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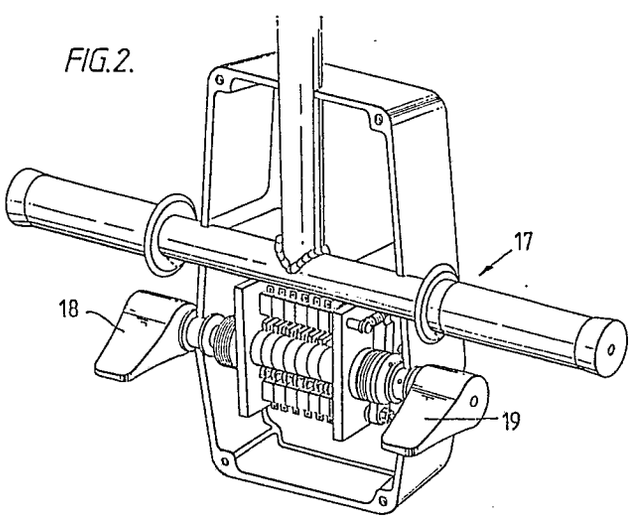
(54) **A control unit for a man-rider crane.**

(57) A control unit for a man rider crane comprising a chassis 1 movable horizontally and an operators cab 7 movable in a vertical direction relative to the chassis 1, the control unit being a pendant control 13 adapted to depend from the roof 11 of the cab and being movable between a stowed position 14 clear of an operator and a depending operative position, the control having two manually operable control members 18, 19 operable respectively to control the positioning of the crane and the operators cab relative thereto. The control members are such that movement of the cab and/or crane is possible only when the operator moves both of the control members 18, 19 from a neutral position to which the members are resilient biassed by a torsion spring 20.

FIG.2.



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Description

A control unit for a man rider crane

This invention relates to a control unit for a man rider crane adapted for use in warehousing systems.

In the storage of individual products or pallets in modern warehouses, space is at a premium and it is the current practice to provide racking on each side of long aisles, the racking extending upwardly to provide a plurality of shelves or tiers for the storage of items, which may be individual packages or pallets or other types of known container. In order to place items on the shelves and to retrieve them when required it is known to provide man rider cranes, which is a term of art. A man rider crane comprises a main chassis designed to run along each aisle on rails and has an operators cab mounted on the chassis so as to be movable vertically. The control of the movement of the crane along the aisles and the vertical movement of the cab is controlled by the operator when he is in the cab. Thus, the operator can position himself at a desired position in an aisle and adjacent a desired shelf in the vertical direction to enable him to load and unload items from the desired shelf.

For safety reasons it is highly desirable that the position of the operator on the cab should be proscribed during movement of the crane and/or cab and the present invention seeks to provide a control unit for such man rider cranes which ensures that the crane and/or cab cannot be moved unless the operator is in a predetermined, safe, position.

According to the present invention there is provided a control unit for a man rider crane comprising a chassis movable horizontally and an operators cab movable in a vertical direction relative to the chassis, the control unit being a pendant control adapted to depend from an overhead part of the cab and being movable between a stowed position clear of an operator and a depending operative position, the control having two manually operable control members operable respectively to control the positioning of the crane and the operators cab relative thereto, the control members being such that movement of the cab and/or crane is possible only when the operator moves both of the control members from a neutral position to which the members are resilient biassed.

In certain circumstances, it is a requirement for two operators to be in the cab. To ensure the safety of the second operator, a pair of safety switches is provided on the pendant control unit these switches being biassed to the off position to prevent movement of the cab or crane unless both switches are simultaneously moved manually to the on position by the second operator. A further key operable switch is provided to convert the cab for one man or two man operation, as the case maybe.

A preferred embodiment of the present invention will now be described by way of example with reference to the accompanying drawings in which:

Figure 1 shows a general schematic view of a man rider crane,

Figure 2 shows part of the control unit with the front cover removed,

Figure 3 shows an exploded of the control unit of Figure 2 and,

Figures 4a and 4b show a total of 18 permutations for the positions of the control members of the control unit.

