2) and the driving-frame-segment (1) which are connected to each-other pivotably above a pivot-axis (4), can be offset along the pivot-axis (4).

14. Collapsible bicycle according to any of the preceding claims 1-13, characterized in that the flip-axis (5) forms an angle of 0-45 degree with the plane of the parallelly positioned wheels (6, 7) and/or pivot-axis (4) forms an angle of 0-45 degree with the perpendicular of this plane.

15. Collapsible bicycle according to any of the preceding claims 1-14, characterized in that the steering-wheel (6) is designed to be pivotable along an axis which is out of the plane of the steering-wheel (6) itself, which axis can be of one of the forks' (8) or a different one parallel or close parallel to the fork (8), when the fork-crown item which connects the forks (8) to the stem (16) consist of two releaseably fixed parts splitted horizontally.

16. Collapsible bicycle according to any of the preceding claims 1-15, characterized in that the bicycle is designed with an extra frame-brace (9) to increase the stiffness of the bicycle, which frame-brace (9) connects the driving-frame-segment (1) either with the central-frame-segment (2), or with the steering-frame-segment (3), with pivotable connection on the one end, and with releasable fixing on the other or on both ends; and the complementary frame-brace (9) can be fixed to the driving-frame-segment (1) in multiple positions on the alternative frame-brace fixing points (10), and/or can consist of two or more longitudinally telescoping pieces sliding into or sideby each-other; and the extra frame-brace (9) is suitable for fixing the saddle (14), or of the structure incorporating the saddle (14), or of the seatpost (15).

17. Collapsible bicycle according to any of the preceding claims 1-16, characterized in that beside the basic rigid connection of the central-frame-segment (2) and the driving-frame-segment (1) of the unfolded bicycle, the bicycle can be equipped with central suspension, where the flexible-item can be either at the pivot-axis (4) or incorporated in the extra frame-brace (9), and this flexible-item can be de-activated during the folding of the bike above the pivot-axis (4).

18. Collapsible bicycle according to any of the preceding claims 1-17, characterized in that in order to further decrease the folded size of the bicycle, the crank-arms (12) mounted on both ends of the crank-shaft (11) are connected to it with releasable fixing in such a way, that the crank-arms (12) can be re-fixed even in less than 180 degree to each-other which is their normal position, and/or one or both crank-arms (12) can be re-fixed even with pedals (13) inward.

19. Collapsible bicycle according to any of the preceding claims 1-18, characterized in that in order to further decrease the folded size of the bicycle, the seatpost (15) may run even out of the plane of the parallelly positioned wheels (6, 7).

20. Collapsible bicycle according to any of the preceding claims 1-19, characterized in that in order to further decrease the folded size of the bicycle, the stem (16) runs out of the plane of the steering-wheel (6), and can be slid into one of the forks (8) of the steering-wheel (6), or beside it.

