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(54) Moving-frame printing machine frame-holding carriage with obstacle-detection sensor

(57) Printing frame-holding carriage (15) for printing machines (10) for ribbon-like products (12) of the type moving on the machine along the ribbon between preset printing positions and equipped with motor means (20) and motion control means (21) and characterized in that it comprises means (22,27,29,42) of detection of the presence of obstacles along the motion trajectory. The detection means are connected to control means (34,35) for stopping the carriage (15) upon detection of an obstacle.

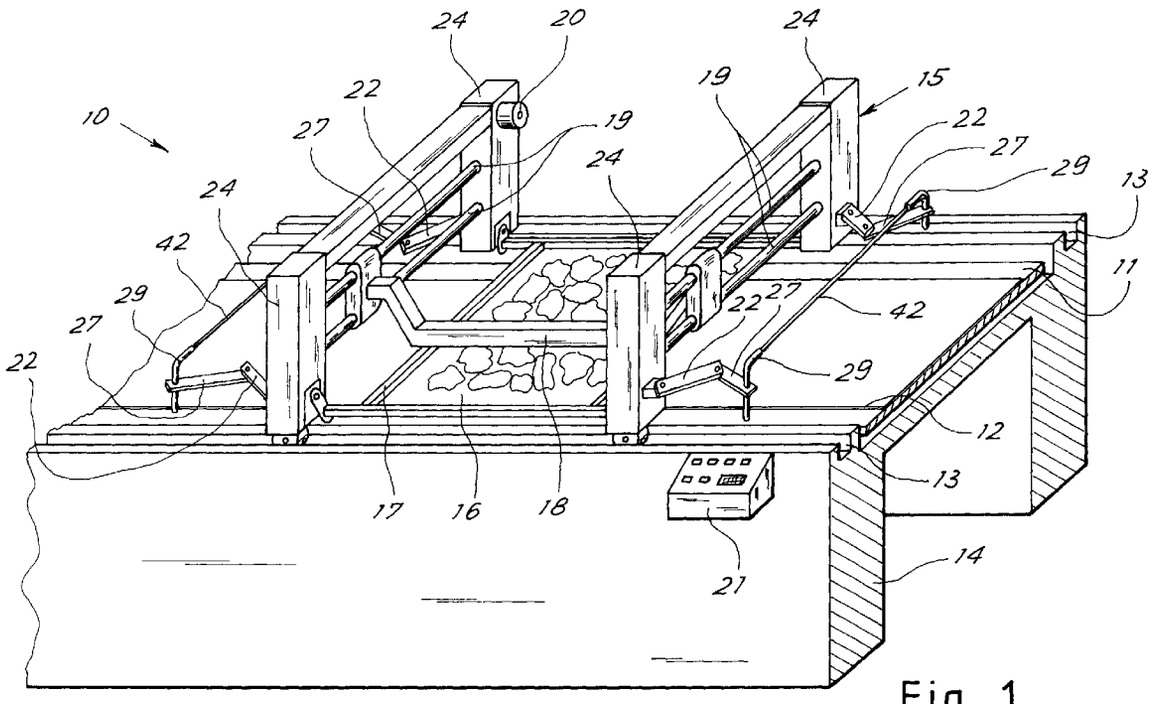

Fig. 1

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Description

The present invention relates to a carriage for the support of printing frames in machines for printing ribbon-like products such as fabrics, paper ribbons or the like.

In the technology of printing on ribbon-like products and in particular fabrics various types of printing machines are used. In particular, fixed-frame and moving-frame printing machines are used.

In fixed-frame machines the product to be printed and appropriately fastened on a moving support such as a conveyor belt is made to advance to the desired position with respect to the printing frame and then stopped. There is then performed accurate adjustment of the relative position of the frame and belt.

