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D-81669 München (DE)**(54) **An automatically operating apparatus for pulling up bank sticks.**

(57) According to the invention one has aimed at providing an automatically operating apparatus for pulling up bank sticks (4) and similar rods/poles driven down into the ground, intended to be mounted on a vehicle and comprising an articulated boom having an attachment bracket or similar coupling member carried at the free end thereof. The apparatus according to the invention distinguishes itself in that a bank stick catcher device (1) is connectable to the attachment bracket (3) or similar coupling member and comprises a frame part (11) having bank stick land means (14, 15) and a catching arm (17) pivotally arranged in relation to the frame part (11) and pivotable between an inactive and an active position, wherein it cooperates with said bank stick land means (14, 15) in order to retain a bank stick (4), the rotation of the catching arm (17) taking place compulsorily from a drive unit (12) through a transmission means (23, 24, 22, 13).

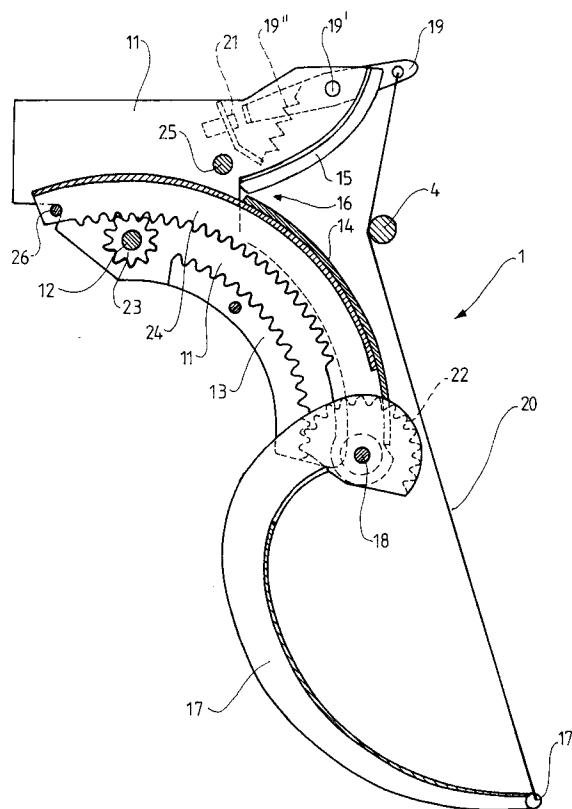


Fig.2

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The present invention relates to a vehicle-carried, automatically operating apparatus adapted to pull up bank sticks and similar rods/poles driven into the ground and to displace a pulled-up bank stick, etc., for arranged accumulation on the vehicle.

From NO patent No. 168,721 an apparatus for automatical setting of bank sticks and the like is known, said apparatus being intended to be mounted on a vehicle and comprising i.a. an articulated boom consisting of pivotal arms displacing the bank sticks, one at a time, from a bank stick magazine or supply on the vehicle to a pre-drilled hole in the ground, the bank stick being swung from a horizontal position within the magazine or supply to a vertical set position.

This prior art bank stick setting apparatus functions satisfactory. On the market, however, there does not exist a corresponding automatically operating apparatus to remove bank sticks set or rods/poles driven down and to collect these within a magazine or supply on the vehicle.

As well known, bank sticks are placed along the roadsides in the autumn within regions wherein the roads are expected to be covered with snow in the winter. The bank stick portion protruding above the snow, marks the course of the road below the snow cover. However, it is desirable to remove these bank sticks in the spring and to use them once more the next autumn. In the summer, they are quite useless and might be damaged through cars or by wilful damage.

Manually operated mechanical auxiliary means are previously known, in the form of so-called bank stick gathering claws, adapted to contribute in pulling-up driven-down bank sticks, thereby reducing the hard work. Even equipped with such gathering claws, the work is time-consuming and risky because one all the time works in a region subjected to more or less traffic. Bad weather conditions may also represent a health risk associated with such work.

Thus, there exists a clear need for a vehicle-carried, automatically operating apparatus adapted to grip around a bank stick or the like driven down into the ground, and to pull the same up from the ground, thereafter displacing it to a magazine or supply in order to establish an arranged collection on the vehicle.

This need is covered through designing an apparatus of the kind defined introductorily in accordance with the characterizing part of the following claim 1.

According to a suitable embodiment of the present invention, that apparatus component comprising the catcher means with assigned devices may be arranged at the free end of the aforesaid articulated boom structure (or similar boom struc-

ture) incorporated into said NO patent No. 168,721, wherein the individual bank sticks are displaced through rotation between a horizontal non-active position to a vertical active position, the order of displacement being reversed in the apparatus according to the present invention.