Referring now to Figure 1, there is shown, schematically, a man rider crane. The crane has a main chassis part 1 carrying rollers 2 which run on rails 3 laid in the aisles along which the crane travels. The crane has a superstructure 4 which has two vertical posts 5 and 6 providing guides for a vertically movable cab 7. The cab 7 is guided on the posts 5 and 6 by known means and it is connected to a motor 8 by a cable arrangement 9 through which its height can be adjusted as desired. The cab consists of a base platform 10, a roof superstructure 11, with a guide rail 12 to prevent the operator falling off the cab. Parts, 12a and 12b of the cab guide rail are movable to allow the operator to enter and leave the cab. The control of the vertical movement of the cab on the posts 5 and 6 and the horizontal movement of the entire crane on the rails 3 is controlled by an operator on the cab by means of a pendant control unit 13. Details of the pendant control unit are shown in greater detail in Figures 2, 3 and 4. The unit 13 is pivotally mounted to the roof 11 of the cab so as to pivot between a stowed position 14 shown in outline, where the unit is parallel to the roof clear of the roof and a depending operative position 15 where control members on the unit may be manually held by the operator.

The details of the control members for controlling the movement of the cab and crane will be described hereinafter with reference to Figures 2 and 3, but in addition to these control members there is a further control system 16 for use when there is a second operator on the cab. For safety reasons it is essential that the position of the operators during movement is proscribed and therefore the control unit includes a second set of controls which consist of a control handle containing two manually operable safety switches (not shown). The safety switches comprise manually operable switches placed on each side of a handle bar and are biassed to the off position to disable the control circuitry to thereby prevent movement of the cab and crane by the other operator. The safety switches must be held manually in the on position to enable movement of the crane to be controlled by the first operator to thereby ensure that the second operator remains in a safe place during movement. A key operable switch is located elsewhere on the cab to disable or override the effect of the safety switches for the second operator when no second operator is on the cab.

Referring now to Figure 2 there is shown the lower most part of the pendant unit 13 with the front cover removed to show part of the mechanism. Figure 3 shows a similar view of this part of the control unit in an exploded form.

As shown in Figures 2 and 3, the control unit has a

handle bar 17 which is held by the operator with his hands positioned so that he can operate two switches 18 and 19 with his thumbs. The two switches 18 and 19 are biassed to a neutral position (stage 5 shown in Figure 4a) by springs 20, shown in Figure 3. The construction of the switches 18 and 19 is essentially identical so that the two halves of the unit are identical and therefore only one will be described for simplicity. The lever 19 is biassed to the neutral position by a torsion spring 20 which is concentrically mounted on a shaft 21 to which the lever 19 is connected so as to be rotationally fast thereon. The switch lever 19 has a further member 22 pivotally fast thereto which has a outwardly extending limb 23 which engages between the ends of the torsion spring 20. Thus, in which ever direction the lever 19 is pivoted, the spring 20 is placed under tension and this tension serves to bias the lever to the neutral position. Each of the levers 18 and 19 is movable upwardly or downwardly through four distinct positions. The positions are determined by a detent arrangement consisting of a series of detents 24 on the member 22 which are engaged by a detent pin 25 on a lever 26 which is pivotally mounted on the body of the control unit. A spring 27 serves to bias the lever 26 so that detent pin 25 is biassed into engagement with the detents 24. The detents are shaped so as to have a gentle ramp in the direction in which the member 19 is pushed into one of the selective positions by the operator the other face of the detent being much steeper to provide a positive abutment to define the position, so that the operator has to make a positive pressure movement to move into the next stage. However the shallowness of the lead-in ramp is not sufficient to prevent the spring 20 from returning the lever to the neutral position as soon as the member 19 is manually released by the operator.

A series of micro-switches arranged in two banks 28 and 29 are associated with each of the levers 18 and 19. The micro-switches associated with the lever 19 are numbered 1 to 8 and those associated with the lever 18 are numbered a to h. Pivotable movement of the members 18 and 19 causes corresponding rotation of a series of cams 30, each cam controlling two of the micro-switches, there being four cams controlled by each of the two members.

