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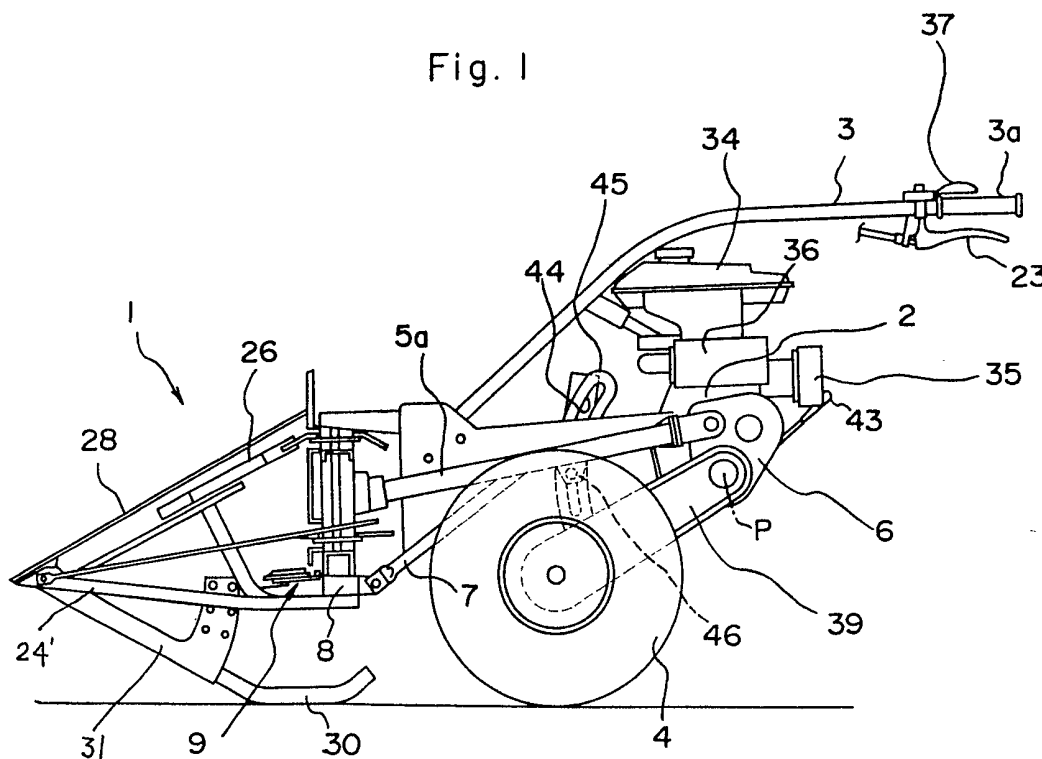
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(54) **Walk-behind type reaper**

(57) A walk-behind type reaper
comprising a reaping and transferring
section (1) an engine (2), manipulation
handles (3) and wheels (4), wherein

the running travel configuration of the
machine may easily be changed
between a two wheel running travel
configuration, where a pair of left and
right running wheels (4) are mounted
respectively to the left and right of the
vehicle, and a one wheel running
travel configuration, where a single
running wheel (4) is mounted adjacent
the longitudinal center line of the
vehicle; so that it is possible arbitrarily
to alter such running travel
configuration in accordance with the
field conditions and the nature of the
agricultural roads, thereby to enable
an efficient reaping action in a stable
condition, as well as effective travel
on agricultural roads.