An apparatus according to the invention is equipped with means for finding and adaption to the position of the bank stick driven down; this being the case because it is not every time possible to position the catcher head in the optimum position in relation to a bank stick set. Likewise, means are built in for determination of direction of the bank stick when it becomes locked within the catcher or claw.

Moreover, an apparatus according to the invention for use in an automatic bank stick pulling-up operation should exhibit such properties that the catcher/claw - whenever it grips the bank stick - adapts itself to the position of the bank stick, within certain limits, simultaneously - after the bank stick being pulled up from the ground - providing a determination of direction of the same, so that the bank stick may be placed controllably into a collection magazine or supply.

Advantageous embodiments representing further developments of the apparatus according to the following claim 1, are defined in the sub claims.

An example of a preferred embodiment is further explained in the following, reference being made to the accompanying drawings, wherein:

Figure 1 shows diagrammatically an apparatus according to the invention mounted on a vehicle, seen in the direction of motion;

Figure 2 shows the catcher device for the bank sticks, seen in a cross-sectional view along the line II-II in figure 3;

Figure 3 shows the catcher device of figure 2, seen in a side elevational view;

Figure 4 shows a cross section along the line IV-IV in figure 3, illustrating the catcher device of figure 2, the catcher claw being rotated closer to its active bank stick surrounding position;

Figure 5 shows a cross section along the line V-V of figure 3, illustrating the catcher device of figure 2 and 4, the catcher claw occupying its active bank stick locking position, wherein it cooperates with stationary land portions, against which the bank stick rests.

First, reference is made to the general drawing of figure 1, wherein the catcher device of the apparatus has been generally denoted by the reference numeral 1, the reference numeral 2 generally denoting an articulated boom comprising pivoted arms 2',2'', the free end thereof carrying the catcher device 1 through an attachment bracket 3.

The boom 2 does not constitute any real part of the present invention, because the boom struc-

ture, in principle, may be built in the same manner as the articulated boom according to NO patent No. 168,721. As previously mentioned, this known boom serves to displace through rotation bank sticks from a horizontal to a vertical position, the boom structure incorporated into the apparatus according to the invention being intended to perform exactly the reverse function, namely to displace bank sticks, one at a time, from a vertical to a horizontal position, thereby requiring the boom 2 to perform exactly the same movements, only in the opposite order. Each single bank stick 4 is at first to be caught and retained by means of the catcher device of the apparatus according to the invention, thereafter pulled up and transported to horizontal resting position by means of the boom 2.

Concerning the boom 2, reference is being made to the specification and drawings of NO patent No. 168,721, no further report thereof being included here.

Guide rails and collection tray are in figure 1 denoted at 5,5' and 6, respectively.

The attachment bracket 3 which is arranged at the free end of the boom 2 and carries the catcher device 1 of the apparatus in figure 1, appears in the top plane view of figure 4, but is omitted from figures 2 and 5 wherein merely parts coupled to the attachment bracket 3 of figure 4 are included.

According to figure 4, an articulated arm 7 has been pivotally mounted to the attachment bracket 3, the articulation being constituted by a vertical pivot 8. Between the attachment bracket 3 and the articulated arm 7, a spring 9 has been arranged, said spring 9 tending to keep the articulated arm 7 pulled in towards the attachment bracket 3 when the articulated arm 7 is not influenced by external forces acting on the catcher device 1.

The bank stick catcher device 1 has been suspended from the articulated arm 7 which is pivotable in the horizontal plane, the suspension being effected by means of a horizontal pivot 10 attached to a bracket 10' which, in its place, has been attached to the frame part 11 of the catcher device 1. More specifically, the frame part 11 of the catcher device 1 is pivotally arranged in the vertical plane in relation to the articulated arm 7. This frame part 11 constitutes a fastener for a drive motor, e.g. an electric or hydraulic motor, here represented through the output shaft 12; guide rollers (not shown) and a first arched gear rim 13.

Two arched clamp parts 14 and 15 define a locking slot 16 for the bank stick 4, the clamp part 15 being rigidly attached to the frame part 11, the clamp part 14 being rigidly attached to a pitch rack 24 later to be described.

The catching arm 17 of the bank stick catcher device 1 is arched and pivotally arranged around a vertical pivot 18.

According to figure 2, between the outer end of the catching arm 17 and a spring-loaded signal arm 19 on the clamp part 15, an elastic signal and bank stick ejector line 20 has been arranged. (The ejection takes place when a pulled-up bank stick is positioned adjacent the magazine 5). When the signal line 20 is influenced by a bank stick 4, this will cause the production of a signal in a signal transmitter 21 associated to the signal arm 19, in that the signal arm 19 rotates around a pivot 19' past the signal transmitter 21 against the force of a spring 19".

