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(71) Applicants
Claas OHG,
Munsterstrasse 33,
4834 Harsewinkel 1,
Federal Republic of
Germany.
(72) Inventors
Norbert Diekhans
(74) Agents
Withers and Rogers,
4, Dyer's Buildings,
Holborn,
London EC1N 2JT.

(54) **Adjustment device for harvester**

(57) An adjustment device for gathering apparatus of harvesters comprises a spring (3) and ram (2) coupled in series between the gathering apparatus (1) and a support member of the harvester and a preselector (5) for adjustment of the ram (2) by means of which the height of the gathering apparatus (1) is adjusted. The preselector has two different ranges of adjustment, one range for the pressure of the gathering apparatus (1) against the ground and another range for the distance (h) of the gathering apparatus from the ground. Only one actual value indicator (5a) is provided for both ranges of adjustment.

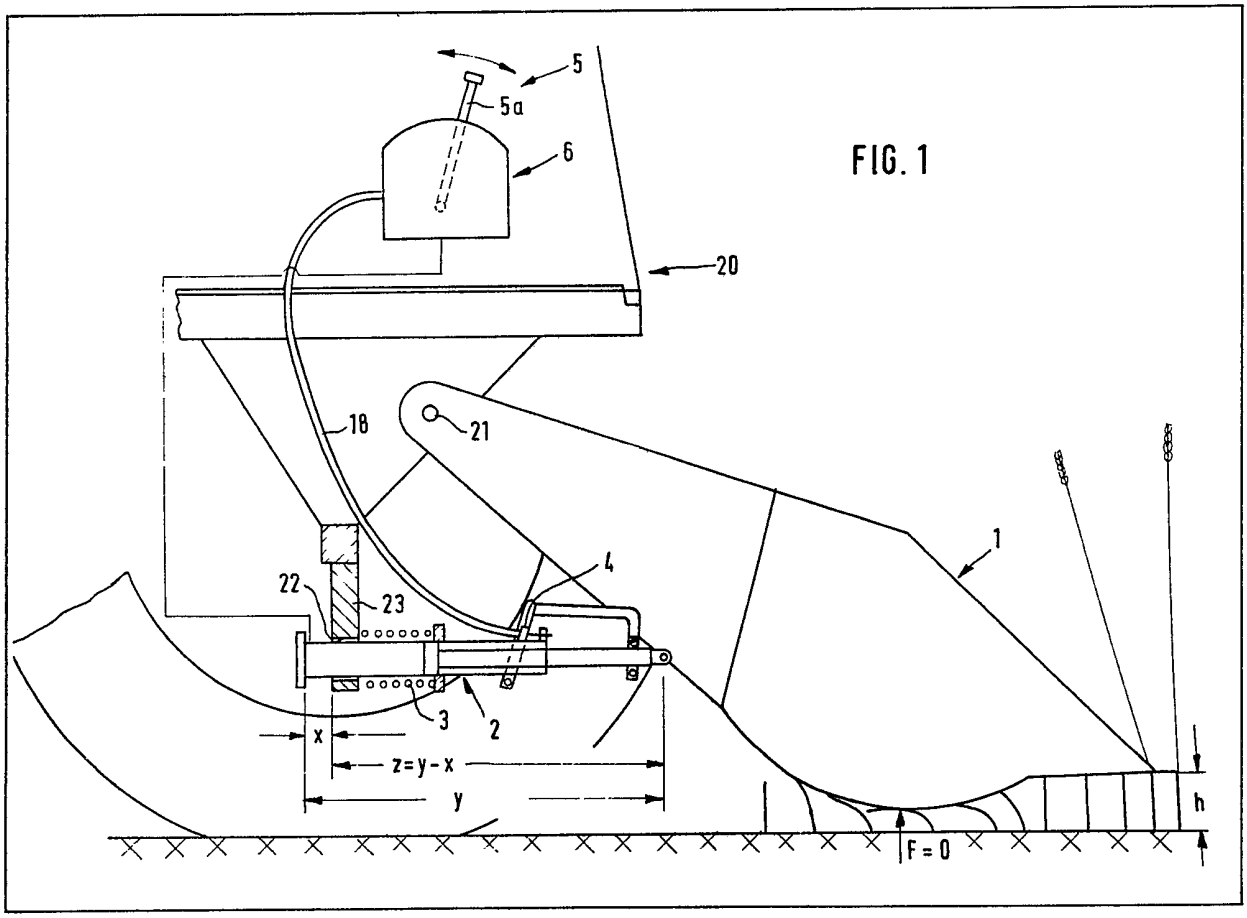
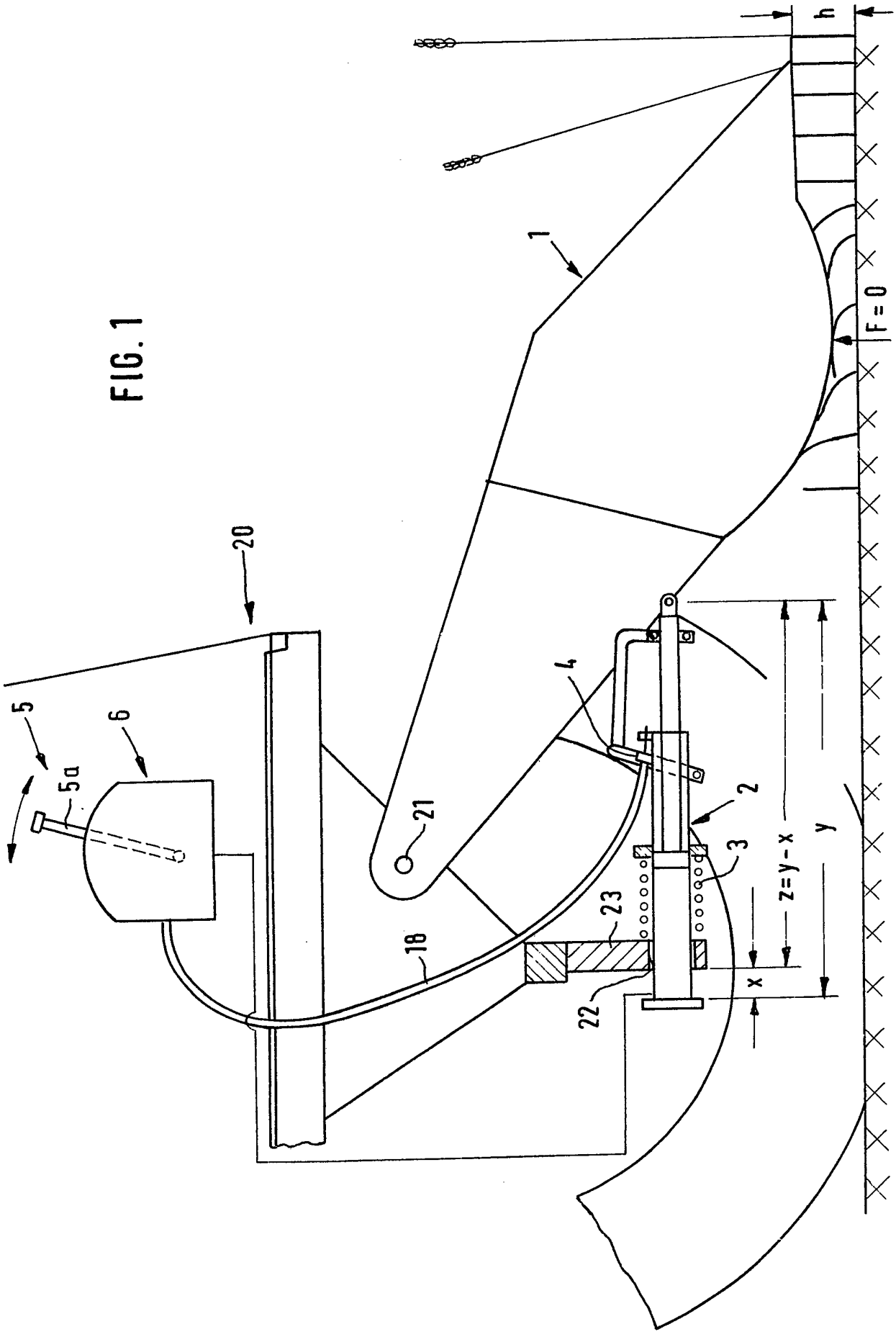