Figure 1

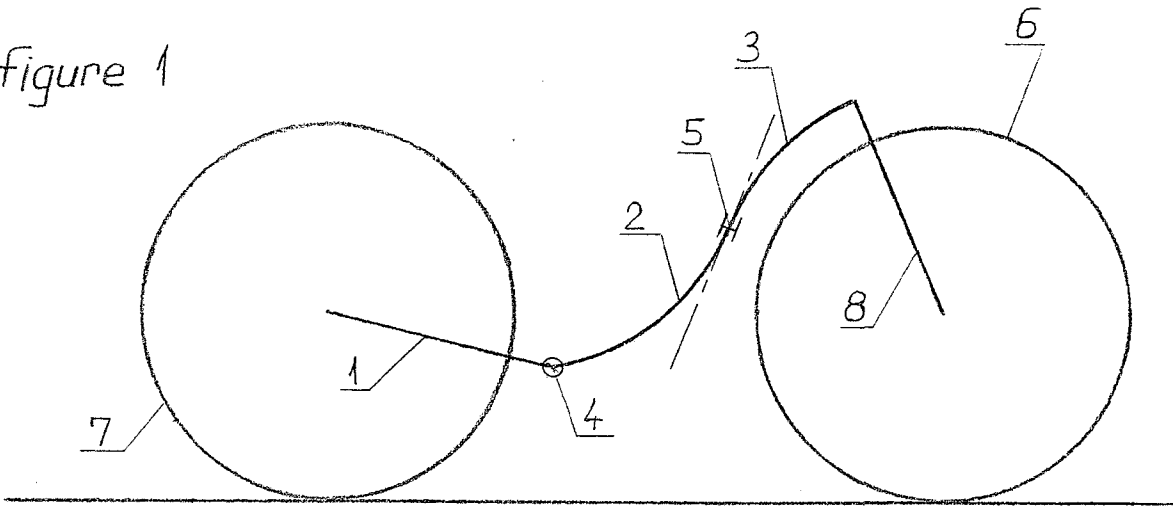


Figure 2

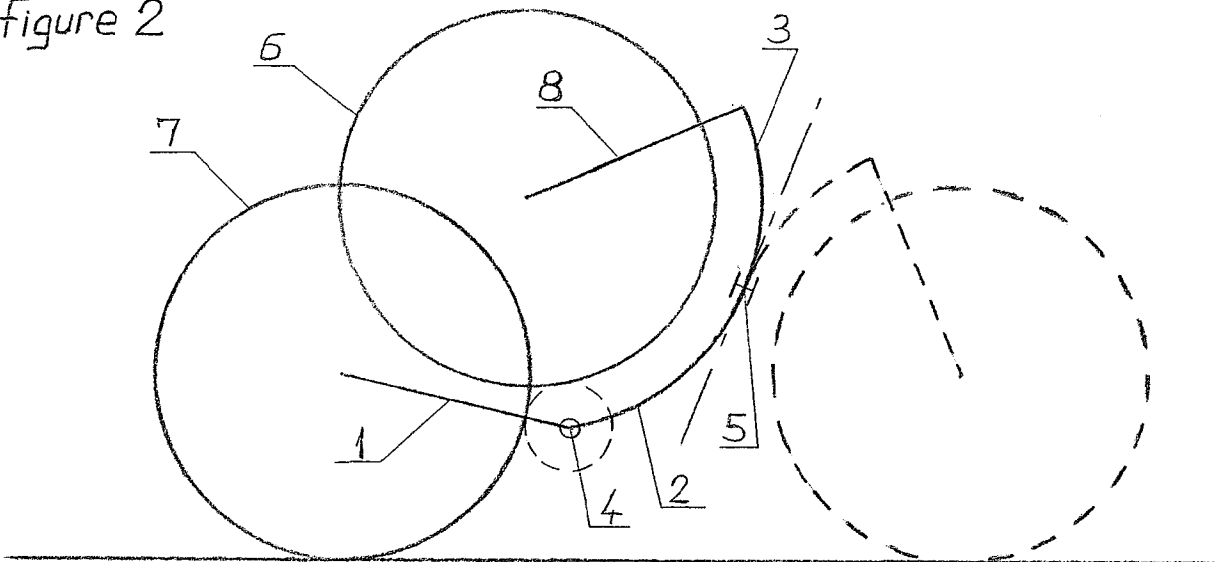


Figure 3