Fig. 1



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Fig. 1

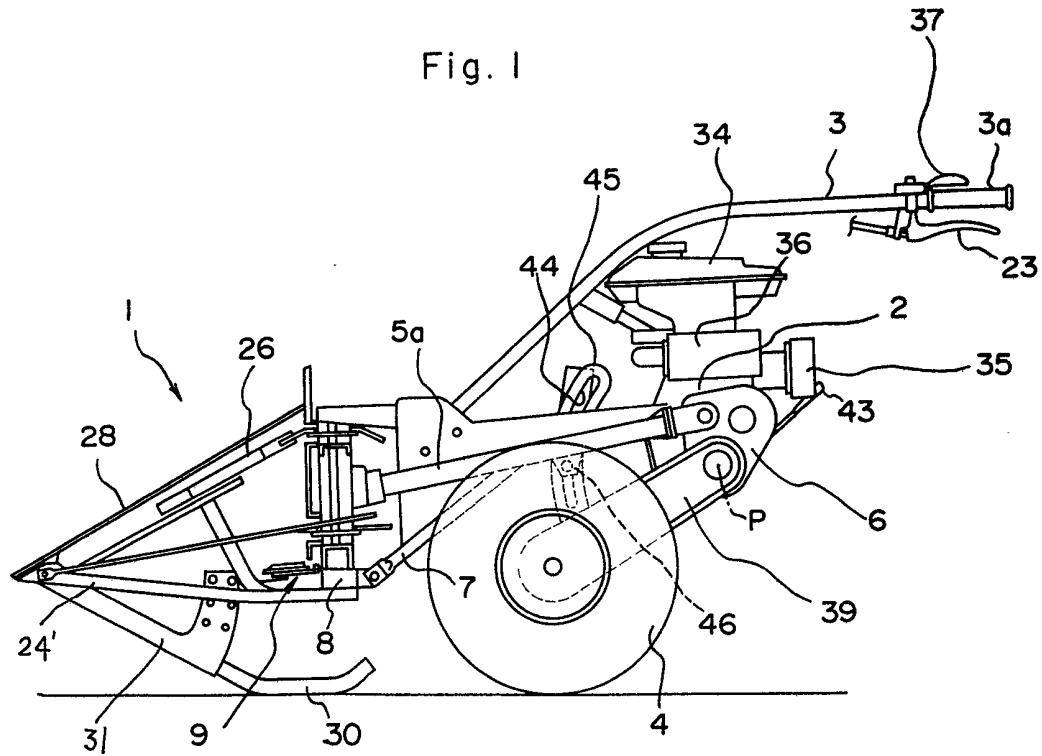
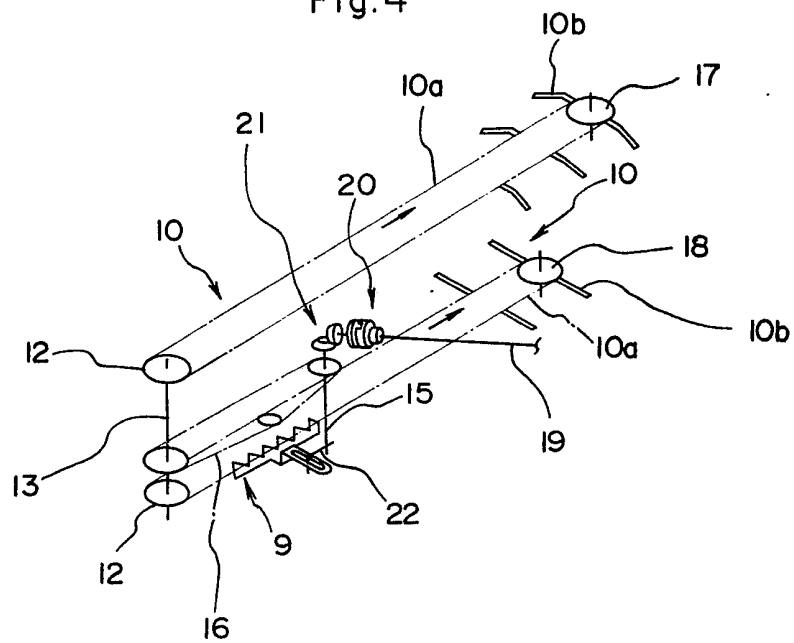
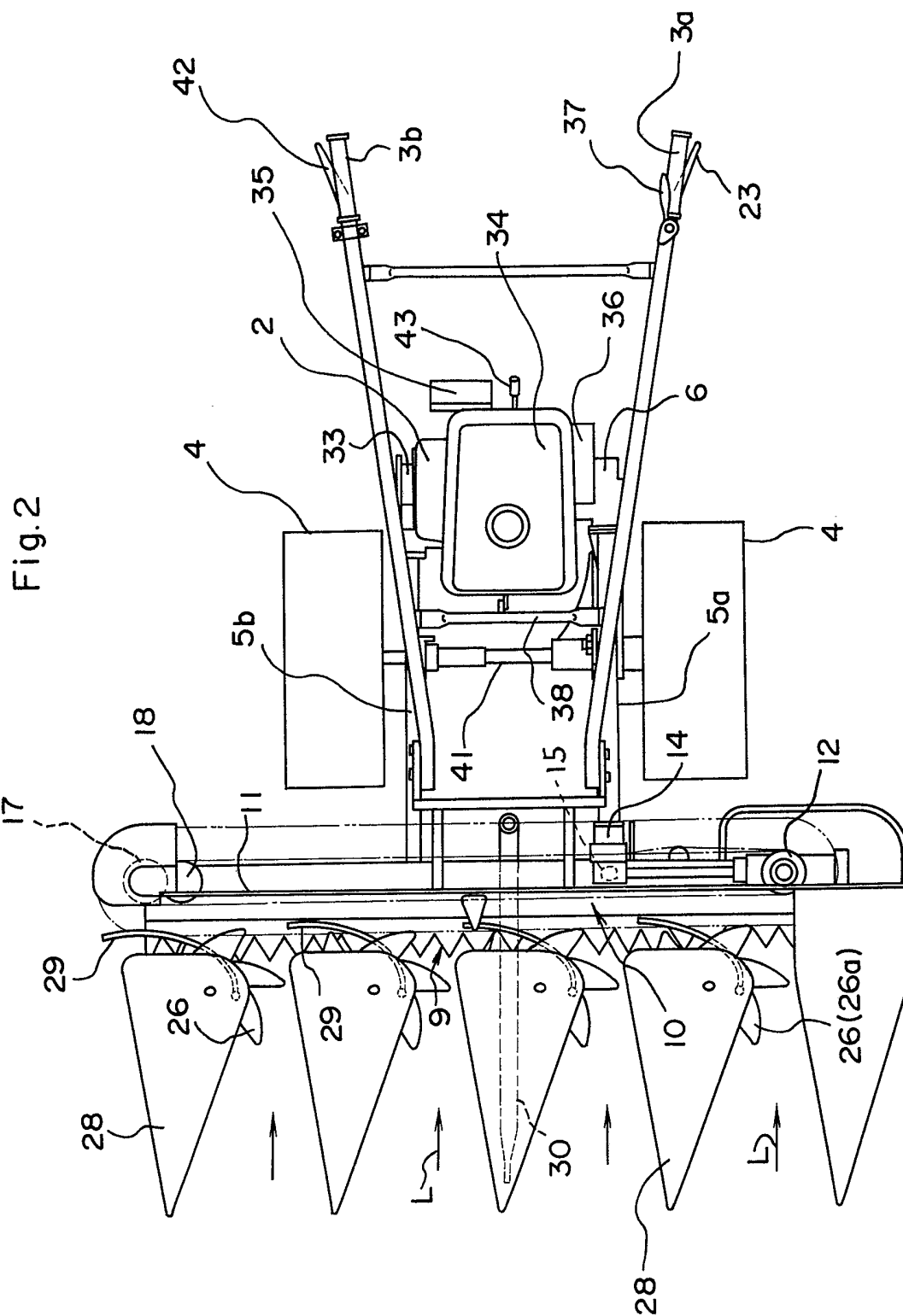