The horizontal movement of the crane is controlled by the switch 19 and the vertical movement by the member 18. It is impossible to move either the cab or the crane by operation of its associated member unless the other member is simultaneously moved also, at least into its first position to close the first of its micro-swtiches. This position is shown as stage 1 in Figure 4a in which both of the members 18 and 19 have been moved to their first position. When in this position no movement of the cab or crane takes place but the system is primed to enable one or both to be moved. This ensures that the operator is always in a known safe position with both hands occupied before the cab or crane can be moved. From this position either the cab or crane or both can be moved. In stage 2 of Figure 4a, for example, the cab is being moved up at its slowest speed and the crane is being moved horizontally at its slowest speed in one direction. Stage 3 shows an intermediate speed stage for both the vertical cab movement and horizontal movement of the crane whilst stage 4 shows the highest speed.

Stage 5 shows the neutral hands off position. Stage 6 shows the priming position for movement in the reverse direction when the levers 18 and 19 are moved downwardly. Thus, stage 7 shows the cab being moved downwardly at its slowest speed and the crane being moved horizontally at its slowest speed in the opposite direction to that shown in stage 2. It can be seen that in each stage the appropriate micro-switches 30 are closed. Stages 10 to 18 show other permutations in the movement of the cab and crane and it will be seen that the crane can move in each direction at slow intermediate and fast speeds whilst the cab can move vertically at slow intermediate and fast speeds either up or down simultaneously with the movement of the crane.

By this means, the safety of the operator, or both operators where two are present on the platform at the same time, is ensured whilst enabling the maximum efficiency of movement of the cab and crane. When the control unit is not in use, as when the operator is picking up from the racks and/or loading pallets onto the platform the pendant unit can be raised up to the stowed position out of the way of the operator. Two gas struts (not shown) are provided to assist in the movement of the pendant unit. Provision is also made for the vertical adjustment of the pendant over a range of 100 mm to compensate for the different heights of the operators to enable each operator to position the control unit at the most comfortable height.

Although not shown in detail, the station for the second operator is generally similar to that described in Figures 2 and 3. The second operator will be provided with a similar handle bar arrangement and two switches but instead of these switches comprising control switches they are simple on/off safety switches which must be held closed by the second operator before the first operator can initiate movement of the cab and/or crane.

Claims

1. A control unit for a man rider crane comprising a chassis movable horizontally and an operators cab movable in a vertical direction relative to the chassis, the control unit being a pendant control adapted to depend from an overhead part of the cab and being movable between a stowed position clear of an operator and a depending operative position, the control having two manually operable control members operable respectively to control the positioning of the crane and the operators cab relative thereto, the control members being such that movement of the cab and/or crane is possible only when the operator moves both of the control members from a neutral position to which the members are resilient biassed.

2. A control unit according to claim 1 wherein

there is further provided a pair of safety switches biassed to an off position to prevent movement of the cab or crane unless both switches are simultaneously moved manually to the on position by a second operator.

3. A control unit according to claim 2 wherein the said pair of safety switches are mounted on the pendant control.

4. A control unit according to claim 2 or 3 wherein a further switch is provided selectively switchable to set the cab for one man or two man operation, as required.

5. A control unit according to claim 3 or 4 wherein said pair of safety switches for the second operator are positioned so that they can only be operated simultaneously by the second operator using both hands.

6. A control unit according to any one of claims 1 to 4 wherein the pendant control has a handle bar having two spaced handgrips, the manually operable control members being positioned adjacent the two handgrips so as to be operable by an operator gripping the two handgrips.