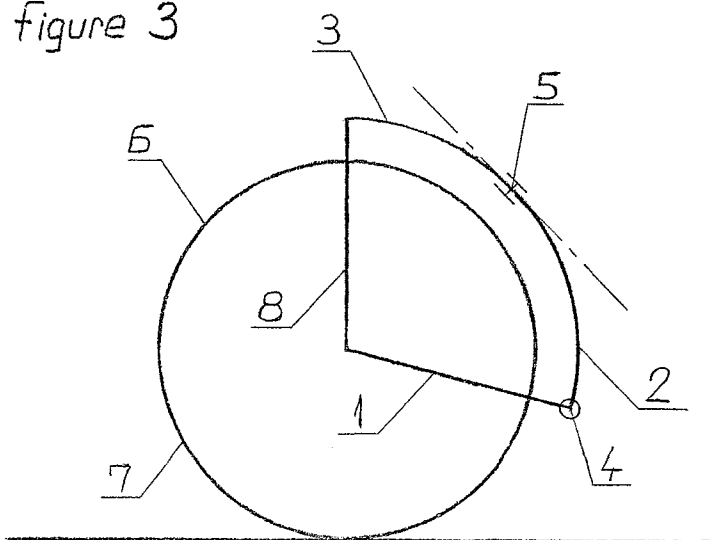


figure 4

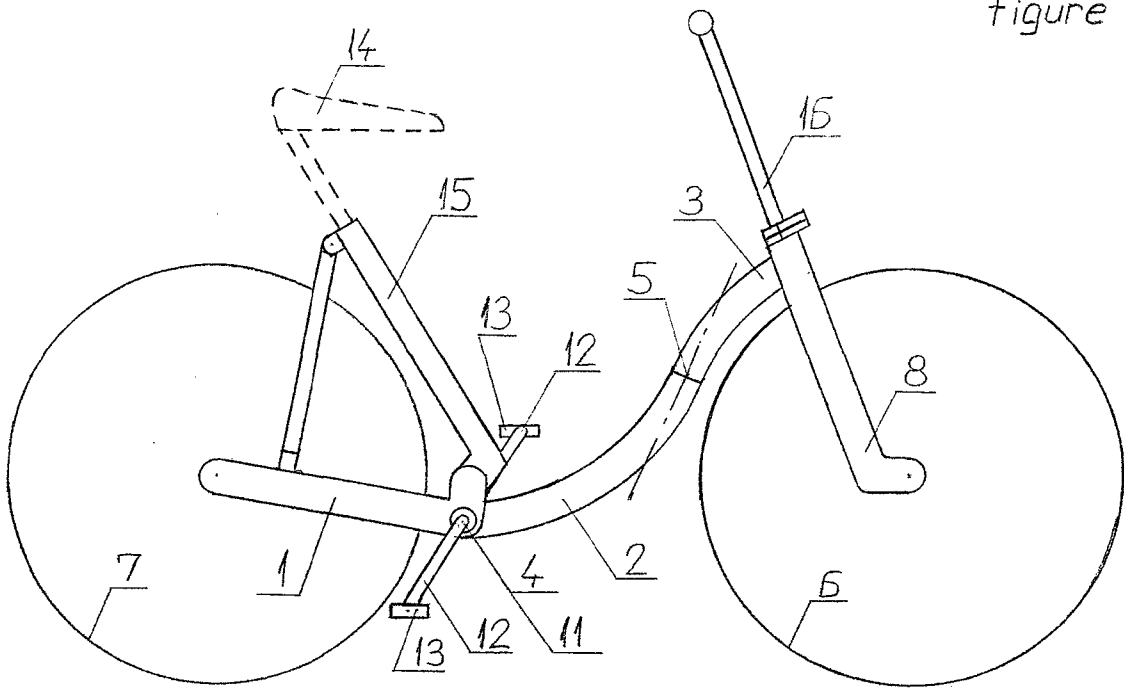
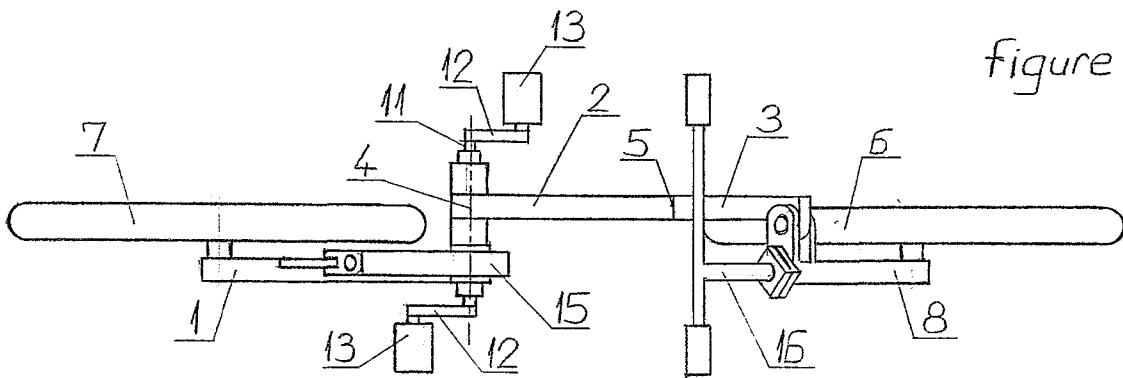


