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(54) Combine harvester header attachment

(57) A combine harvester is provided with a header (10) which is arranged at a feed shaft (3) of the harvester to be able to pendulate longitudinally of and transversely to the direction of travel of the harvester. A frame (6) is placed between the feed shaft (3) and adapter (10), which frame is mounted to be forwardly pivotable at the lower part of the feed shaft and in the centre, at the same height as its pivot axis, has a socket (9) for a bearing pin (14) of the header (10). A pendulum carrier (20), over which hooks (22) of the header (10) engage, is slidably mounted in the frame (6) at the top. The header (10) and frame (6) lie planarly one against the other. Guide plates are arranged at the sides and base of the frame (6) to bridge the gap between the header and the feed shaft.

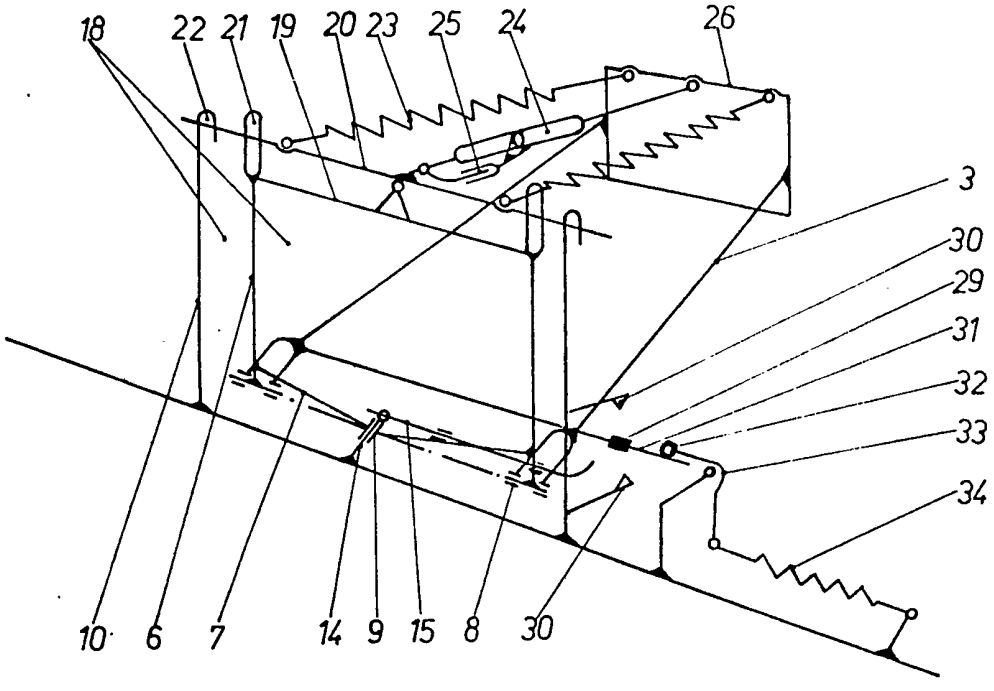

Fig. 1

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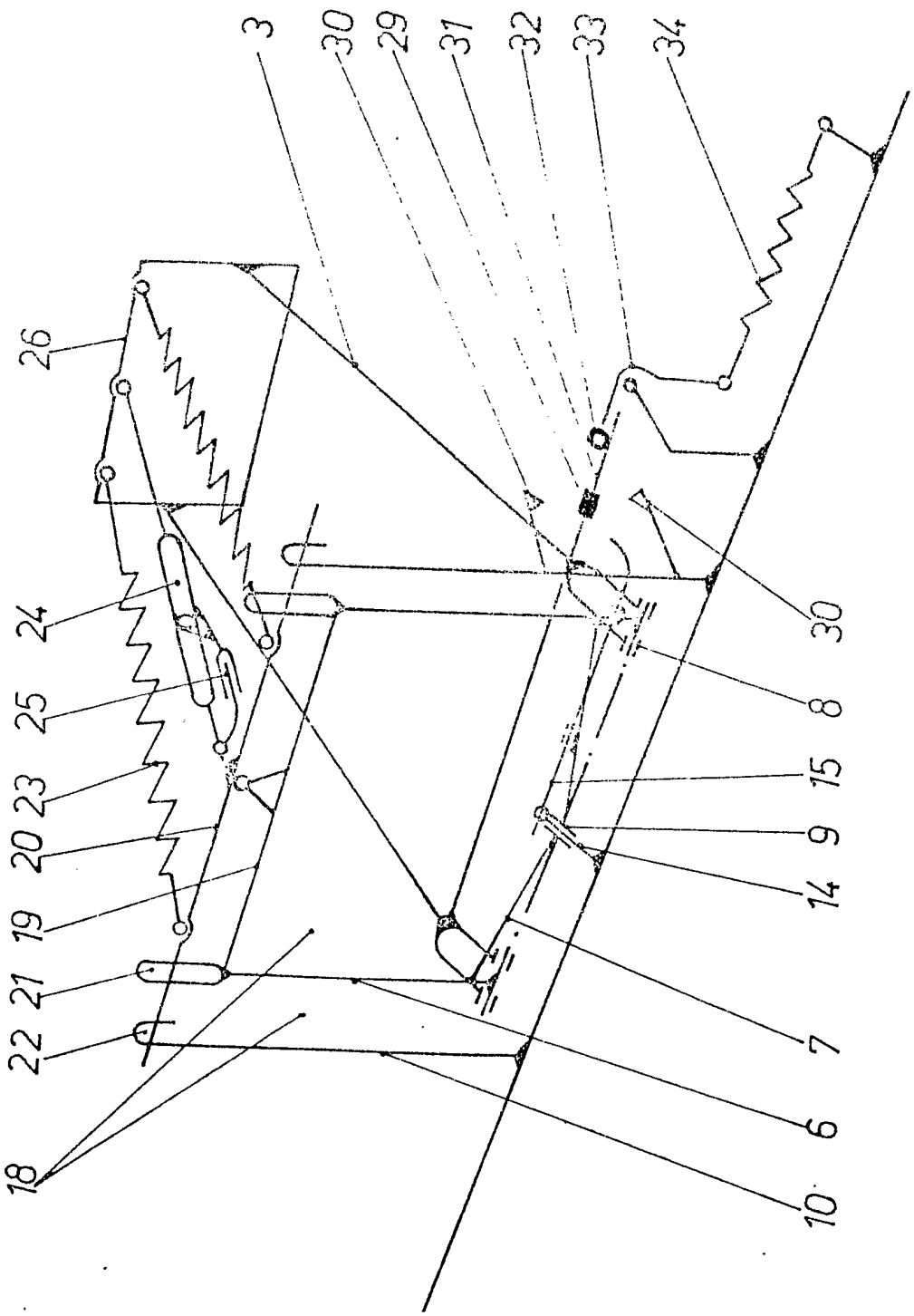