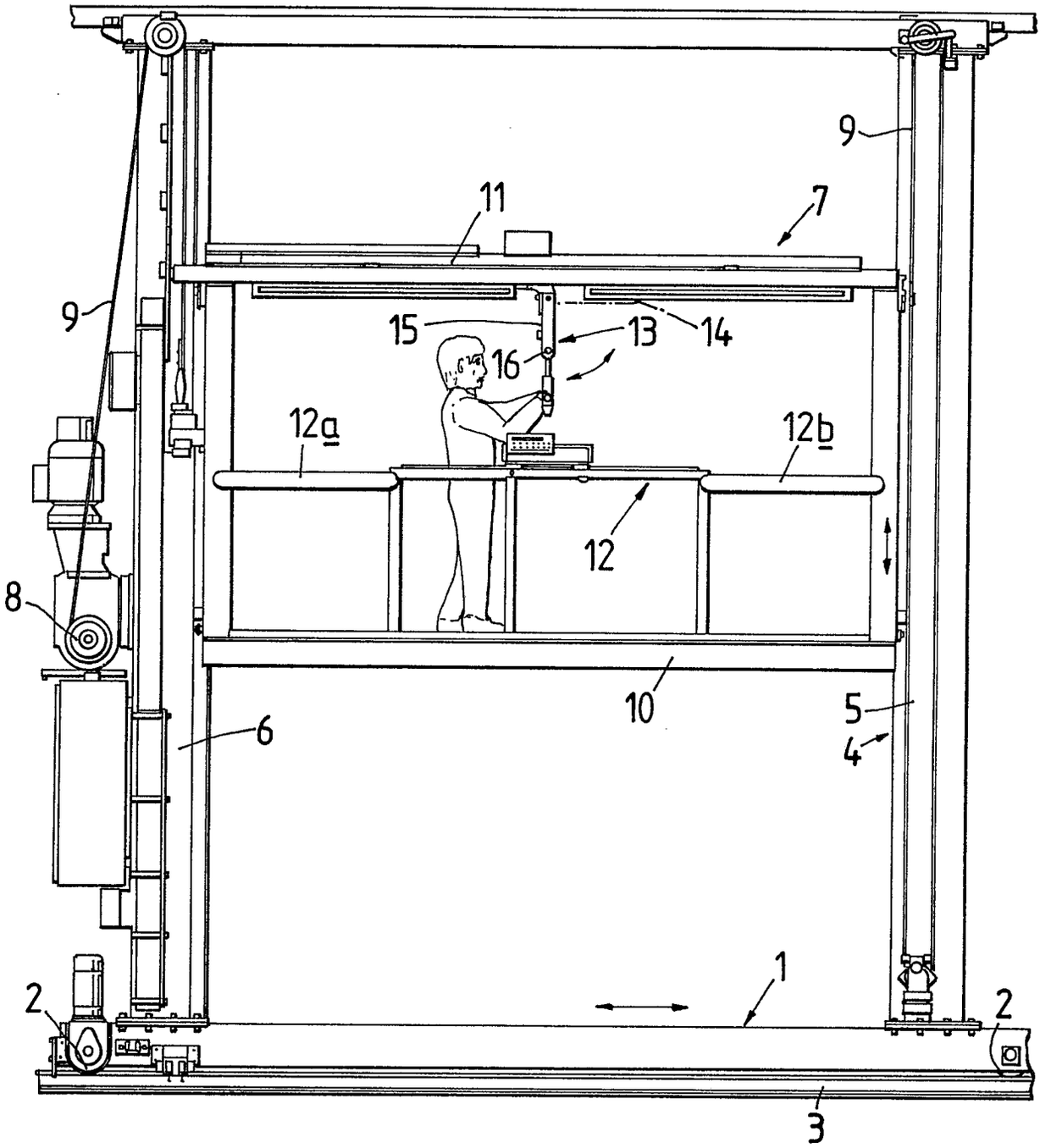
7. A control unit according to any one of the preceding claims wherein said control members are pivotable manually out of the neutral position in both directions against the bias of a torsion spring.

8. A control unit according to claim 7 wherein the control members are pivotable into a selected one of a plurality of positions determined by detents into which a detent pin on the control member is resiliently biassed.

9. A control unit according to claim 8 wherein the detents each have a gentle ramp in the direction towards the neutral position and a steeper positive ramp in the direction away from the neutral position to give a positive stop so that the operator has to make a positive effort to move to the next stage away from neutral, but the gentle ramps enable the control member to move back easily to the neutral position as soon as the member is released.