In moving-frame machines the belt is held stationary in a position such as to keep a certain length thereof within the range of the printing frames. The latter are moved into preset positions along the belt for application of the color to the fabric by means of purpose-made printing heads. In machines of this type the moving members have relatively low inertia so that high accuracy in reaching the correct printing positions can be easily achieved.

To achieve high production capacities the frame-holding carriages are moved at high speed between the different printing positions along the fabric ribbon.

In these systems it is not infrequent that an operator is in a position near the ribbon along the trajectory of motion of the carriage, e.g. to manually control certain operations of the machine or to inspect the fabric printing quality. It is clear how serious the consequences for the operator in case of impact by the frame-holding carriage moving at high speed along the ribbon could be.

The general purpose of the present invention is to obviate the above mentioned shortcomings by supplying a moving-frame printing machine frame-holding carriage capable of stopping its travel before an obstacle obstructing its motion trajectory without striking it.

In view of this purpose it is sought to provide in accordance with the present invention a frame-holding carriage for machines printing ribbon-like products and of the type moving on the machine along the ribbon-like product between preset printing positions and equipped with motive means and motion control means and characterized in that it comprises means of detecting the presence of obstacles along the motion trajectory with said means connected to means for commanding stopping of the carriage upon detection of an obstacle.

It is noted that the frame-holding carriage detection means in accordance with the present invention allow detecting the obstacle by contact therewith while transmitting thereto only a virtually negligible and nearly constant force during the entire carriage deceleration phase until it stops. There can thus be avoided serious consequences for the safety of the operator who might find himself along the motion trajectory during carriage transit.

To clarify the explanation of the innovative principles of the present invention and its advantages compared with the prior art there is described below with the aid of the annexed drawings a possible embodiment thereof by way of non-limiting example applying said principles. In the drawings:

Fig. 1 shows a partial perspective view of a printing machine equipped with a printing frame-holding carriage in accordance with the present invention,
Fig. 2 shows a top view of a detail of the frame-holding carriage in accordance with the present invention with the obstacle detection means, and
Fig. 3 shows a front elevation of the detail of Fig. 2.
With reference to the above figures reference number 10 indicates as a whole a printing machine for ribbon-like products such as fabrics, paper ribbons, etc. The machine itself being of known type it is shown only partially and diagrammatically in Fig. 1 since the components not represented such as loading and removal devices, drying means, washing devices, etc. are readily imaginable for one skilled in the art.

Near the upper part of the machine 10 is arranged a support or belt 11 on which lies advantageously fastened by gluing a ribbon 12 of product to be printed.

Over the ribbon 12 runs on purpose-made guides 13 integral with the machine frame 14 and parallel to the ribbon 12 a carriage 15 for support of the printing frame 16. The frame 16 is supported by a frame 17 configured to be slightly offset with respect to the ribbon 12 in accurate adjustment after the carriage 15 reaches a preset printing position.

Over the frame 16 is arranged a printing head 18 shown diagrammatically since it can take on quite different configurations. The printing head 18 moves along guides 19 of the carriage 15 and extends transversely to the ribbon 12.

The machine 10 also comprises motor means 20 for carriage movement and control means 21 for movement and printing function control. The means 20, 21 are shown diagrammatically since they belong to the prior art and are thus readily imaginable by one skilled in the art as are the connections between them.

In accordance with the innovative principles of the present invention the frame-holding carriage 15 is equipped with means for detection of obstacles along the motion trajectory and designed to command emergency stopping of the carriage when an obstacle is detected.

As may be seen in Fig. 2 the detection device in accordance with the present invention comprises a first arm 22 pivoted at one end 23 to the carriage 15 advantageously opposite a riser 24 of the carriage structure. The arm 22 is pivoted at the other end 25 to one end 26 of a second arm 27. The arms 22, 27 constitute a jointed

unit extending towards the exterior of the carriage 15 in the direction of motion.

The arm 27 supports at the other end 28 an obstacle-interception element 29 arranged in the machine's external edge zone. The element 29 extends at least partly transversely to the trajectory of motion of the carriage and vertically to involve the machine portion near which the operator might be.