Fig. 4





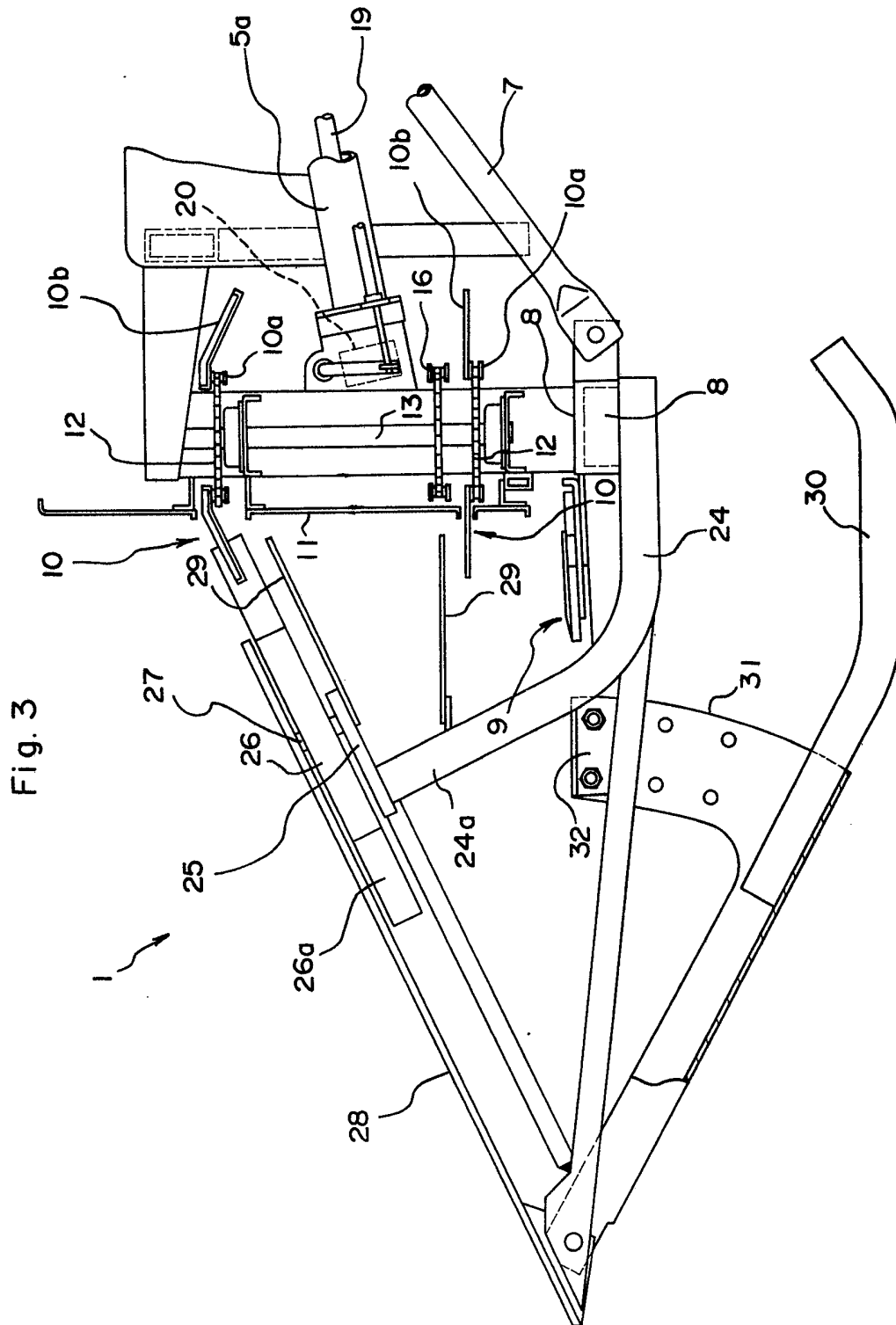


Fig. 3

Fig 5

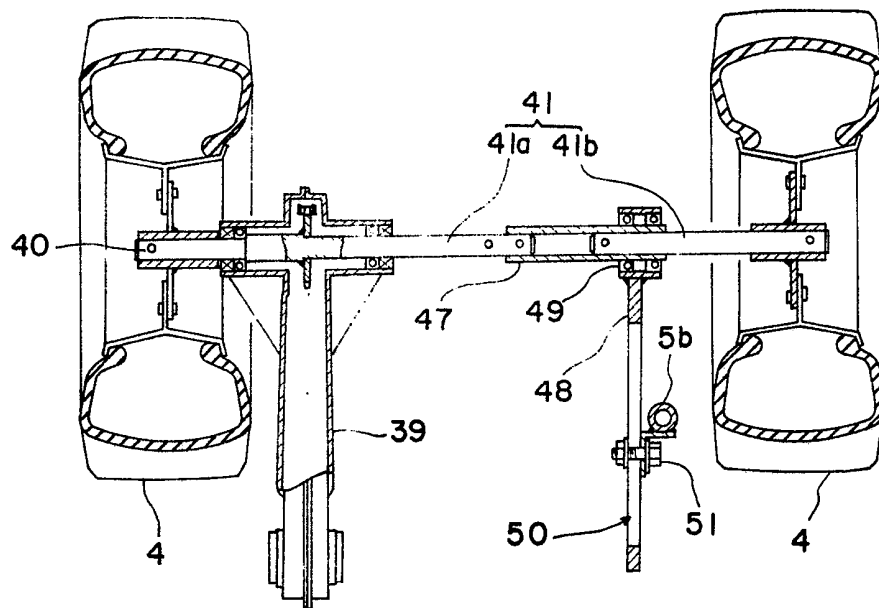