10. A control unit according to any one of the preceding claims wherein the height of the pendant control relative to the cab is adjustable.

FIG.1.



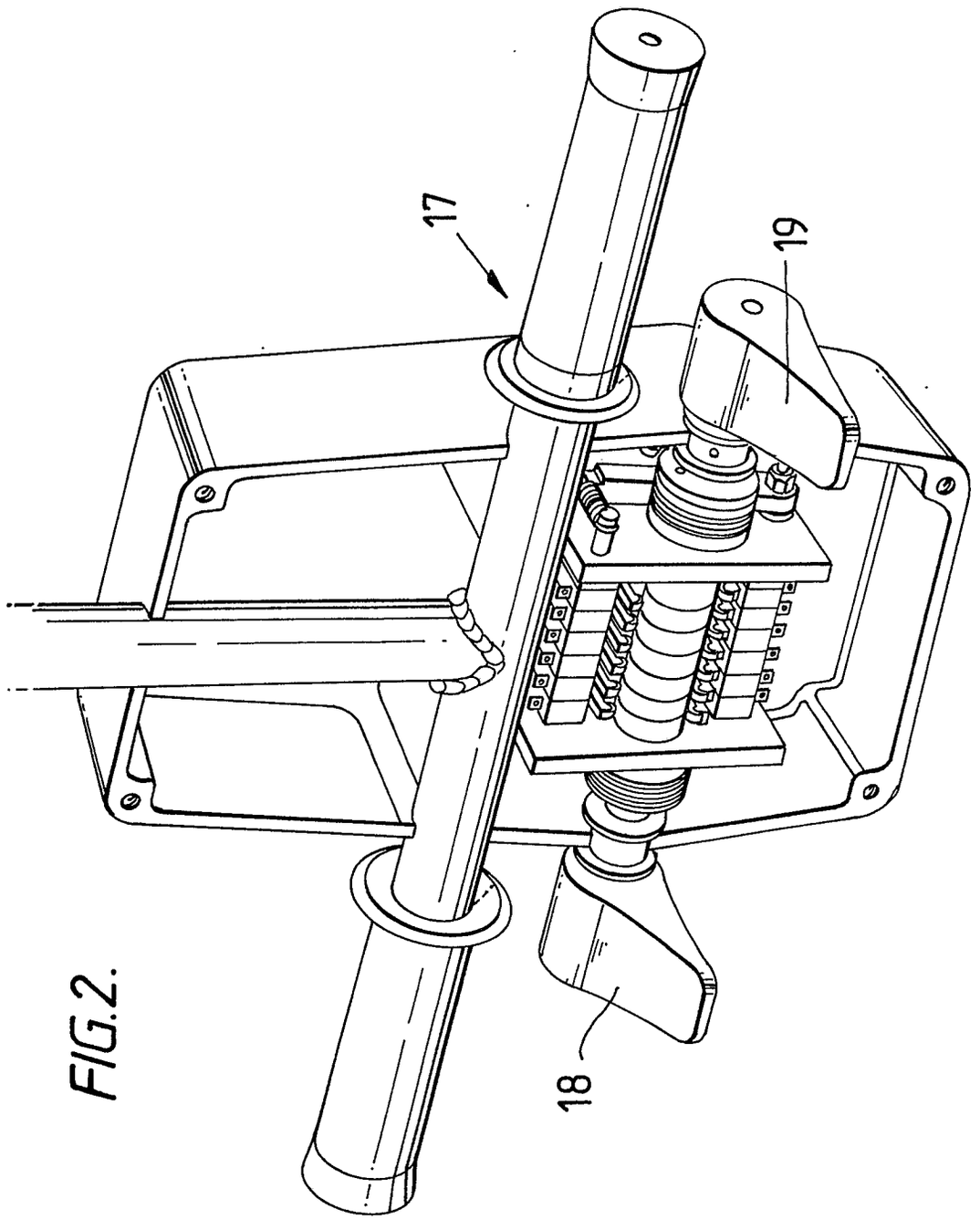


FIG.2.