In the configuration of the carriage shown in Fig. 1 there are advantageously provided four obstacle-detection and stopping devices in accordance with the present invention. They are applied to respective risers 24 of the frame-holding carriage structure opposite the four angles. There is thus ensured maximum protection for assigned personnel on whatever side of the machine they might be regardless of the direction of motion of the carriage 15.

Advantageously the pairs of interception elements 29 turned in the same direction of motion are connected by elements 42 such as cables or the like extending transversely to the belt 12 and near it so as to intercept even possible obstacles present on the belt 11.

The jointed arms of the detection device are movable between an initial extended or rest position in which they can contact through the interception elements 29, 42 any obstacle present in the trajectory of the carriage 15 before the carriage reaches the obstacle and a final contracted position.

In accordance with the present invention when the jointed device 22, 27, 29 meets an obstacle it begins to contract to cause operation of appropriate emergency stop control means of the frame-holding carriage 15 which are described below.

The amplitude of travel of the jointed arms between the initial extended position and the position of full contraction possible with a stationary obstacle is dimensioned to be greater than the space necessary for emergency stopping of the frame-holding carriage 15 traveling at full operational speed. In this manner, once the obstacle is contacted by the interception elements 29 or 42 the carriage 15 stops with the arms 22, 27 in partially contracted position even in case of immobility of the obstacle to thus avoid striking the latter directly with its shape and transmitting thereto its impact force. At the joint between the arms 22 and 27 are arranged elastic means 30 consisting for example of a wire spring (shown in Figures 2 and 3) with ends pressing against respective strikers 31, 32 of the arms to keep the detection device in extended position. The spring 30 has elastic characteristics such as to supply virtually constant reaction force between the initial extended positions and the final contracted positions of the arms. In addition the above mentioned reaction force is sufficiently low to transmit to the obstacle a negligible impact force.

Advantageously spring means 33 of equal elastic characteristics can also be provided at the joint between the arm 22 and the carriage structure 24.

As mentioned above, the frame-holding carriage in accordance with the present invention comprises control means for emergency stopping upon detection of an obstacle by the detection means 22, 27, 29, 42. The control means can consist for example of microswitches 34, 35 arranged in a position such as to be operated respectively by the relative movement of the arms 22, 27 and by the movement of the arm 22 with respect to the carriage structure 24.

In the embodiment shown in the figures the microswitch 34 is integral with the arm 22 and advantageously housed within its channel. Operation takes place by means of detection of the running a roller 36 thereof on a corresponding surface 37 of an element 38 integral with the arm 27 upon occurrence of a relative rotation of the two arms. The microswitch 35 is integral with the carriage structure and advantageously housed within the channel of the riser 24. Operation takes place by running of one of its rollers 39 on a rod 40 integral with the arm 22 upon occurrence of a rotation of this arm with respect to the carriage structure. An opening 41 is provided in the wall of the riser 24 for passage of the rod 40.

The microswitches 34, 35 are connected in a well known manner, and accordingly not described in detail, with the control means 21 and the motor means 20 to command an emergency stop of the frame-holding carriage if an impact of the interception elements 29 or 42 against an obstacle causes relative rotation of the arms 22, 27 and/or the arm 22 with respect to the carriage structure.

Naturally the above description of an embodiment applying the innovative principles of the present invention is given by way of non-limiting example of said principles within the scope of the exclusive right claimed here.

For example, the interception elements 29 could consist of mutually independent plate-like elements with faces turned in the direction of movement of the carriage. These plates could be pivoted on the arms 27 or could be advantageously rigidly constrained to the arms so that upon contraction of the jointed device the plate would direct itself outward while accompanying the obstacle to a safe position outside the range of the carriage 15.

It is also clear that a printing machine could be equipped with a plurality of frame-holding carriages each equipped with the detection devices described here.