Fig 6

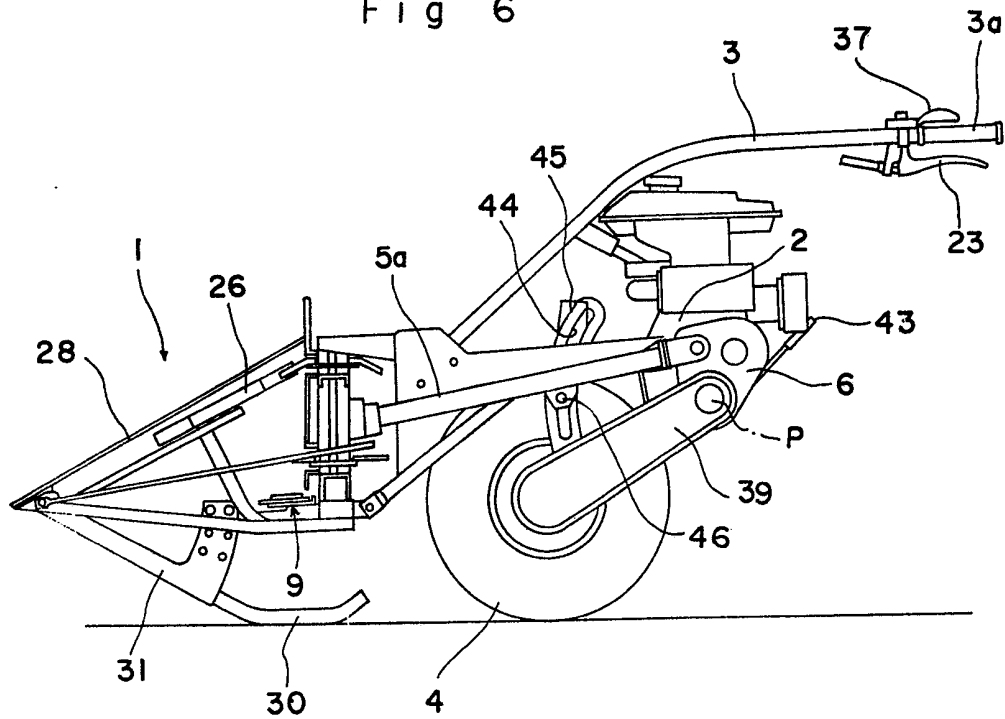
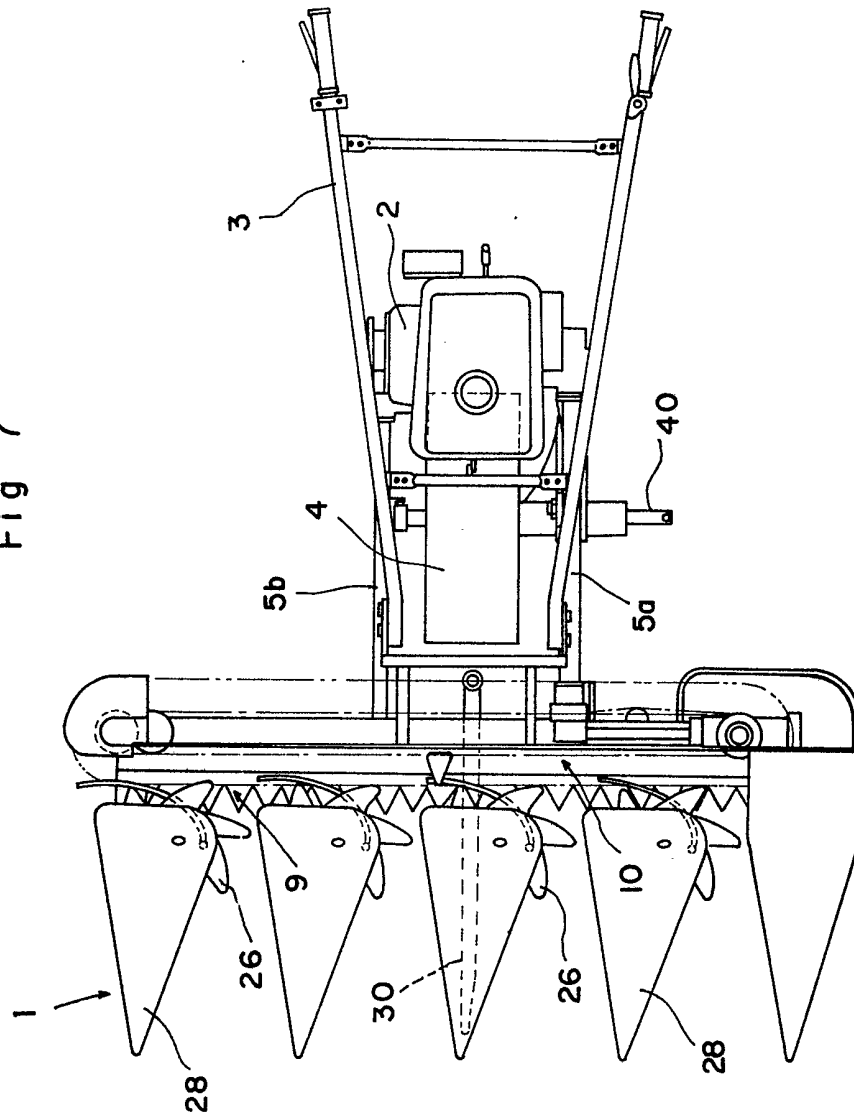