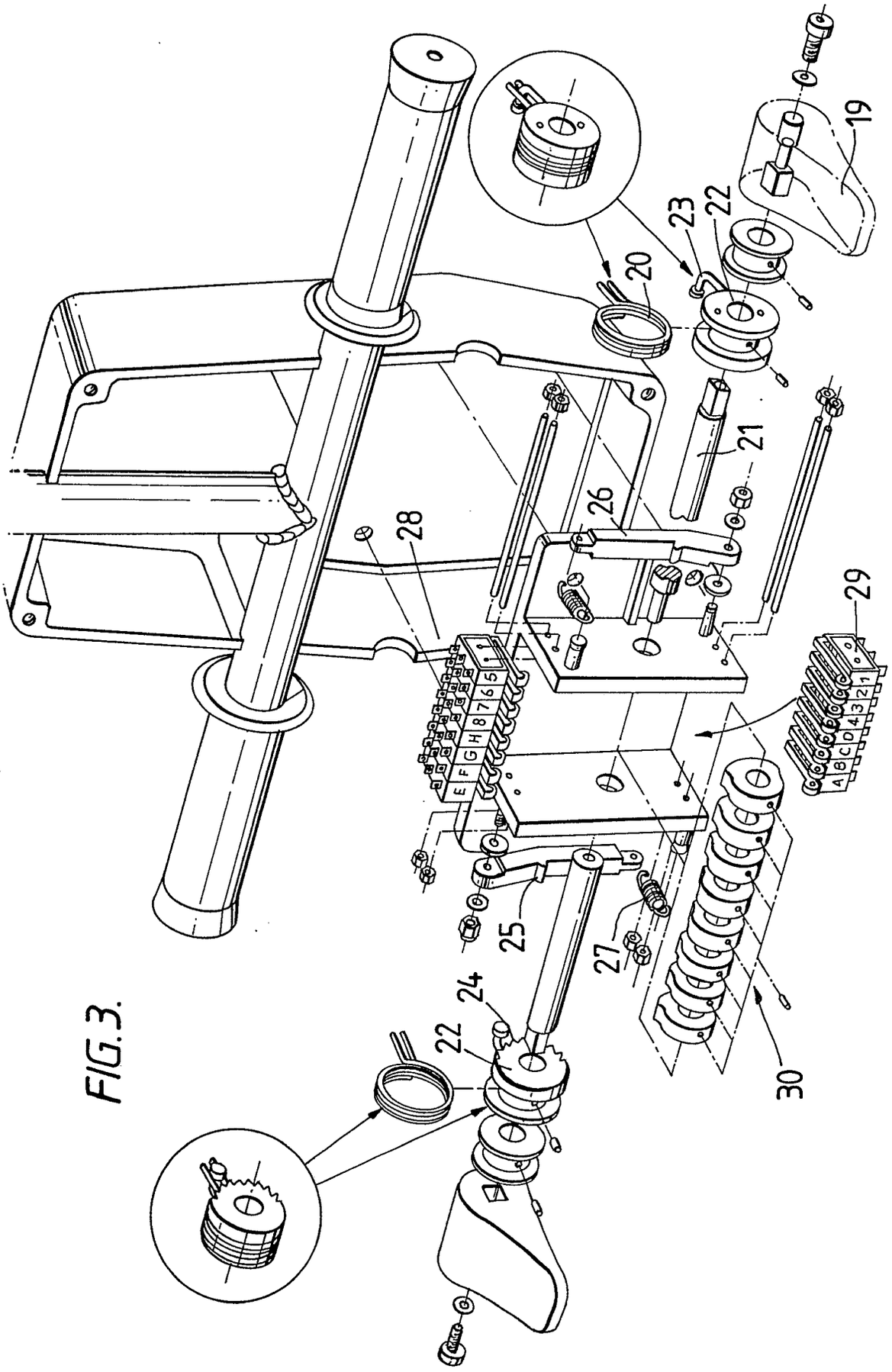


FIG.3.