FIG. 1

GB 2 097 642 A

FIG. 1



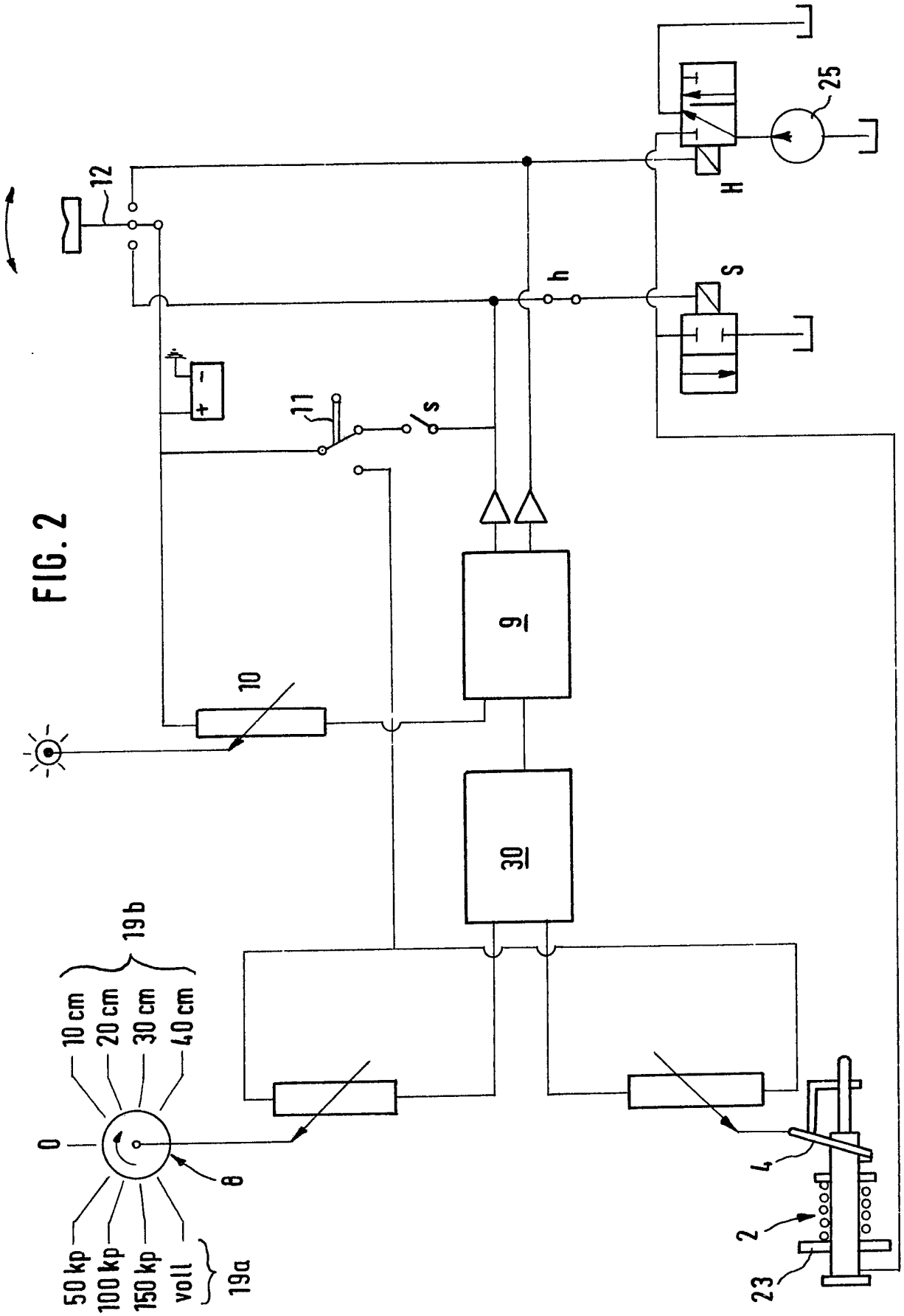

12
25
H
S
h
11
s
9
10
30
19b
10 cm
20 cm
30 cm
40 cm
0
8
50 kp
100 kp
150 kp
voll
19a
4
2
23