The pivot 18 of the catching arm 17 carries a gear segment 22 meshing with the arched pitch rack 13 of the frame part 11.

The output shaft 12 of the drive motor carries a gear 23 meshing with a second pitch rack 24 which is concentric with the first pitch rack 13 and one end of which forms a bearing for the pivot 18 for the catching arm 17.

When the driving gear 23 is brought to rotate counterclockwise, the second pitch rack 24 is displaced in the same direction, whereby the gear segment 22 is displaced "upwards" according to e.g. figure 2 and is brought to rotate counterclockwise as a result of its engagement in the first pitch rack 13. This will effect an "upwardly directed" rotation of the catching arm 17 from the position shown in figure 2. As figures 2, 4 and 5 show top plane views, the displacement of the gear segment 22 and the rotation of the catching arm 17 in practice take place in the horizontal plane.

When the catcher device 1 is displaced forwardly in the driving direction and the signal line 20, figure 2, comes into contact with a bank stick 4 driven down into the ground, the latter will exert a horizontally directed pressure on the signal line 20, bringing the spring-loaded signal arm 19 to rotate past the signal transmitter 21 and cause the production of an electrical signal, whereby the driver is informed of the position of the bank stick 4, more specifically that it is positioned within an area which the catcher device 1 can handle. On the basis thereof, the automatic bank stick pulling-up cyclis starts, the drive motor (not shown) causing its output shaft 12 and the gear 23 wedges thereto to rotate counter-clockwise. The second pitch rack 24 meshes with the driving gear 23 and is given a corresponding movement towards the central area of the frame part 11. Thereby, the second pitch rack 24 pulls with it the pivot 18 of the catching arm 17, so that the catching arm 17 - because of the engagement of its gear segment 22 into the first pitch rack 13 of the frame part 11 - will be brought to perform said rotating movement simultaneously as it is displaced towards the central area of the frame part 11. As the catching arm 17 has been shown in an inactive position in figure 2 and

in a completely active position in figure 5, the rotation of the catching arm 17 takes place from inactive to active position.

During this rotation, the outer end 17' of the catching arm 17 will move over a large area in the horizontal plane and take with it a bank stick 4 situated within this area as well as guiding it towards the locking slot 16 defined between the clamp parts 14,15, the latter being stationary with respect to catching arm 17. The locking position for the bank stick 4 is illustrated in figure 5, wherefrom it clearly appears that the bank stick 4 is clamped from three sides, namely by means of the clamp part 14, the clamp part 15 and the catching arm 17. Such a three-sided clamping is very advantageous and secures that the bank stick 4 thereby is retained in a firm grip within the catcher device 1 of the apparatus. This three-sided clamping secures further that the bank stick 4 becomes directional determined in relation to the catcher device, which is very favourable with regard to the further handling of the bank stick 4 and its disposal into the collecting magazine 5, figure 1.

With the bank stick still driven into the ground and retained in the position shown in figure 5, the boom structure 2 of the apparatus is operated in order to swing upwards in the vertical plane, thereby pulling the bank stick 4 up from the ground, whereafter the boom 2 conveys the pulled-up bank stick 4 upwards as well as rotating it to a horizontal position in the area of the magazine 5. With the pulled-up bank stick 4 in horizontally directed, correct position in relation to the magazine 5, the drive motor is activated such that the output shaft 12 thereof is rotated clockwise, whereby the catching arm 17 is rotated into inactive position, figures 1 and 2, through the shown and described toothed transmission means 23,24,22,13.

The signal and ejector line 20 which may consist of elastic rubber and which only is shown in figures 1, 2 and 3 (it is omitted in figures 4 and 5 for the sake of clarity), will always occupy a position inwardly of the bank stick 4, so that it - because of its inherent elasticity and flexibility - will be capable of contributing positively to the ejection of the bank stick from the catcher device 1 and into the magazine 5. When the catching arm 17 is swung to the position just described, the signal and ejector line 20 will be tensioned, so that it will be in a position to hurl the bank stick 4 out from the catcher device and, through the guiding rails 5, into the collecting tray 6.

The catcher device 1 of the apparatus has a collecting extent from the free end 17' of the catching arm 17 to the signal arm 19 which is quite substantial and which enables the collection of bank sticks 4 having greatly varying positions in relation to the locking slot 16. An important factor

in this connection is that the bank sticks individually are to be pulled up from the ground in the position the individual bank stick 4 occupies. According to an advantageous feature of the present invention, this is attended to in that the frame part 11 is pivotable in the vertical plane through its pivoted connection 10 with the articulated arm 7 which, in its turn, is pivotably (8) connected with the attachment bracket 3 which, in its turn, is carried at the free end of the articulated boom 2. The last-mentioned flexible coupling 8 makes the frame part 11 and, consequently, the entire catcher device 1 pivotable in the horizontal plane.