FIG.4a.

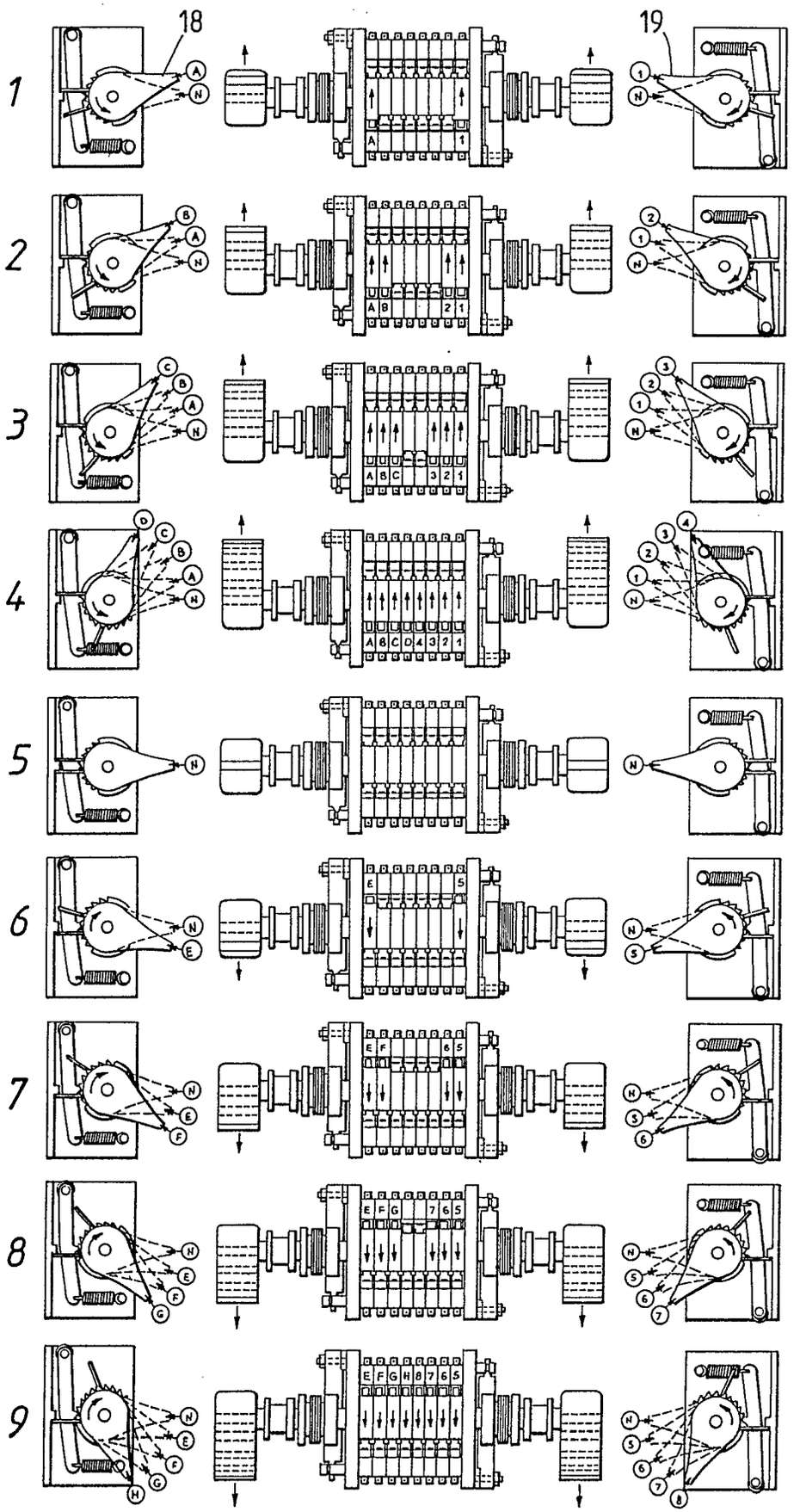


FIG.4b.