Claims

1. Printing frame-holding carriage (15) for printing machines (10) for ribbon-like products (12) of the type moving on the machine along the ribbon-like product between preset printing positions and equipped with motor means (20) and motion control means (21) and characterized in that it comprises means (22, 27, 29, 42) of detection of the presence of ob-

stacles along the motion trajectory with said means being connected to control means (34, 35) for stopping the carriage (15) upon detection of an obstacle.

2. Frame-holding carriage in accordance with claim 1 and characterized in that the detection means comprise a plurality of jointed arms (22, 27) moving with respect to the carriage (15) between a first extended position designed to contact the obstacle and a second contracted position upon occurrence of movement between the first and second positions with there being operated the control means (34, 35) for stopping the carriage (15).

3. Frame-holding carriage in accordance with claim 2 and characterized in that the jointed arms (22, 27) are movable between a first and second positions against the action of elastic means (30) holding them in the first position.

4. Frame-holding carriage in accordance with claim 2 and characterized in that the elastic means (30) are dimensioned to supply virtually constant reaction force between a first and a second position.

5. Frame-holding carriage in accordance with claim 4 and characterized in that the elastic means (30) are dimensioned to supply virtually negligible reaction force upon contact with an obstacle.

6. Frame-holding carriage in accordance with claim 2 and characterized in that the range of the jointed arms (22, 27) between a first and a second position is greater than the stopping distance of the carriage (15) once the obstacle has been detected.

7. Frame-holding carriage in accordance with claim 2 and characterized in that the jointed arms extend towards the exterior of the carriage (15) in the direction of motion and comprises a first arm (22) pivoted to a portion (24) of the carriage (15) and a second arm (27) pivoted to the first (22) with the second arm (27) being connected to an interception element (29) extending at least in part transversely to the direction of motion of the carriage (15) and vertically.

8. Frame-holding carriage in accordance with claim 1 and characterized in that the detection means (22, 27, 29) are arranged virtually opposite the lateral edges of the carriage (15) with respect to its direction of motion.

9. Frame-holding carriage in accordance with claim 3 and characterized in that the elastic means consist of at least one wire spring (30) at the joint between the arms (22, 27) and having ends pressing against respective strikers (31, 32) of the arms.

10. Frame-holding carriage in accordance with claims 3 and 7 and characterized in that the elastic means comprise another spring (33) arranged at the joint between the first arm (22) and the portion (24) of carriage (15).

11. Frame-holding carriage in accordance with claim 7 and characterized in that the stop control means for the carriage (15) upon detection of an obstacle comprises a microswitch (34) operated by the relative movement of the arms (22, 27).

12. Frame-holding carriage in accordance with claim 7 and characterized in that the stop control means for the carriage (15) upon detection of an obstacle also comprise a microswitch (35) operated by the movement of the first arm (22) with respect to the carriage (15).

13. Frame-holding carriage in accordance with claim 11 and characterized in that the microswitch (34) is integral with the arm (22) and is operated by the running of its roller (36) on a corresponding surface (37) of an element (38) integral with the second arm (27).

14. Frame-holding carriage in accordance with claim 12 and characterized in that the additional microswitch (35) is integral with the carriage (15) and operated by running of its roller (39) on a rod (40) integral with the first arm (22).

15. Frame-holding carriage in accordance with claim 1 and characterized in that it comprises four obstacle-detection devices (22, 27, 29) and stop controls (34, 35) with each applied to a corner of the carriage (15).

16. Frame-holding carriage in accordance with claim 15 and characterized in that the pairs of detection devices (22, 27, 29) turned in the same direction of motion as the carriage are connected by additional interception elements (42) extending transversely to the direction of motion.

17. Frame-holding carriage in accordance with claim 16 and characterized in that that the additional interception elements (42) consist of cables arranged near the ribbon-like product (12).