Fig. 1

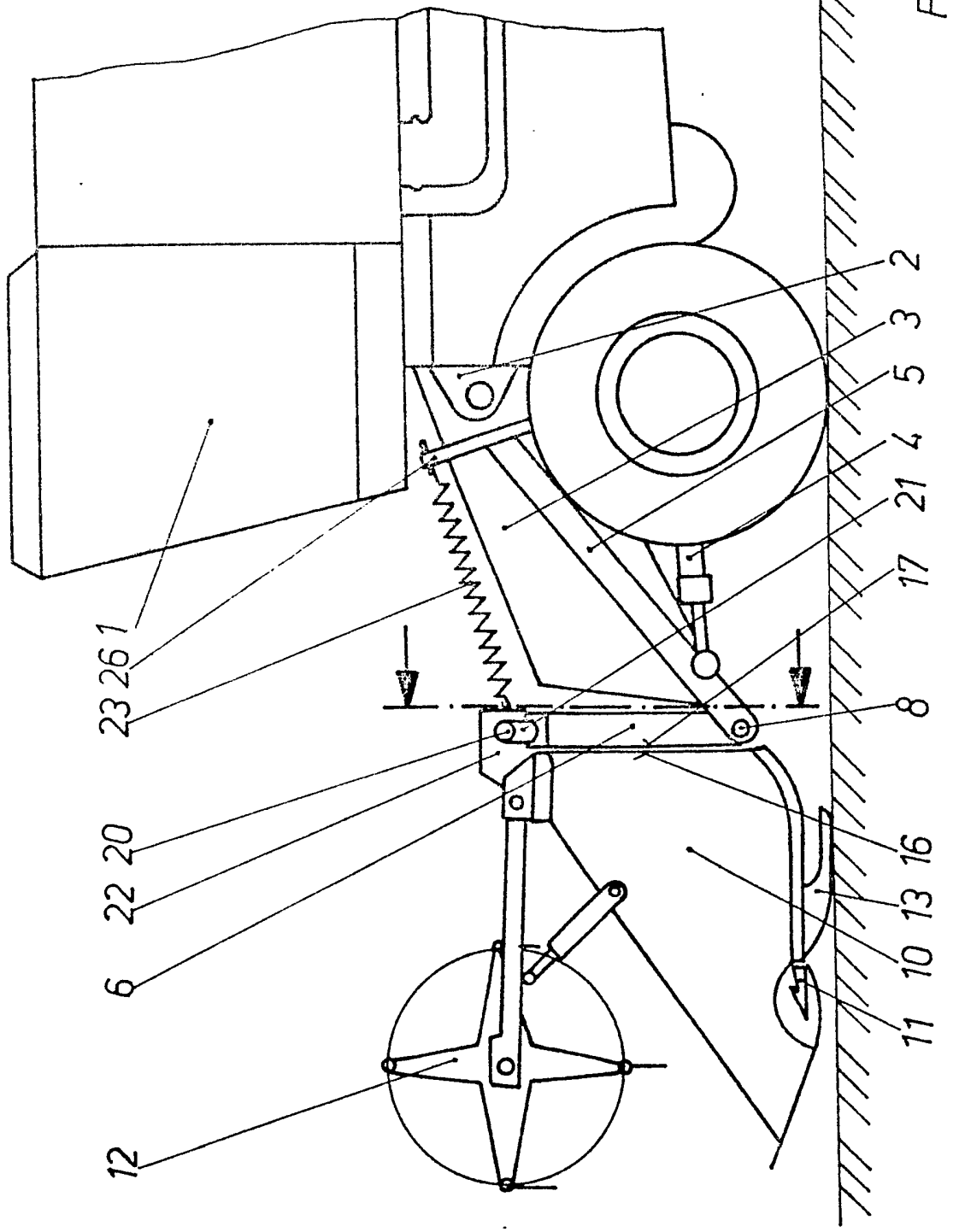

Fig.2

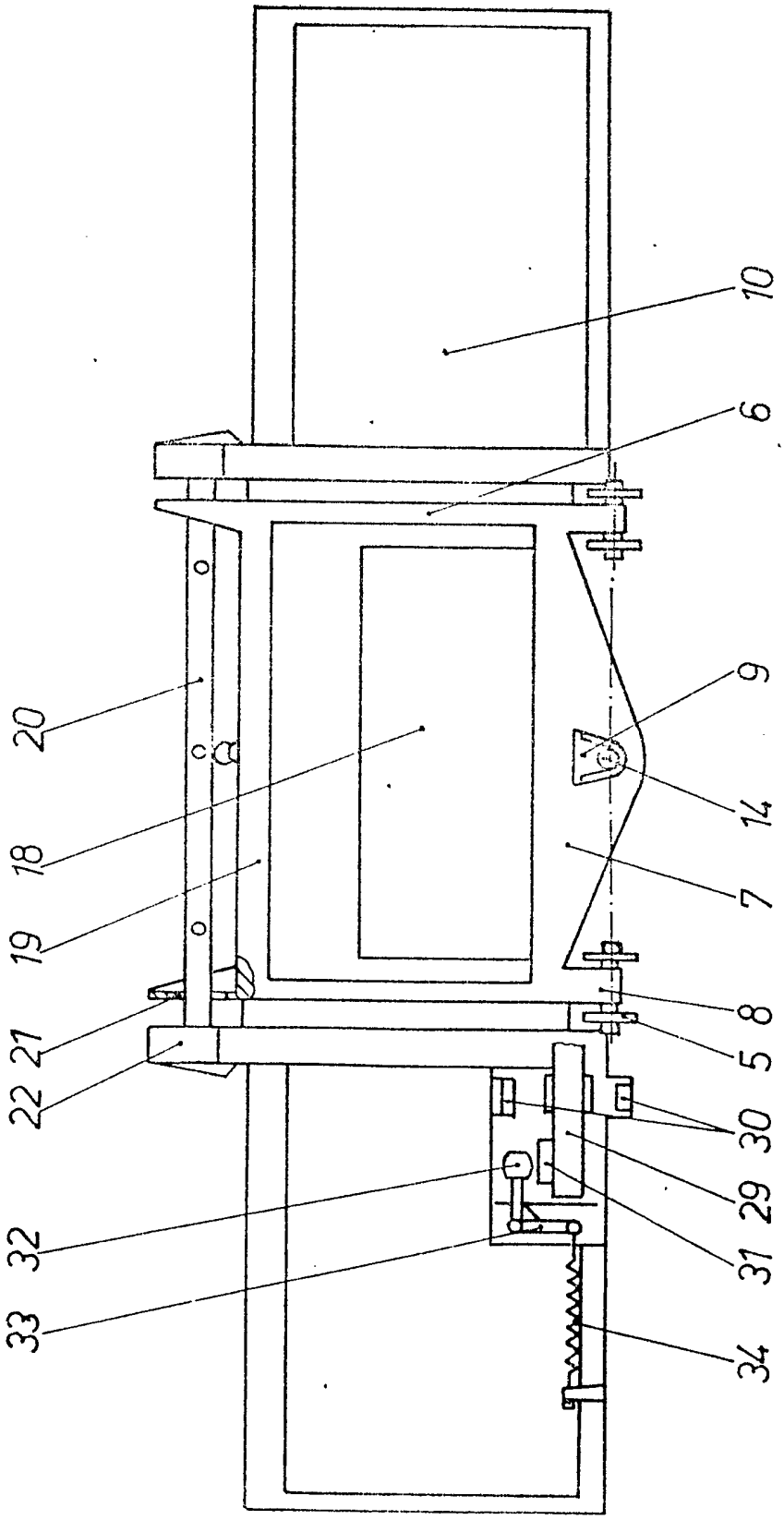

Fig.3

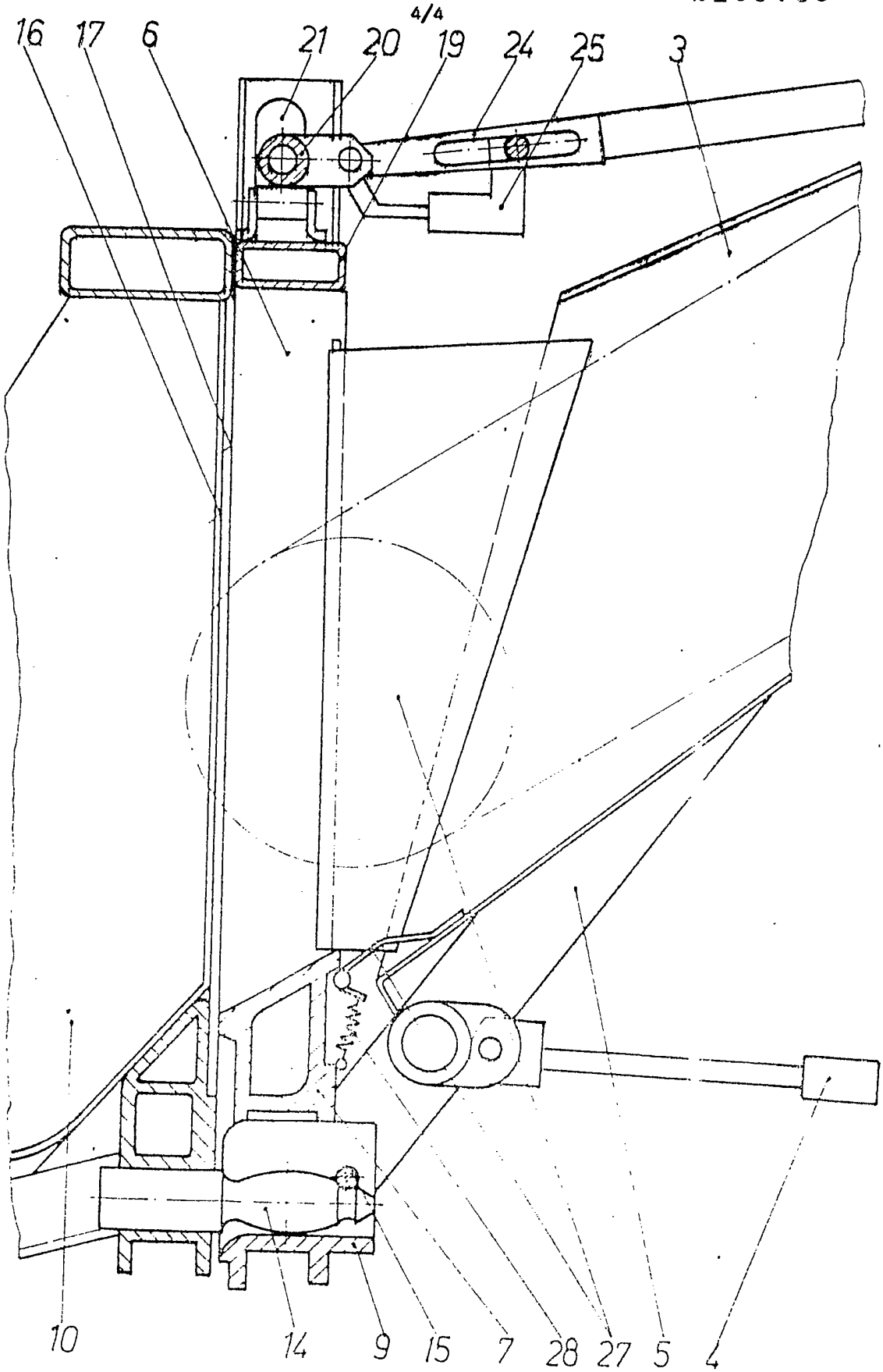

Fig. 4

SPECIFICATION

Combine harvester adapter attachment

The present invention relates to a combine harvester, in particular to an adapter attachment at the harvester.

In known attachments, the adapter is connected with a feed shaft of the combine harvester in such a manner that pendulation of the adapter is possible in a plane longitudinally and transversely of the direction of travel of the harvester. DD-PS 94 725, for example, describes an arrangement in which the adapter is articulated to the feed shaft centrally at the underside of the rear wall, about which articulation the adapter can pendulate in the two planes. A centrally supported pendulum carrier, which extends transversely to the direction of travel, is received in the upper, forward region of the feed shaft, guided in elongate openings in the side parts of the feed shaft and pivotable in a vertical plane. A horizontally extending link guide connected by a yoke