FIG. 2

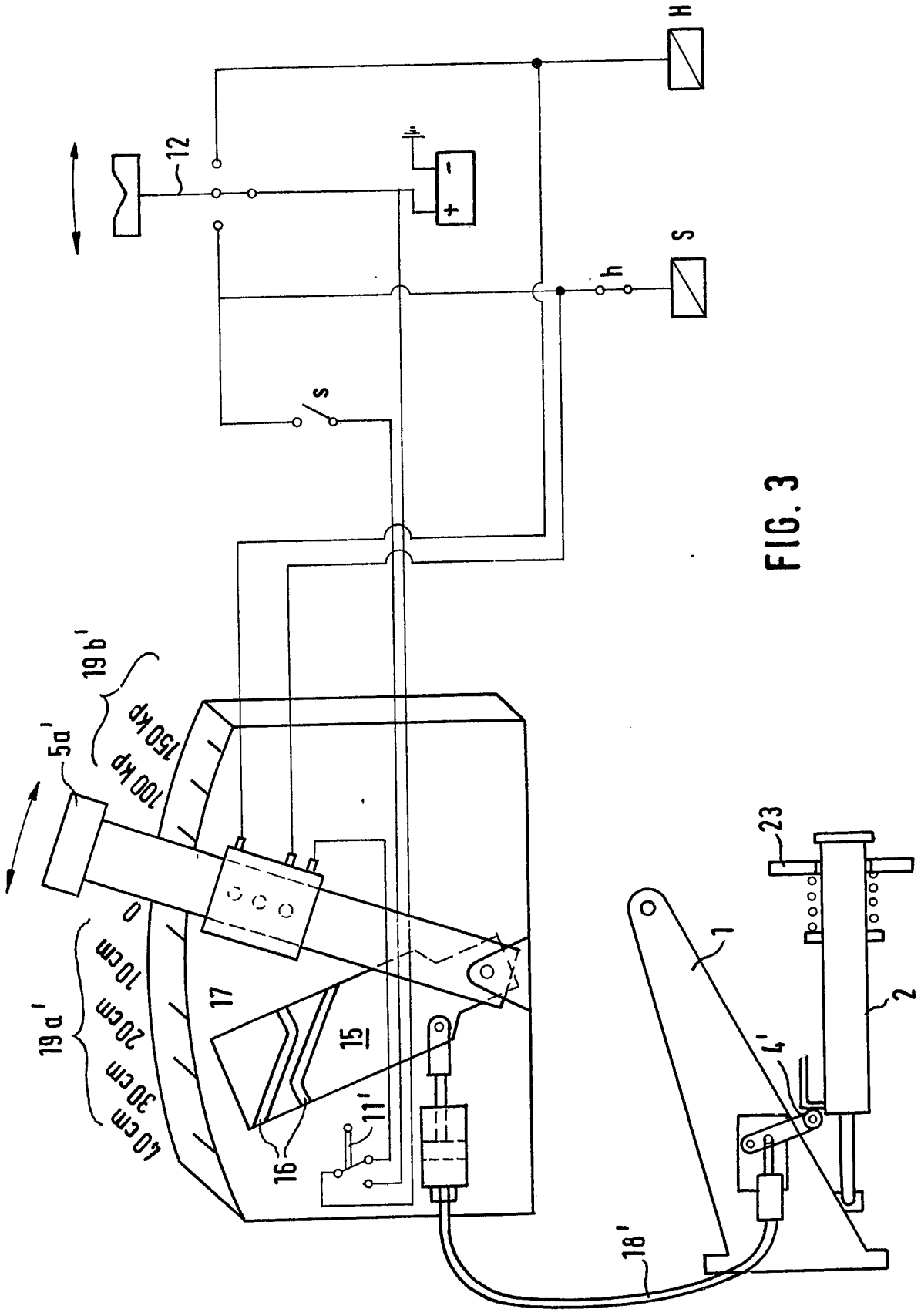

H
12
S
h
s
19b'
150 kp
100 kp
5a'
19a'
0
10 cm
20 cm
30 cm
40 cm
17
15
16
11'
18'
1
23
2
4'

FIG. 3

SPECIFICATION

Adjustment device for the gathering apparatus of harvesters

This invention relates to an adjustment device according to the introductory part of claim 1.