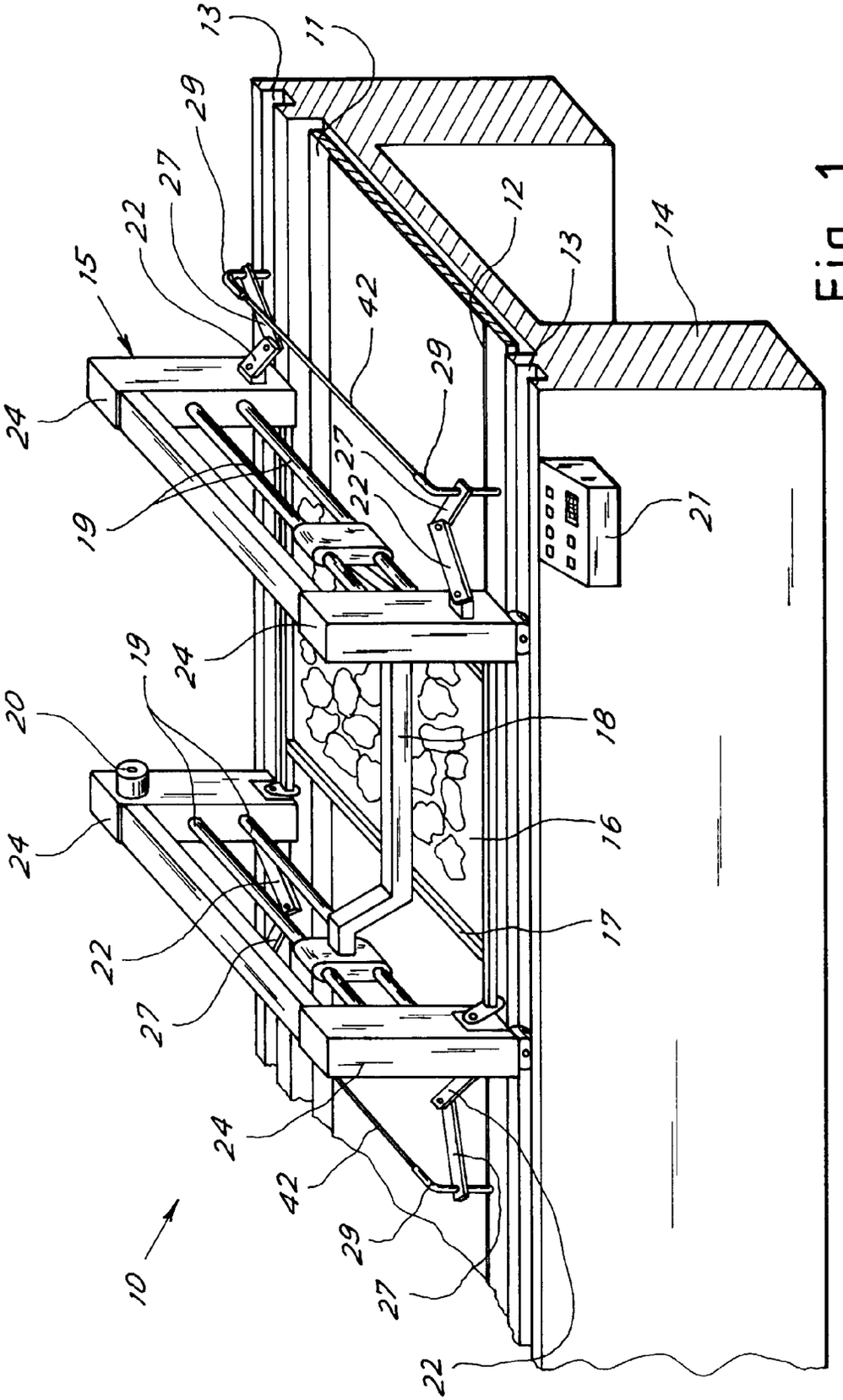
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Fig. 1