Thus, when the catching arm 17 is swung from open to closed position, i.e. from the inactive position shown in figure 2 to the active locking position shown in figure 5 through the intermediate position shown in figure 4, The resistance from the bank stick 4 against the catching arm 17 will cause the frame part 11 to swing around the pivot 8 and to move out with its locking slot 16 in order to lock the bank stick 4 in the position it occupies. Any deviations in the bank stick 4 concerning the vertical direction are compensated for through the mobility of the frame part 11 around the horizontal pivot 10. Subsequent to the bank stick leaving the ground, suspended from the catcher device 1 and locked therein, the frame part 11 will no longer be influenced by oscillating external forces, whereby it will be pulled in to rest against the attachment bracket 3 by means of the spring 9. Thus, the catcher device will take a normal position which is equal irrespective of what position the bank stick in question had; this is advantageous whenever the bank sticks are to be handed over to the magazine 5.

The frame part 11 is formed of two parallel segments with the intermediate catching arm 17. 25 denotes distancers, 26 denoting a distancer and stop member.

Claims

1. An automatically operating apparatus for pulling up bank sticks (4) or similar rods/poles driven into the ground, intended to be mounted on a vehicle and comprising an articulated boom (2) having an attachment bracket or similar coupling member (3) carried at the free end thereof, **characterized in** that to the attachment bracket or similar coupling member (3) is mounted a bank stick catcher device (1) comprising a frame part (11) having bank stick land means (14,15) and a catching arm (17) pivotable in relation to the frame part (11) and pivotable between an inactive position and an active position, wherein it cooperates with said bank stick land means (14,15) in order to retain

a bank stick (4), the rotation of the catching arm (17) taking place compulsorily from a drive unit (12) through a transmission device (23,24,22,13).

2. An automatically operating apparatus as defined in claim 1, **characterized in** that between the catching arm's (17) free end (17') and a point on the frame part (11), said point may be constituted by a signal arm (19), a preferably elastic line (20) has been drawn, a bank stick (4) driven into the ground at first coming into contact with said line (20) when it comes within the reach of the catcher device (1).

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3. An automatically operating apparatus as defined in claim 1 or 2, **characterized in** that the bank stick land or abutment means (14,15) therebetween define a tapering locking slot (16) formed for supporting receipt of a bank stick (4), said locking slot (16) being closed by the catching arm (17) when the latter has been swung to active position, whereby the bank stick (4) is clamped from three sides.

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4. An automatically operating apparatus as defined in claim 1, 2 or 3, **characterized in** that the frame part (11) of the catcher device (1) is pivotably connected (10) with an articulated arm (7) which is pivotably connected (8) with said attachment bracket (3), the axes of said pivoted connections (10,8) extending mutually perpendicularly, so that the frame part (11) may be rotated in both the vertical and the horizontal plane in relation to the attachment bracket (3).

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5. An automatically operating apparatus as defined in claim 4, **characterized in** that said articulated arm (7) is spring-loaded (9) in the direction towards the attachment bracket (3).

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6. An automatically operating apparatus as defined in any one of the preceding claims, **characterized in** that the frame part (11) of the catcher device (1) carries a drive motor, the output shaft (12) thereof carrying a gear (23) meshing with a pitch rack (24) displaceably guided in relation to the frame part (11) and the free end thereof forming a bearing (18) for the inner end of the catching arm (17), and that the pivot (18) of the catching arm (17) carries a gear or a gear segment (22), respectively, meshing with another pitch rack (13) rigidly connected with said frame part (11).

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7. An automatically operating apparatus as defined in claim 6, **characterized in** that the two pitch racks (24,13) has an arched, mutually parallel course.

8. An automatically operating apparatus as defined in one or more of the claims 2 - 7, **characterized in** that the signal arm (19) is coupled to a signal transmitter (21) which, upon the influence of the signal arm (19) as a result of an established contact between a bank stick (4) and the signal and ejector line (20), is activated and produces a signal for the driver.