In a known device of this type provided in sugar cane harvesters, the gathering apparatus is carried over the ground at an approximately constant pressure against the ground. The supporting force is regulated by the oil pressure in the cylinder and piston units. This entails considerable hysteresis owing to the friction in the cylinder seals. Controlling the supporting force by influencing the bias tension of a pressure relieving spring, which is another known method, entails a poor time response of the control because a comparatively great mass of 1000 kg or more has to be displaced by way of a very yielding spring.

It is also known to carry the gathering apparatus at a certain distance above the ground with the aid of a feeler attached to the gathering apparatus. This feeler, however, only produces a control signal so long as the gathering apparatus does not make contact with the ground at some other point and is not too far above the ground.

It is an object of the present invention to construct an adjustment device of the type indicated in the introductory part so that it combines the advantages of the ground pressure control described with those of the control in the height of cut also mentioned.

The solution to this problem is achieved by means of the feature of the characterising part of claim 1.

By using a single sensor on the cylinder and piston unit and a preselector with an adjustment device in the driver's cabin, it is possible to preselect either the height of cutting or the weight bearing against the ground, as required. The indicator instruments hitherto required both for the height of cutting and for the pressure against the ground or for the pressure relieving forces are now no longer required since the operating conditions can be read off the scale of the preselector.

Preselection of the height and of the ground pressure can be obtained with a single, simple rotary potentiometer.

Preferred embodiments of the invention are described in the sub-claims.

Preferred embodiments of the invention are described in detail below with reference to the drawings, in which

Figure 1 is a schematic side view of the adjustment device,

Figure 2 is a circuit diagram of an electric control arrangement, and

Figure 3 shows a mechanical embodiment of the preselector.

A gathering apparatus 1 is pivotally mounted on a horizontal shaft 21 on the chassis 23 of a harvester 20, only part of the front region of which is indicated schematically in Figure 1. A cylinder and piston unit 2 acts on the gather apparatus 1. The cylinder and piston unit 2 pivots the gather apparatus 1 about its shaft 21 and this pivotal movement raises or lowers the gathering apparatus. The cylinder of the cylinder and piston unit 2 extends with its rear end through a bore 22 in the chassis 23 of the harvester. The cylinder and piston unit 2 bears against the chassis 23 by way of a spring 3.

Figure 1 illustrates an operation without ground contact. Under these conditions, the spring excursion x remains constant so that the length of extension y of the cylinder and piston unit 2 is a measure of the cutting height h. The length z corresponds to the length of extension y minus the spring excursion x.

When operation is with ground contact (this condition is not illustrated), the spring excursion x is an indicator of the amount of relief of weight of the gathering apparatus 1.

Since z is approximately constant when there is contact with the ground, the length of extension y of the cylinder and piston unit is a measure of the spring excursion x under these operating conditions, i.e. operation with ground contact. If a signal corresponding to the length of extension y is compared by way of a motion pick-up 4 with an adjustable lever 5a serving as actual value indicator of a preselector generally indicated by the referenc 5 by means of a comparator 6, then this comparator 6 is capable of supplying the adjustment signal for adjusting the height, for example by way of a suitable servo control.

Figure 2 represents an electronic comparator circuit. A motion pick-up 4 picks up the position of the cylinder and piston unit 2 within the range to be adjusted, for example when the gathering apparatus 1 is close to the ground.

The signal of the motion pick-up 4 is compared with the value adjsuted in the driver's cabin in an electronically operating comparator 30.

The scale of the potentiometer 8 has two ranges, namely the range 19a for indicating the weight of contact of the gathering apparatus 1 on the ground and the range 19b for indicating the distance from the ground.

A logical circuit 9 with variable sensitivity which can be adjusted by means of the potentiometer 10 delivers the raising and lowering signals to the appropriate magnetic valves H (for raising) and S (for lowering) according to whether the deviation from the nominal value is positive or negative. When the gathering apparatus moves outside the given preselected range, for example, when it is raised to 1 meter, the signal for the comparator circuit is cut off and the preselector logic is switched off. At the same time, control is handed over to the jogging switch 12 by the changeover switch 11.