engages over the pendulum carrier at both sides outside the feed shaft. Tension springs for relief of the adapter engage tie yoke. In addition, the adapter engages by downwardly open pockets over the link guides. During lifting-out, the adapter is drawn against the feed shaft by way of a spring-loaded cable line which is deflected several times and coupled to a piston-cylinder unit of the feed shaft.

This arrangement is used in a modified form in the combine harvester E 516 of Kombinat Fortschritt Landmaschinen, the link guide and the yoke being dispensed with. The pockets of the adapter engage directly over the pendulum carrier, to which the relief springs are also connected. The pockets in horizontal direction to the pendulum carrier possess a substantial play which corresponds to the maximum pivotal range of the adapter longitudinally of the direction of travel. In place of the cable line, a hydraulic piston-cylinder unit, the forward heel of which engages into an eye of the adapter and thus draws this against the feed shaft during lifting, is arranged between the relief springs on the upper side of the feed shaft.

In these arrangements, relatively large losses in harvested material, particularly in the case of small grain sizes, arise at the transfer between adapter and feed shaft. Moreover, many coupling locations between adapter and feed shaft are necessary and must be connected or separated during attachment and detachment of the adapter, which leads to relatively high manual work. Furthermore, a high wear rate is present due to the many sliding guides. At the same time, these sliding guides increase the inertia of the adapter during ground contour copying. A further disadvantage is that specially constructed adapters, which are not usable on other machines, for example machines for the stalk fodder harvesting, are necessary. This leads to increased costs in production and operation.

There is thus a need for an adapter attachment in which harvest material losses at the transfer between adapter and feed shaft may be able to be reduced and a more rapid and simpler attachment or detachment of the adapter and fluid ground contour copying possible.