Fig 7



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Fig 8

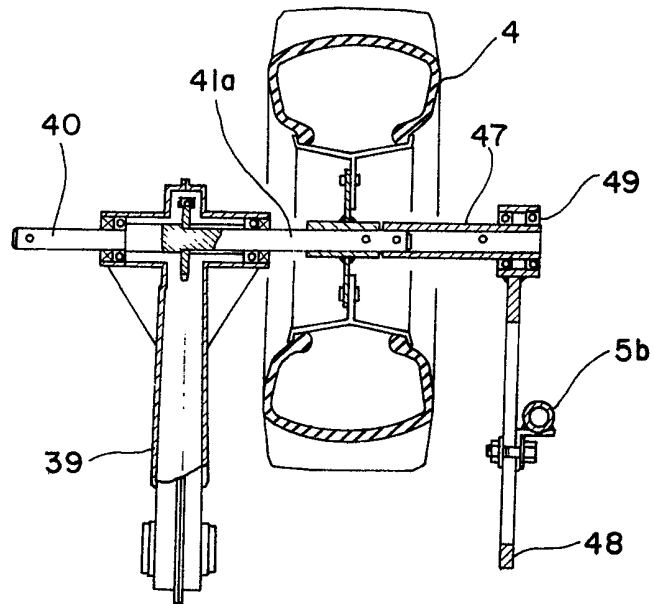
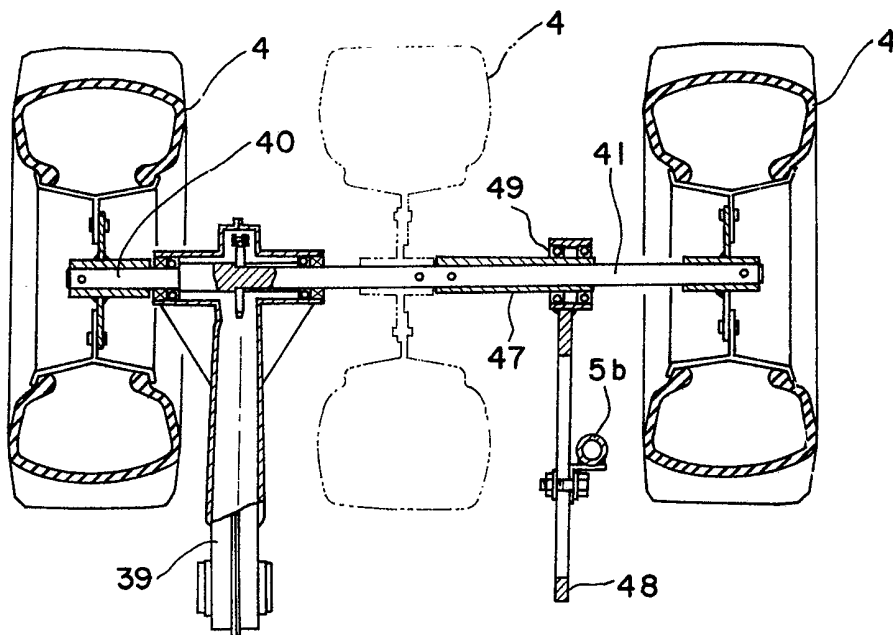


Fig 9



SPECIFICATION

Walk-behind type reaper

The present invention relates to a walk-behind type reaper which is provided, in a front portion of the vehicle, with a reaping and transferring section comprising a reaping apparatus and transverse transferring apparatus for stalks, and in a rear portion of the vehicle, with an engine and a manipulation handle, and which is adapted to reap planted upstanding grain stalks in the said reaping and transferring section and to discharge same laterally and outwardly of the vehicle, while running forwardly as it is propelled by a wheel or wheels disposed between the said reaping and transferring section and engine.

Known reapers of this kind, are of the two wheel running travel type provided, centrally with respect to the left and right of the vehicle, with a running wheel transmission case and further with axles protruding on the left and right of the transmission case, respectively, which carry the wheels thereon.