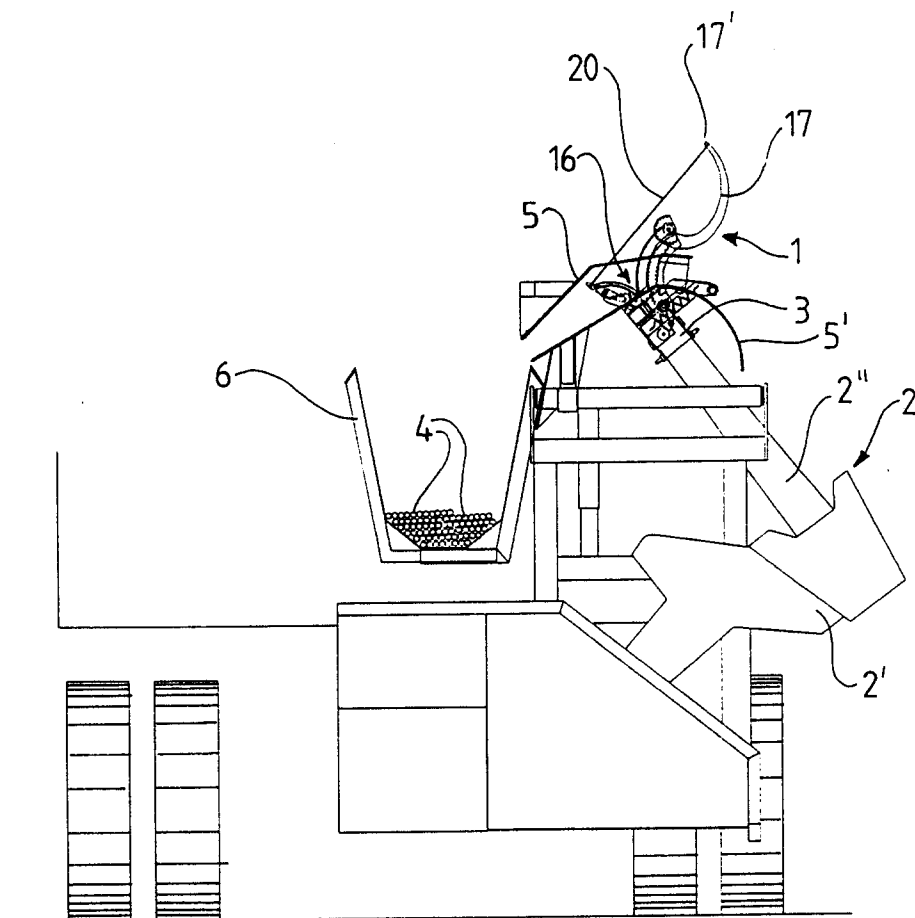


Fig.1