The switch for the "lowering" operation is a holding switch with closing element s and opening element h, each of which is operated by the appropriate control relay for lowering (S) or raising (H). Touching the switch 12 is sufficient to lower the gathering apparatus 1 to the preselected position. For safety reasons, this lowering movement can be stopped at any time by moving the jogging switch 12 in the direction of "raising". The jogging switch is always in operation while the holding switch comes into operation only outside the control range, by

operation of the changeover switch 11.

The hydraulic pump is indicated by the reference numeral 25.

In the embodiment of Figure 3, a motion pick-up 4' displaces a pivotally mounted slotted lever 15 with switching cams 16 by means of a connecting element, for example a hydraulic linkage 18' or a Bowden cable. A lever 5a' is pivotally mounted on the same fixed shaft as the slotted lever 15. The lever 5a' carries the electric contacts 17 for energizing the magnets on the magnetic valves S and H which initiate the lowering or raising movement, i.e. the movement of the cylinder and piston unit 2 in the direction of "lowering" or "raising". In addition to the contacts for raising and lowering, the switch 17 on the lever 5a' has a contact for the zero position. The switch 17 is actuated by the relative displacement between the lever 5a' and the slotted lever 15.

If the gathering apparatus 1 is raised above the control range, the changeover switch 11' which switches off this control is operated by the slotted lever 15. The manual switch provided in parallel with the control described above corresponds to the embodiment shown in Figure 2. The embodiment of Figure 3 is again provided with a scale having two different ranges, namely a range 19a' for the height of cutting and a range 19b' for the pressure against the ground.

When lever 5a' is in the position illustrated in Figure 3, i.e. to the right of the slotted lever 15, lowering of the gathering apparatus is initiated by the switch 17. When the lever 5a' is to the left of the slotted lever 15, the magnetic valve H for raising the gathering apparatus 1 is activated. When the two levers 5a' and 15 take up the same pivotal position, the zero contact of switch 17 is closed so that neither raising nor lowering takes place.

CLAIMS

1. Adjustment device for the gathering apparatus of harvesters, comprising a cylinder and piston unit which acts at one end on the gathering apparatus and at the other end on the chassis of the harvester and is designed to adjust the height of the gathering apparatus, and further comprising a spring situated between the cylinder and piston unit and the chassis or gathering apparatus, one end of the cylinder and piston unit being freely movable relative to the chassis in its direction of adjustment, characterised in that a preselector (5; 5') for the setting of the cylinder and piston unit (2) is provided with two different ranges of adjustment and only one actual value indicator (5a; 5a') for both ranges of adjustment, that is to say for the pressure of the gathering apparatus (1) against the ground and for the distance (h) above the ground.

2. Adjustment device according to claim 1, characterised in that the piston rod of the cylinder and piston unit (2) is pivoted to the gathering apparatus (1) while the spring (3) is arranged between the cylinder and the chassis of the harvester.

3. Adjustment device according to one or more of claims 1 and 2, characterised in that the common preselector (5; 5') for the ground pressure and for adjustment of the distance above ground has two scale ranges (19a, 19b; 19a'; 19b') corresponding to the different ranges of adjustment.

4. Adjustment device according to one or more of claims 1 to 3, characterised in that an additional control device (12) which puts the preselector out of action is provided for operating the cylinder and piston unit (2) to raise or lower the gather apparatus (1).

5. Adjustment device according to claim 4, characterised in that the additional control device (12) provided to operate the cylinder and piston unit (2) is designed as a holding circuit.

6. Adjustment device according to one or more of claims 1 to 5, characterised in that the control device is designed as electric comparator circuit with adjustable sensitivity.

7. Adjustment device according to one or more claims 1 to 6, characterised in that the control device has limit switches, changeover switches or contacts (17) designed to be operated by adjustable cams or the like.

8. Adjustment device according to one or more of claims 1 to 7, characterised in that hydraulic control slides are provided for the comparison between nominal value and actual value.

9. A harvesting machine comprising: adjustable gathering apparatus; a spring and a ram coupled in series between the gathering apparatus and a support member, the ram being operable to adjust the height of the gathering apparatus; a control device arranged to operate the ram and provided with two ranges of adjustment, one for setting the pressure of the gathering apparatus against the ground and the other for setting the distance of the apparatus above the ground; and an actual value indicator for both ranges of adjustment.

10. A harvesting machine constructed and arranged substantially as herein described and shown in the drawings.

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