figure 5



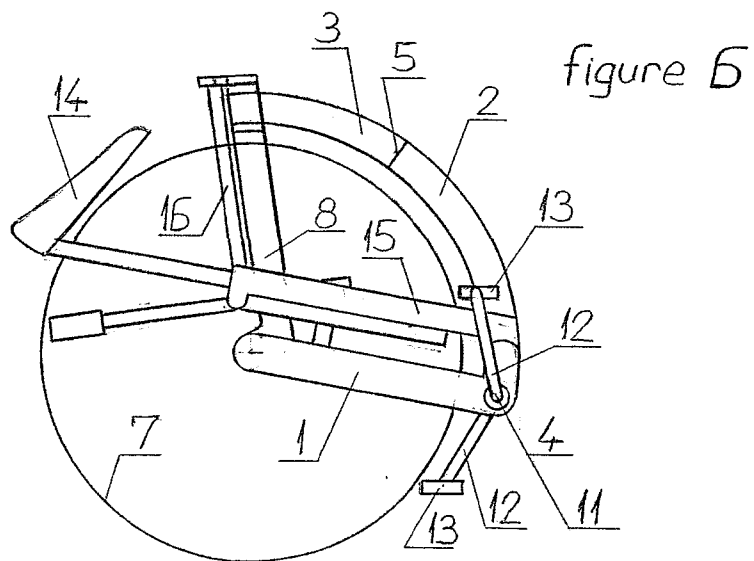


figure 5

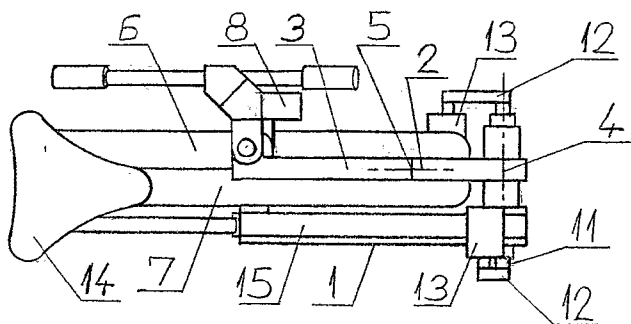


figure 7

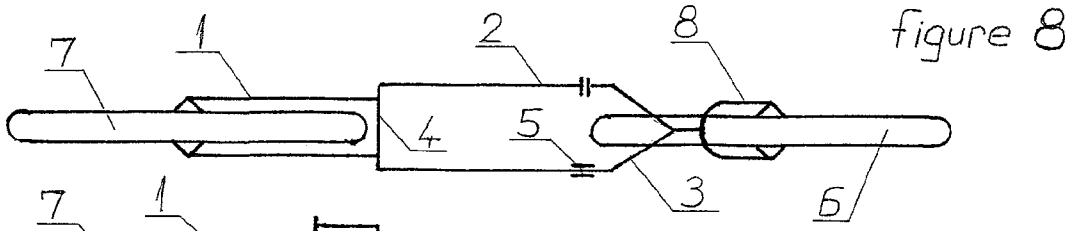


figure 8

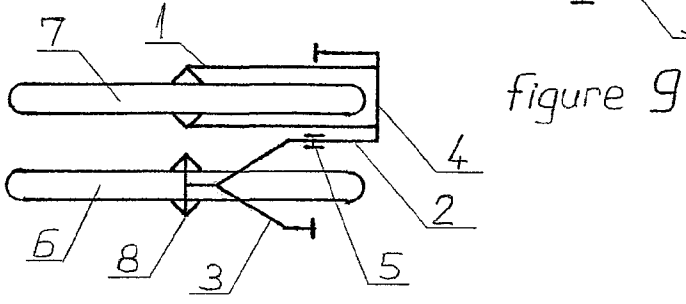


figure 9

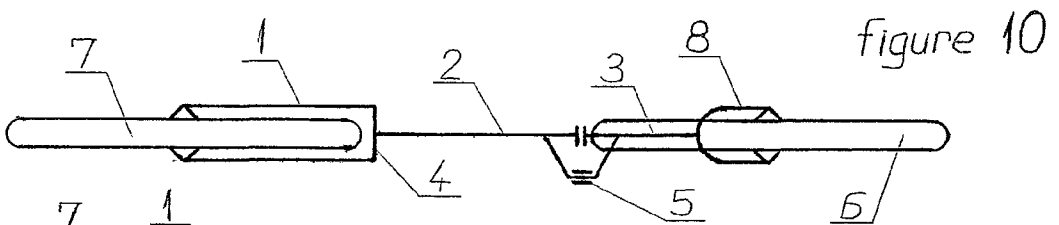


figure 10

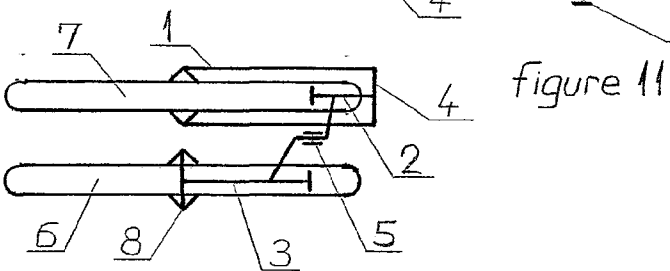


figure 11

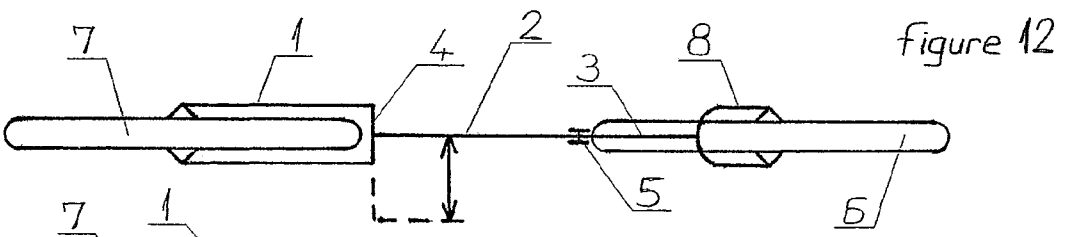


figure 12

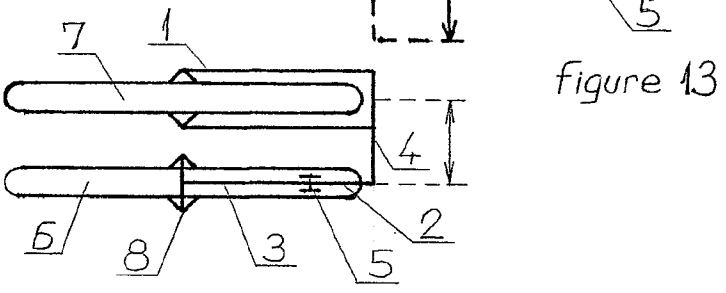


figure 13

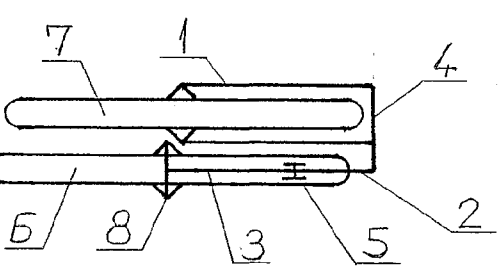


figure 14

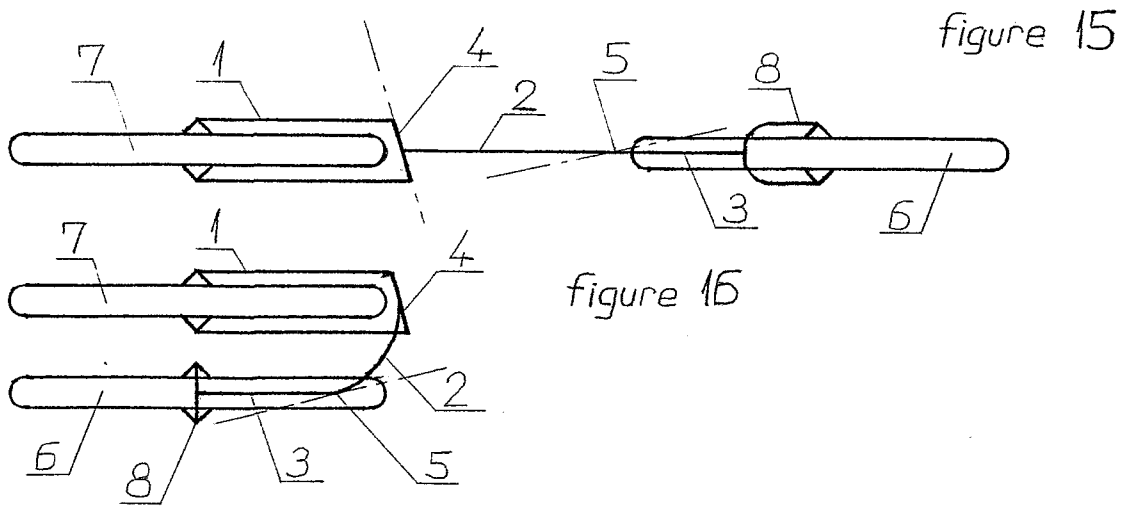