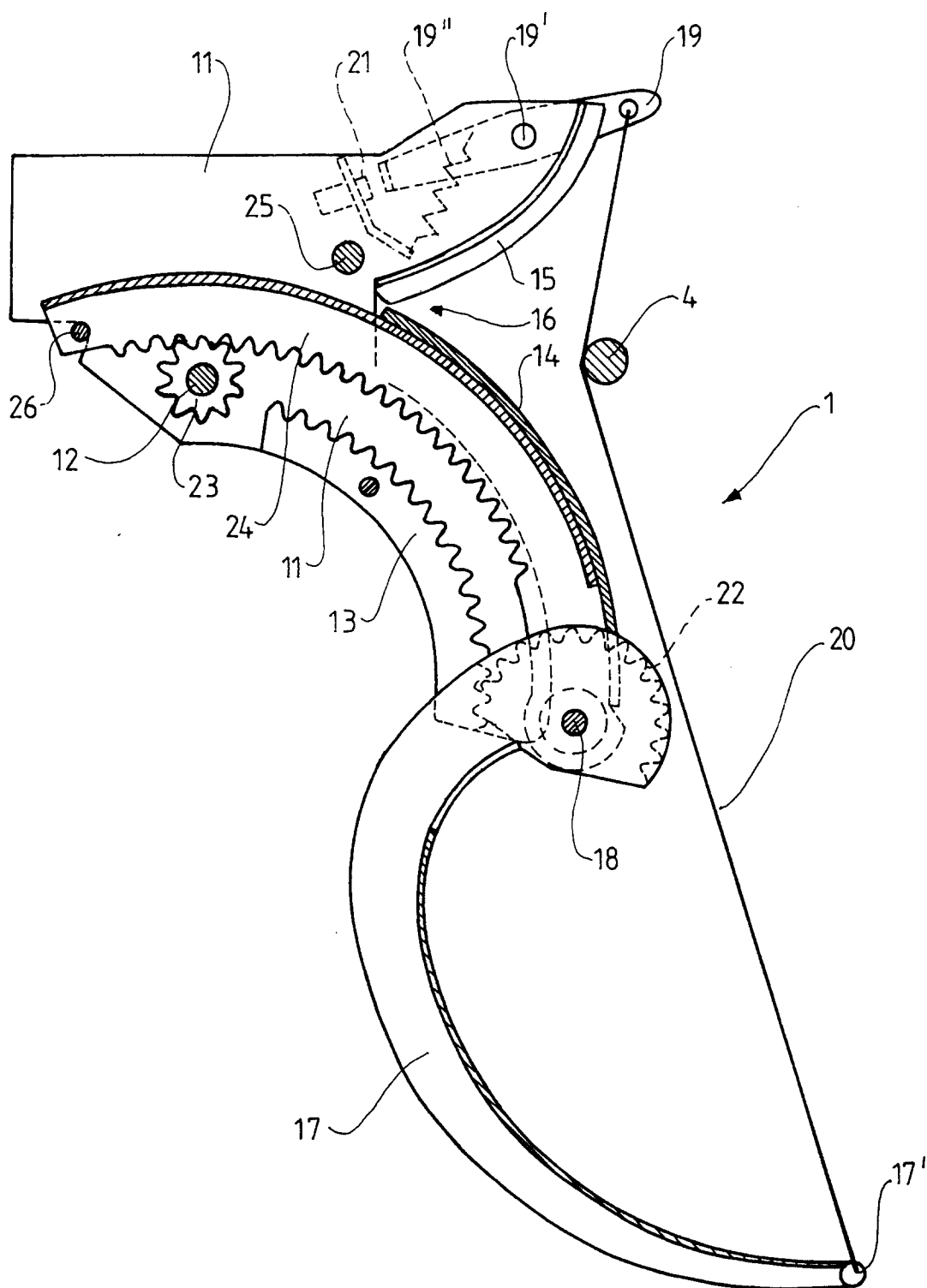
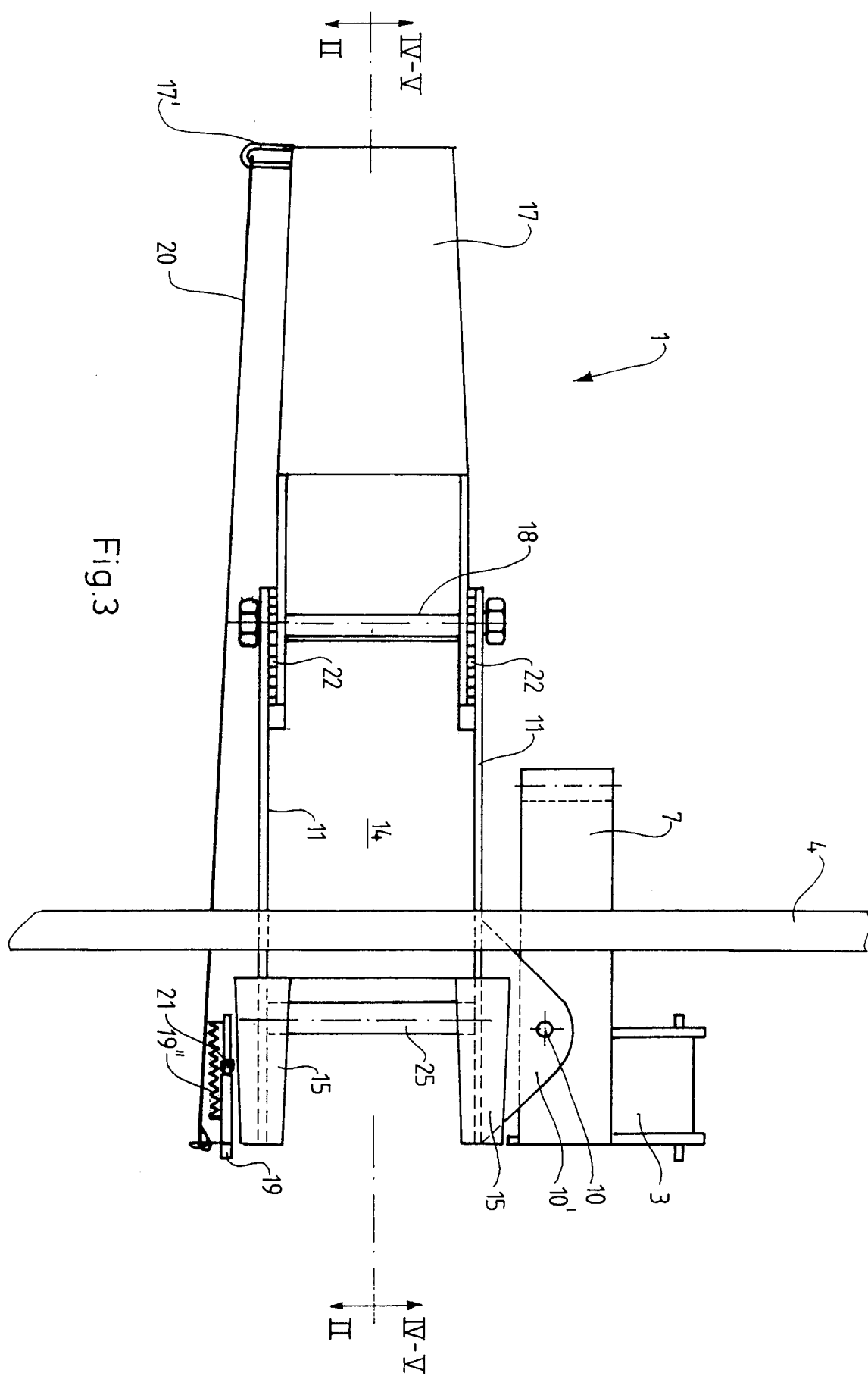