According to the present invention there is provided a combine harvester provided with a forwardly extending feed shaft, a support frame mounted on the shaft in the lower region of its forward end to be pivotable forwardly of the shaft, an elongate carrier member slidably engaged in laterally disposed guides at the upper portion of the frame to be upwardly and downwardly movable, an adapter provided with coupling means to movably couple the adapter to the end portions of the carrier member and to the lower portion of the frame centrally thereof, counterbalancing means acting between the frame and the feed shaft or harvester chassis, and guide plates movably arranged at the sides and base of the frame to co-operate with internal wall surfaces of the shaft.

In a preferred embodiment, the harvester comprises an adapter able to be pendulatingly arranged at the feed shaft transversely to the direction of travel, an upper, vertically pivotable pendulum carrier over the outer ends of which engage pockets of the adapter, and a relieving device for the adapter. To make possible a simple and secure sealing between adapter and feed shaft with few coupling places and with the adapter constructed so that it can also be used on a machine at which the pendulation in two planes is not required, articulated at the forward end of the feed shaft at approximately the lowest point thereof is a forwardly pivotable frame, at the lower transverse carrier of which a bearing bush or socket pointing in longitudinal direction of the harvester is inserted centrally of the feed shaft, a bearing pin of the adapter being engageable in the bush. The pendulum carrier is guided in lateral elongate holes in the upper transverse carrier of the frame and the relieving device is connected at the upper transverse carrier and at the other side fastened to the feed shaft. The pockets of the adapter embrace the pendulum carrier and guide plates, which by their ends are laid against the inside of the feed shaft, are movably arranged at the sides and the base of the frame. The pivotal movement, arising during ground contour copying, of the adapter longitudinally of the direction of travel is transmitted by the adapter by way of the pockets and the pendulum carrier directly to the frame and absorbed by way of the bearing thereof at the feed shaft. The relieving device ensures that there is a constant low ground

pressure of the adapter. The movements of the adapter transversely to the direction of travel are taken up through rotation of the pin in the bush and by way of the pockets through vertical pivotation of the pendulum carrier. The guide plates, which ensure a tight transfer of harvest stock from the frame to the feed shaft, can through their movable fastening at the frame adapt to any change of inclination between frame and feed shaft.

For this purpose, it is expedient if the mounting of the frame at the feed shaft and the bearing bush in the frame are arranged at the same height and if the frame at the adapter side and the adapter at the frame side each have a planar bearing surface portion extending around a transfer opening for harvested material. This is advantageous for fluid ground contour copying and provides a particularly good sealing between adapter and frame.

Furthermore, it is advantageous if a pendulation limiter is fastened to the side of the feed shaft and abutments, which are fastened to the adapter, are disposed above and below the limiter. A restriction of the transverse pendulation of the adapter is provided by these abutments, wherein the forces are introduced directly into the feed shaft while bypassing the actual pendulum equipment. In this case, the pendulation limiter or the abutments can be constructed to be resilient for the reduction of load peaks.

Finally, it is expedient if a lever mounted on the adapter rests at one end by way of a roller on a support of the limiter and its other end is biassed by way of a tension spring connected with the adapter. A mass equalisation of the adapter transversely to the direction of travel is attainable with this lever so as to provide a stable static equilibrium.

The harvest material losses at the transfer place between adapter and feed shaft can be reduced by such an adapter arrangement, while attachment and detachment of the adapters may be possible quickly and in a simple manner. All additional coupling elements which are not required for the drive of the adapter are redundant. Through resolution of the pendulum bearing into individual rotary bearings and deletion of sliding guides, the mobility of the adapter is enhanced and thereby improves ground contour copying. Due to the planar connection of the adapter to the frame without relative movement longitudinally of the direction of travel between the two component groups, the adapter can be used without change of the connecting parts and connecting surfaces in a machine in which a pendulation is necessary in only one plane or in which the adapter is mounted rigidly to a component group of the machine. Consequently, the cost in production of different adapters is reduced. At the same time, the user now needs only one series of adapters for different machines such as combine harvesters, field chaff cutters and swath mowers.