figure 17

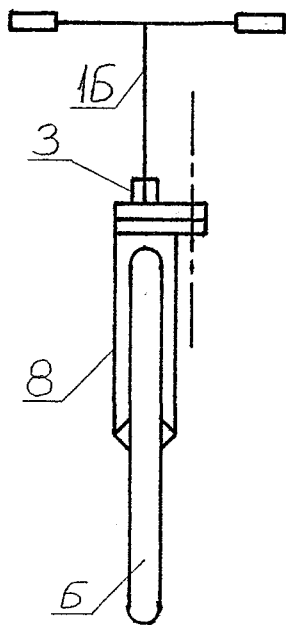


figure 18

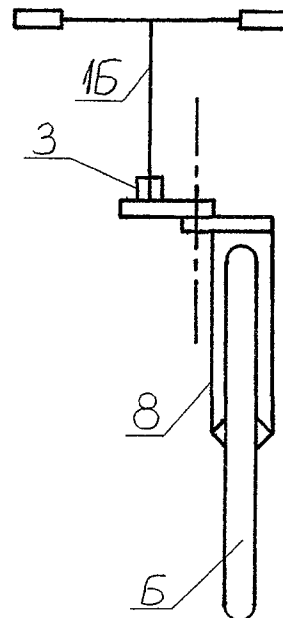


figure 19

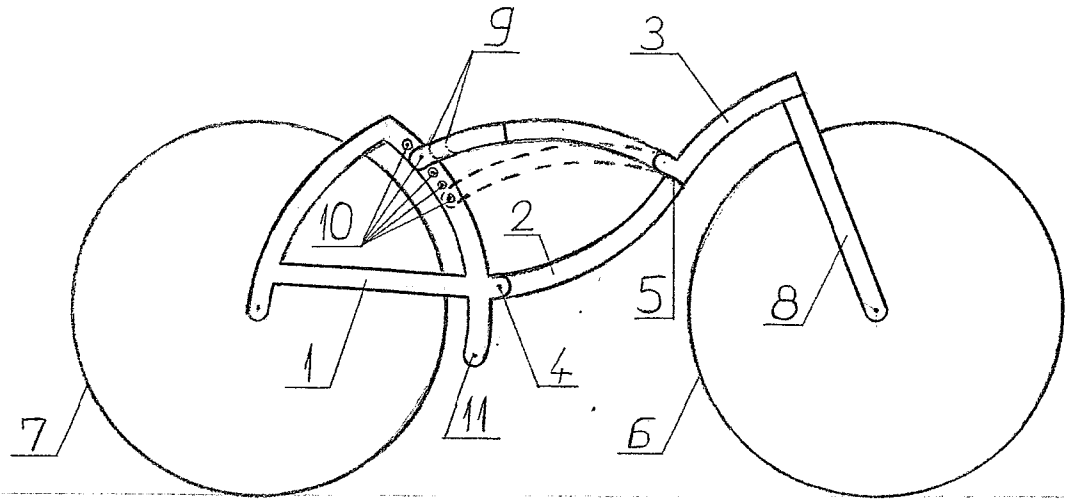


figure 20

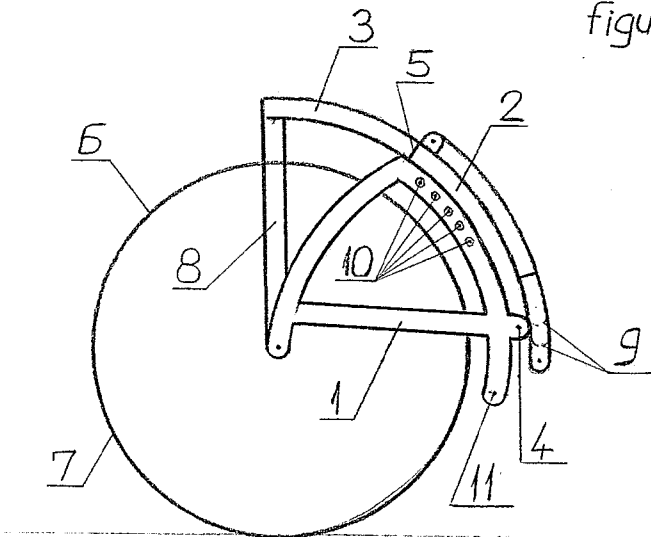


figure 21

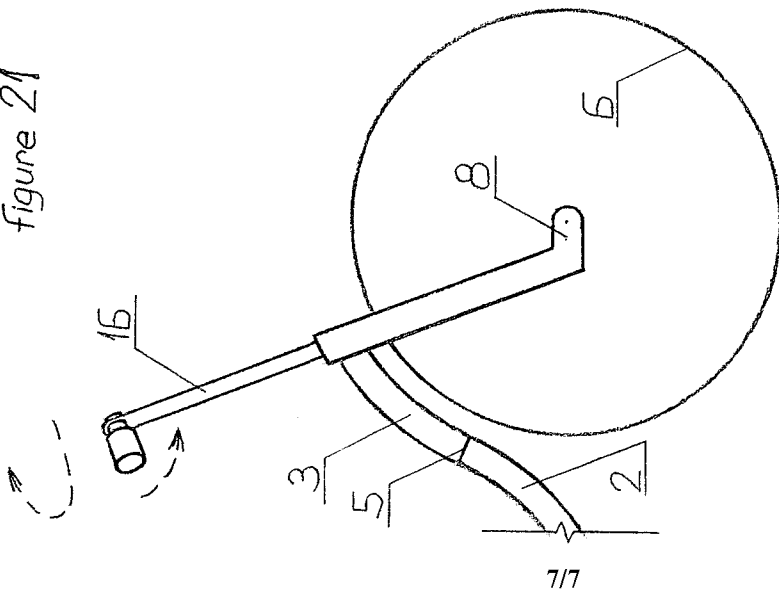


figure 23

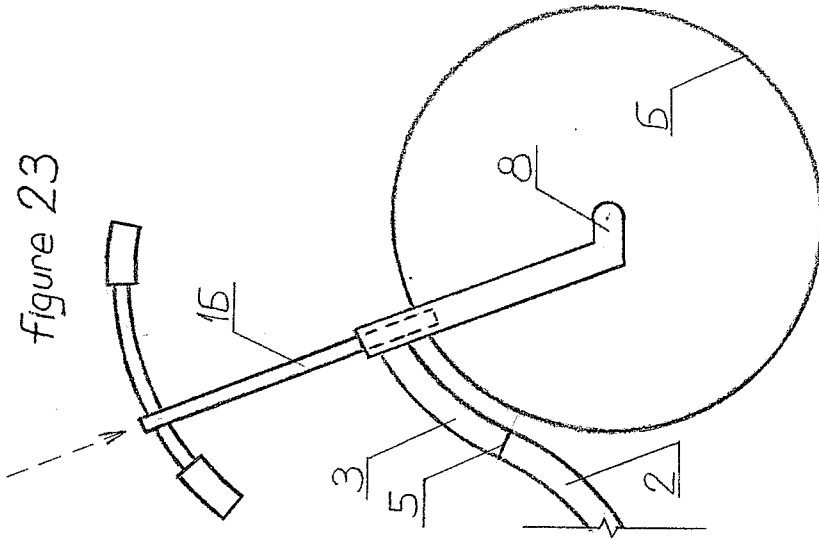


figure 24

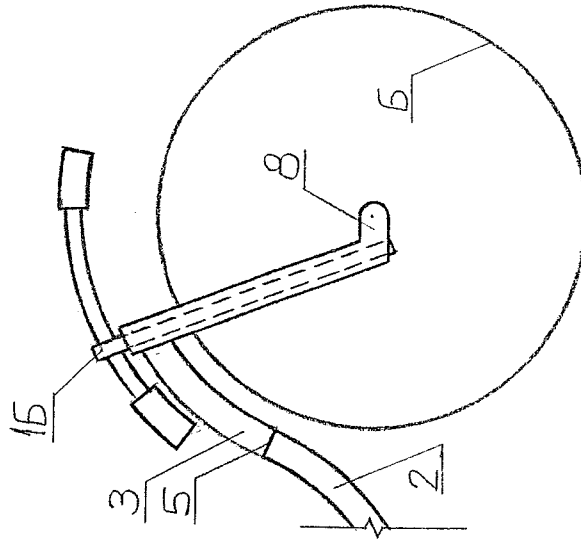
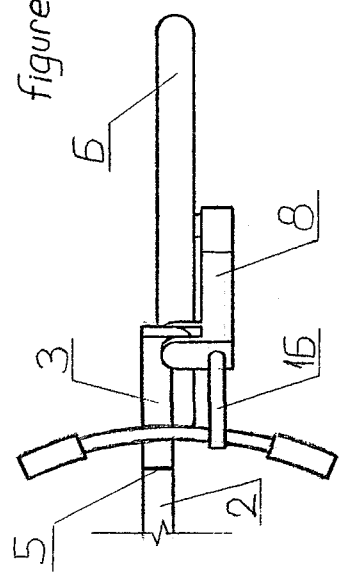


figure 22



## INTERNATIONAL SEARCH REPORT

International application No.