Such two wheel running travel type reapers can travel with good left-to-right stability in the case where the field surface is sufficiently smooth and flat; but there are inconveniences in fields having substantial undulations, insofar as the vehicles easily commence to roll on account of the unevenness of the ground-engaging surfaces of the left and right wheels. Moreover, in the case of harvesting a plurality of rows of crops whilst travelling along the crop rows planted in ridges, there may occur such a state that one wheel passes over the ridge, which thus results in that the vehicle travels in a posture slanting to one side and therefore in that its manipulation requires skill and that the stalk lengths of the reaped grain stalks get uneven.

Furthermore, when in going to and returning from a field or moving from a field to another field, if a dyke lane to travel on is narrow, it may then result that one lateral side wheel falls off the dyke lane or whilst travelling to rock excessively left and right, thus to require considerable manual labour in its manipulation.

The present invention seeks to ameliorate these disadvantages, and has as its object to provide a convenient walk-behind type reaper which can arbitrarily change its running travel configurations in accordance with the field conditions and the circumstances of the roads, by making the vehicle structure capable of changing over between a two wheel running travel configuration, wherein two wheels are mounted on the left and right of the vehicle, and a one wheel running travel configuration, wherein only a single wheel is mounted adjacent the vehicle center.

Accordingly, the present invention consists in a walk-behind type reaper comprising an engine mounted towards the rear of a pair of spaced left and right main frames, a manipulation handle mounted to extend rearwardly from said frames and a reaping and transferring section comprising a reaping apparatus and a stalk transverse

transferring apparatus attached to a front portion of the said frames; wherein a running wheel transmission case which is driven from the said engine is disposed close to one of said frames and in between the said engine and the said reaping and transferring section; and a pair of left and right axles are mounted in the running wheel transmission case so as to protrude therefrom respectively leftwards and rightwards, and wherein the arrangement is such that the reaper may be used either in a two wheel running travel configuration when a pair of left and right running wheels are respectively mounted on the said axles and are positioned outside the said respective main frames, or in a one wheel running travel configuration wherein only a single wheel is mounted on one said axle extending from the said running wheel transmission case inwardly towards the vehicle longitudinal center line, and said wheel is positioned in between both the said main frames.

By reason of such a construction, when on substantially flat ground with little undulation, it is possible efficiently to effect the reaping travel at high speed, by using the vehicle in a two wheel running travel configuration, and thus enabling to stably support the vehicle on the ground in a two point ground engaging state and therefore to realize safe high speed running. Also on well-arranged wide agricultural roads, it is also possible to go to and return from a field and to move from one field to another field with good stability and rapidly by means of such efficient running in the two wheel running travel configuration.

On the other hand, when reaping in fields with much undulation or reaping of ridge-planted crops, it is possible to let the vehicle run without suffering from rolling or tilting on account of the left and right high and low imbalance of the field surface, by then changing the vehicle to the one wheel running travel configuration, thus enabling it to run with less transverse rocking of the vehicle, and therefore with rather greater stability than in the two wheel running travel configuration. Besides, when running on such soft and loose fields that the wheels substantially sink into the ground, it may well be possible to change the vehicle to the one wheel running travel configuration and have the single wheel pass over the stalk-stubble row and thereby have some rather securely run, preventing the wheel sinking down.

Moreover, in the case of travelling along narrow dyke lanes, it is possible to have the vehicle travel without dropping off the dyke lanes, by changing the vehicle to the one wheel running travel configuration. Accordingly, the vehicle may now run in a self-propelled manner on narrow dyke lanes and thus enter even such fields where it has not previously been possible to introduce the reaping and harvesting machines unless they are laboriously manually brought thereto, by reason of lack of sufficient access in the form of dyke lanes wide enough for free riding of the two wheeled vehicle. Therefore it has now become possible by

means of the present invention to realize highly productive mechanized reaping even in fields where manual reaping has conventionally been necessary.

5 The invention will now be further described, by way of example, with reference to the accompanying drawings, in which:—

Fig. 1 is an overall side elevation of a preferred embodiment of walk-behind type reaper in the two wheel running travel configuration of the vehicle;

Fig. 2 is a plan view of the vehicle in the same configuration as in Fig. 1;

Fig. 3 is an enlarged side elevation of its reaping and transferring section;

Fig. 4 is a perspective view of the arrangement for transmitting drive power to the reaping and transferring section;

Fig. 5 is a sectional plan view showing the running wheel mounting portions of the vehicle in the two wheel running travel configuration;

Fig. 6 is an overall side elevation of the vehicle in its one wheel running travel configuration;

Fig. 7 is a plan view of the vehicle in the same configuration as in Fig. 6;

Fig. 8 is a sectional plan view showing its running wheel mounting portions in the one wheel running travel configuration; and

Fig. 9 is a sectional plan view of the running wheel mounting portions of another embodiment.

Referring first to Figs. 1 to 5, the embodiment of reaper illustrated comprises a reaping and transferring section 1, having four rows of grain stalk introduction passages L, disposed at the front portion of the vehicle, an engine 2 and a manipulation handle 3 disposed in a rear portion of the vehicle, and running wheels 4 for propulsion disposed in a fore and aft intermediate portion of the vehicle. Also, in a fore and aft intermediate portion of the vehicle, there are disposed at a suitable spaced apart distance to the left and right of the longitudinal axis of the vehicle, a pair of left and right main frames 5a, 5b formed of round pipes. Forwardly of both these main frames 5a, 5b there is mounted the said reaping and transferring section 1 and to a rear end of one said main frame 5b there is securely connected the engine 2; whilst a transmission case 6, which is directly securely connected to a lateral side of this engine 2, is supportedly connected to a rear end of the other main frame 5a. The vehicle frame construction thus provided therefore has an ample upwardly and downwardly freely opening through space in between the left and right main frames 5a, 5b.