Fig.2



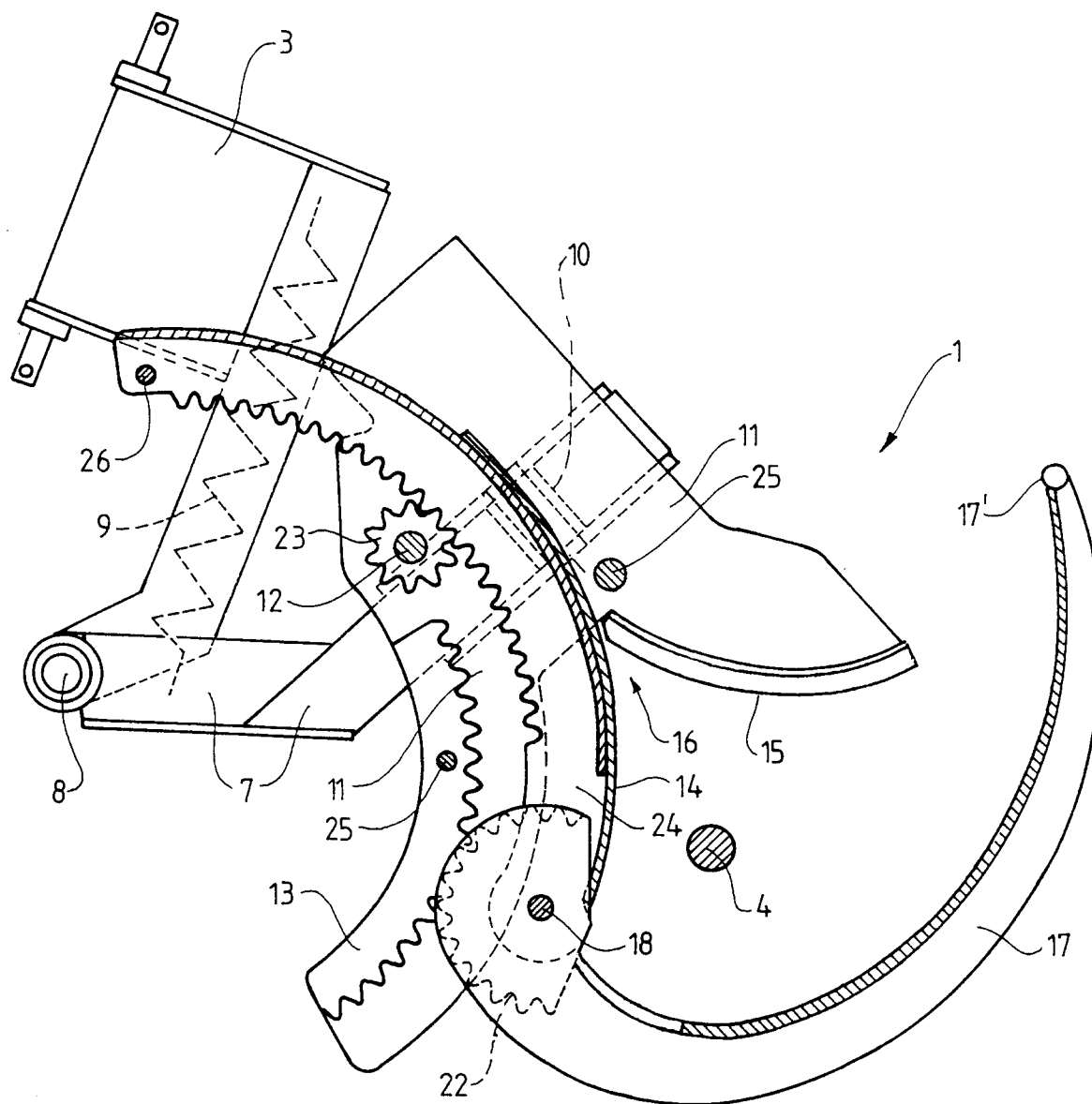


Fig.4

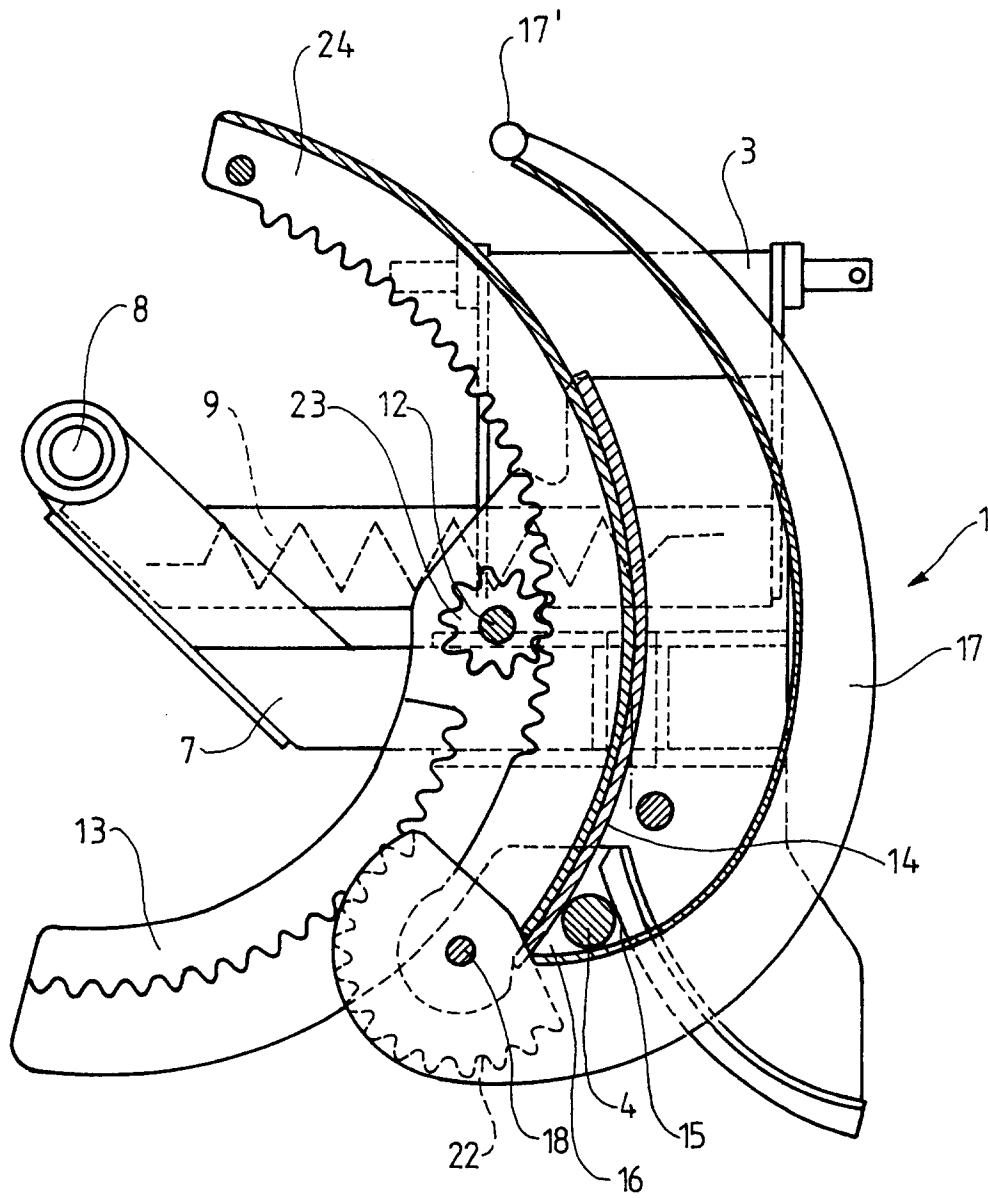


Fig.5



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EUROPEAN SEARCH REPORT

Application Number

EP 93 10 5242

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	US-A-3 110 477 (H.C. CAMPBELL) * column 2, line 40 - column 3, line 35; figures * ---	1	E01F9/01 E04H17/26
A D	WO-A-9 109 194 (S. RISA) &NO-A-168721(S. Risa) * abstract; figure 1 * ---	1	
A	US-A-3 092 265 (B. DA VALLE) -----		
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			E01F E04H A01G
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 07 JULY 1993	Examiner VERVEER D.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			