PCT/HU 2016/000018

A. CLASSIFICATION OF SUBJECT MATTER		
<b><i>B62K 15/00 (2006.01)</i></b>		
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)		
B62K 3/00, 3/02, 13/00, 13/02, 15/00, 19/00, 19/02		
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)		
Espacenet		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	RU 133088 U1 (FEDERALNOE GOSUDARSTVENNOE BYUDZHETNOE OBRAZOVATELNOE UCHREZHDENIE VYSSHEGO PROFESSIONALNOGO OBRAZOVANIYA "URALSKIY GOSUDARSTVENNY LESOTEKHNICHESKIY UNIVERSITET") 10.10.2013, claims, p. 4-5, fig. 1-4	1-3
X	JP 2010285116 A (WAKAO HIROSHI) 24.12.2010, abstract, fig. 1	1-3
X	JP 2010143559 A (ASHIZAWA KATSUMI) 01.07.2010, abstract, fig. 1, 3, 12-16	1-3
A	DE 10052822 A1 (MARGADANT NIKOLAUS) 08.05.2002, abstract, claims, fig. 1A-6	1-3
<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/> See patent family annex.		
* 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 document 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		Date of mailing of the international search report
04 August 2016 (04.08.2016)		18 August 2016 (18.08.2016)
Name and mailing address of the ISA/RU: Federal Institute of Industrial Property, Berezhkovskaya nab., 30-1, Moscow, G-59, GSP-3, Russia, 125993 Facsimile No: (8-495) 531-63-18, (8-499) 243-33-37		Authorized officer  D. Zadunaev  Telephone No. (495)531-64-81

INTERNATIONAL SEARCH REPORT

International application No.

PCT/HU 2016/000018

**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.: **4-20**  
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.