The construction of the said reaping and transferring section 1 will be described in further detail. Along a front end of a transverse elongate frame 8 supported by the said main frames 5a, 5b and struts 7 extending therefrom, there is provided a clipper type reaping apparatus 9; and above this transverse elongate frame 8 there are disposed, in an upper and lower two tier configuration, two sets of transverse transferring apparatuses 10, 10.

Each such set comprises chains 10a, provided

thereon with transferring lugs or arms 10b; and it is thus able to function so as to discharge grain stalks reaped by the machine to the outside of the vehicle, by transferring them transversely to the right along a transfer guide cover 11 provided in an upright position.

Driving sprockets 12 for both said chains 10a are mounted to a common driving shaft 13, and this driving shaft 13 is connected to an output shaft 15 of a bevel gear transmission case 14 which is securely connected to a front end of the left hand main frame 5a, via a chain 16. On the other hand, end sprockets 17, 18 of the respective chains 10a, are adapted respectively independently to be displaced for tension adjustment thereof.

The left hand main frame 5a is made also to serve as a transmission case for the reaping and transferring section 1. Thus, in the interior thereof there is arranged to pass therethrough a transmission shaft 19 connected to a gearing transmission mechanism within the aforementioned transmission case 6. The drive power thus supplied by means of this transmission shaft 19 is transmitted, within the said bevel-gear transmission case 14, via a meshing-engagement type clutch 20 and a bevel-gear transmission mechanism 21 to the upright output shaft 15. On the other hand, to a lower end of the said output shaft 15 there is connected a crank arm 22 to effect a leftwards and rightwards reciprocating driving of the reaping apparatus 9. The clutch 20 is engaged, via a transmission cable, with a reaping clutch lever 23 disposed underneath a lefthand grip 3a of the manipulation handle 3.

Provided to protrude in cantilever manner from the said transverse elongate frame 8 are five arms 24 at suitably spaced apart intervals in the left and right direction and in between these arms 24 the said grain stalk introduction passages L are provided. Four of the arms 24, excepting the most lefthand arm 24', are upwardly bent at an intermediate portion thereof and on brackets 25 attached to such upwardly bent portions 24a there are supported, for free idling rotation on a fixed support shaft 27, rotary packers 26 of star wheel shape, formed for example by molding a plastics material. The support shafts 27 are inclined so that the packers 26 may rotate in a somewhat forwardly inclined posture and such that the rotational locus of each packer 26 and the transverse movement locus of the transferring lugs 10b of the upper tier transverse transferring apparatus 10 come into interference with each other; resulting thereby in driving the packer 26 continually in rotation by means of consecutively engaging claws 26a of the packer 26 with the transferring lugs 10b.

This action operates to draw in, rearwards, the planted upstanding grain stalks entering in the introduction passage L, in other words raking them in by means of the packers 26, thereupon to cut off a lower portion thereof by means of the reaping apparatus 9, and subsequent thereto to transversely transfer the reaped grain stalks by

means of the packers 26 and the upper and lower transferring apparatuses 10. Plant divider plates 28 having tapering tips are attached in a forwardly downwardly inclined posture above and over the forwardly extended ends of the respective arms 24 and the packers 26, thereby guiding into the introduction passages L, by means of these stalk-divider plates 28, the planted upstanding grain stalks. Moreover, underneath the respective packers 26 there are disposed, in an upper and lower two tier arrangement, spring wires 29 which urge the reaped grain stalks against the front face of the transfer guide cover 11.

To a forwardly extended end of the arm 24 which is located on the longitudinal axis, there is mounted a sled 30 made of a round pipe, capable of free up and down rocking and adapted to make it possible arbitrarily to adjust the height of the reaping and transferring section 1 by altering up or down the bolt-connection position of a connection plate 31, which is provided as an upward extension from the sled 30, and cooperates with an attachment metal member 32 which is provided on the block including the arm 24.

The engine 2 is assumed here to be an air-cooled gasoline engine of the horizontal shaft type, and on its right hand outer side there is provided a starter pulley 33 to receive therearound a rope for starting up the engine, while on to its left hand outer side, that is the output side, there is mounted the aforementioned transmission case 6.

Around the engine 2 there are respectively mounted: a fuel tank 34 on an upper portion thereof; an air cleaner 35 on a rear portion thereof; and an exhaust system 36 on a lefthand side portion thereof; while an accelerator lever 37 for this engine 2 is disposed close to the left hand grip 3a of the said manipulation handle 3. The manipulation handle 3 is made to rearwardly extend from a front portion of the main frames 5a, 5b, and its intermediate stay 38 is supported above the engine 2.

At a position lower than the location of the aforementioned transmission case 6 and the left hand main frame 5a, there is mounted a running wheel transmission case 39 secured to the aforementioned transmission case left hand lateral surface, so that the power from the aforementioned transmission case 6 is transmitted via a chain transmission mechanism, accommodated within the case, to axles 40, 41 provided to project leftwards and rightwards from the end of this running wheel transmission case 39. Thus, the engine output power is divided within the first mentioned transmission case 6 into two transmission systems: one transmission system being such that it drives the reaping and transferring section 1 via the left hand main frame 5a; and the other transmission system being the running travel transmission system. Here, a main clutch lever 42, adapted to interrupt and connect the power upstream of both the branched transmission systems, is disposed close to a righthand grip 3b of the said manipulation handle

3; and a change-speed lever 43, adapted to change over the forward and rearward travels by changing over, in the forward and reverse rotations, the running travel transmission system is disposed at a rear portion of the first-mentioned transmission case 6.