An embodiment of the present invention will now be more particularly described by way of example with reference to the accompanying drawings, in which:

Fig. 1 is a schematic diagram of the adapter attachment in a harvester embodying the invention;

Fig. 2 is a schematic side elevation of part of the harvester;

Fig. 3 is a cross-section on the section line of Fig. 2; and

Fig. 4 is a cross-section, to an enlarged scale and in the direction of travel of the harvester of part of the adapter attachment.

Referring now to the drawings, there is shown a combine harvester 1 which is provided in front of a threshing mechanism 2 thereof with a vertically pivotable feed shaft 3. For pivotation of the shaft, two hydraulic piston-cylinder units 4 are pivotably coupled between the harvester 1 and the feed shaft 3. A frame 6 is connected at its lower transverse member 7 by way of two laterally disposed bearings 8 to the forward lowermost point of a stiffening frame 5 of the feed shaft 3. An upwardly open bearing bush or socket 9, pointing in direction of travel, is located in the member 7 centrally of the feed shaft 3 at the height of the axis of the bearings 8.

An adapter 10, for example a cutting mechanism with a blade beam 11, a drum 12 and slide skids 13 by which the adapter 10 rests on the ground, is provided at a rear wall thereof with a bearing pin 14, which is disposed centrally at the bottom of the frame and which engages into the bush 9 where it is lockable by means of a cotter pin 15. The adapter 10 and the frame 6 in that case lie against each other by planar bearing surfaces 16 and 17, which surround a transfer opening 18.

A pendulum carrier 20, which is guided in slots 21 to be pivotable approximately vertically, is arranged at the upper transverse member 19 of the frame 6. Hooks 22 of the adapter 10 engage over the outer ends of the carrier 20. Also engaging at the member 19 are relief springs 23 and a coupling member 24, which is connected with a hydraulic pistoncylinder unit 25. The relief springs 23 and the unit 25 are at the other side articulated to a carrier 26 of the feed shaft 3.

Metal guide plates 27, which at end portions thereof extend into the feed shaft 3 and bear against this by means of springs 28, are movably mounted at the sides and base of the frame 6 for sealing the frame to the feed shaft 3.

A pendulation limiter 29 is fastened to the side of the feed shaft 3 directly at its forward end for limitation of transverse pendulating movement. Abutments 30, which are fastened to the rear wall of the adapter 10, are dis-

posed above and below the limiter 29. In addition, a support 31 is disposed on the limiter 29 to provide static mass equalisation and equilibrium of the adapter 10 in the transverse direction. An angled lever 33, which is mounted at its centre at the adapter 10, bears by way of a roller 32 on the support. The end of the lever 33 remote from the roller is connected by way of a tension spring 34 with the adapter 10.

CLAIMS

1. A combine harvester provided with a forwardly extending feed shaft, a support frame mounted on the shaft in the lower region of its forward end to be pivotable forwardly of the shaft, an elongate carrier member slidably engaged in laterally disposed guides at the upper portion of the frame to be upwardly and downwardly movable, an adapter provided with coupling means to movably couple the adapter to the end portions of the carrier member and to the lower portion of the frame centrally thereof, counterbalancing means acting between the frame and the feed shaft or harvester chassis, and guide plates movably arranged at the sides and base of the frame to co-operate with internal wall surfaces of the shaft.

2. A harvester as claimed in claim 1, the coupling means comprising receptacles to receive the end portions of the carrier member and a pin engageable in a socket centrally disposed in the lower side member of the frame.

3. A harvester as claimed in claim 2, wherein the frame is mounted on the shaft by pivot mountings disposed at the same height as the socket.

4. A harvester as claimed in any one of the preceding claims, wherein the frame and the adapter are provided with respective planar abutment surface portions which are co-operable with each other when the adapter is coupled to the frame and which each surround an opening for passage of harvested material to the feed shaft.

5. A harvester as claimed in any one of the preceding claims, comprising a pendulation limiting member mounted on the shaft and co-operable with an upper and a lower abutment of the adapter to limit pendulation of the adapter.

6. A harvester as claimed in claim 5, comprising a lever pivotably mounted on the adapter and resiliently engageable with the pendulation limiting member by way of a roller to define a stable position of the adapter when coupled to the frame.

7. A combine harvester substantially as hereinbefore described with reference to the accompanying drawings.

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