The said running wheel transmission case 39 is mounted underneath the lefthand main frame 5a, for free rocking up and down, about an output axis P of the running travel system of the first mentioned transmission case 6 as the center thereof; and is adapted to be locked at any arbitrary rocking position, by clamping up a support arm 45 which has an arcuate slot 44 and which is made to extend to one side from this running wheel transmission case 39 by means of a bolt 46 on to the main frame 5a.

The axles 40, 41, provided to project leftwards and rightwards at the forward end of this running wheel transmission case 39, are constructed to rotate integrally with each other. The axle 41 that extends inwardly towards the vehicle longitudinal center line (right hand direction in Fig. 5 of the drawings) comprises a main axle 41a journaled on the transmission case 39 and an extension axle 41b pin-connected to the tip end thereof via a relay tube shaft 47. More specifically the lefthand axle 40 and the said main axle 41a are constructed as an integral shaft. The said relay tube shaft 47 is supported for free idling rotation via a bearing 49 on a lower end of a bearing arm 48 mounted to the right hand main frame 5b. This bearing arm 48 is mounted for free adjustment of the mounting height level relative to the main frame 5b, via a slot 50 and a bolt 51, so that the position of the bearing 49 may properly be altered in accordance with the rocking adjustment of the said running wheel transmission case 39.

A pair of rubber-tyred wheels 4, are pin-mounted to the lefthand axle 40 and to the extension axle 41b of the righthand axle 41, respectively, to thus make up the two wheel running travel configuration with said pair of running wheels 4, positioned outside the left and right main frames 5a, 5b, respectively.

This reaping and harvesting machine, having the two-wheel running travel configuration as mentioned above as its primary running travel configuration, may however be changed over to the one wheel running travel configuration as shown in Figs. 6—8, with only a single wheel 4 in between the left and right frames 5a, 5b. This is achieved by removing the running wheel 4 off the lefthand axle 40; removing the extension axle 41b; and pin-connecting the said single wheel 4 on the main axle 41a of the right hand axle 41, alone. If desired, in order to improve the one wheel running travel with good stability, the said single wheel 4 may be of a special type which has a tyre width broader than that of the normal wheels 4 as used in the two wheel running travel configuration.

The reaping and harvesting machine according to this invention can thus perform efficient reaping travel and also narrow dyke-lane travel, by means of arbitrarily selecting either the said two wheel

running travel configuration or the one wheel running travel configuration, in accordance with the field conditions and the circumstances of the dyke lanes.

5 Incidentally, though a specific construction of the righthand axle 41 has been adopted in the foregoing description which has the main axle 41a and the dismountable extension axle 41b, it is also possible, for the sake of simplicity, to make up the
10 righthand axle 41 as shown in Fig. 9, namely such that it extends outwards further than the righthand main frame 5b and is supported, at an intermediate portion thereof, by means of the bearing arm 48.

15 CLAIMS

1. A walk-behind type reaper comprising an engine mounted towards the rear of a pair of spaced left and right main frames, a manipulation handle mounted to extend rearwardly from said
20 frames and a reaping and transferring section comprising a reaping apparatus and a stalk transverse transferring apparatus attached to a front portion of the said frames; wherein a running wheel transmission case which is driven from the
25 said engine is disposed close to one of said frames and in between the said engine and the said reaping and transferring section; and a pair of left and right axles are mounted in the running wheel transmission case so as to protrude therefrom
30 respectively leftwards and rightwards, and wherein the arrangement is such that the reaper may be used either in a two wheel running travel configuration when a pair of left and right running wheels are respectively mounted on the said axles
35 and are positioned outside the said respective main frames, or in a one wheel running travel configuration wherein only a single wheel is

40 mounted on one said axle extending from the said running wheel transmission case inwardly towards the vehicle longitudinal center line, and said wheel is positioned in between both the said main frames.

2. A walk-behind type reaper as claimed in claim 1, wherein the said one axle that extends
45 from the said running wheel transmission case inwardly towards the vehicle longitudinal center line comprises a main axle which is journaled on the said running wheel transmission case and an extension axle, which is constructed for free
50 mounting with and dismounting from the said main axle; so that one of the running wheels in the said two wheel running travel configuration may be mounted on the said extension axle and the single running wheel in the said one wheel
55 running travel configuration may be mounted on the said main axle.

3. A walk-behind type reaper as claimed in claim 2, wherein the one axle that extends
60 inwardly towards the vehicle longitudinal center line from the said running wheel transmission case which is disposed adjacent the one main frame is constructed to be journaled by means of a bearing arm which is mounted on the other main frame.

4. A walk-behind type reaper as claimed in claim 1, 2 or 3, wherein the said running wheel
65 transmission case is constructed so as to extend forwardly from a lateral side portion of the said engine for free rocking adjustment upwards and downwards, with its mounting end on the side
70 towards the engine as the center therefor, as well as means for locking such adjustment.

5. A walk-behind type reaper substantially as hereinbefore described with reference to Figs. 1 to
75 8, or as modified by Fig. 9, of the accompanying drawings.