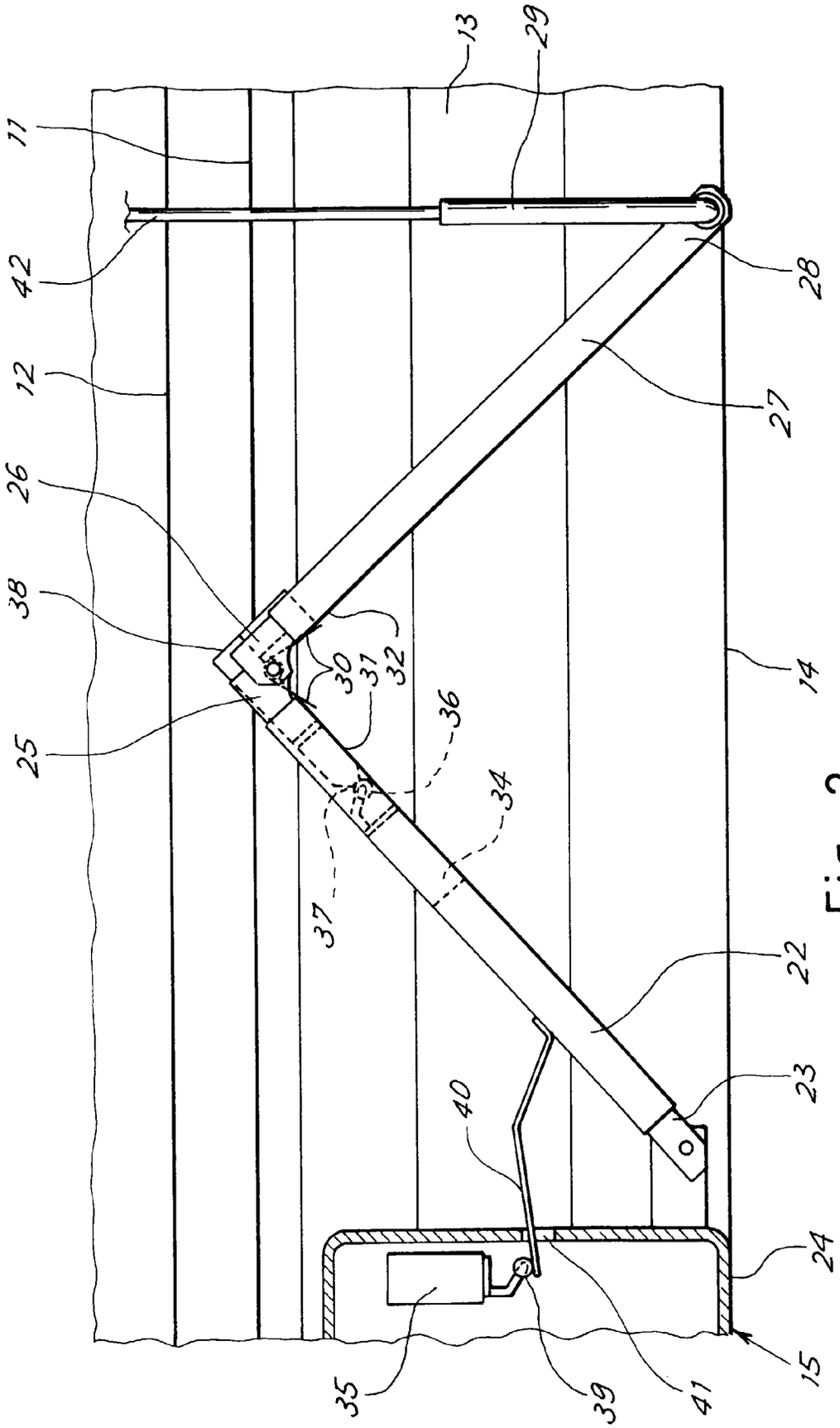
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Fig. 2

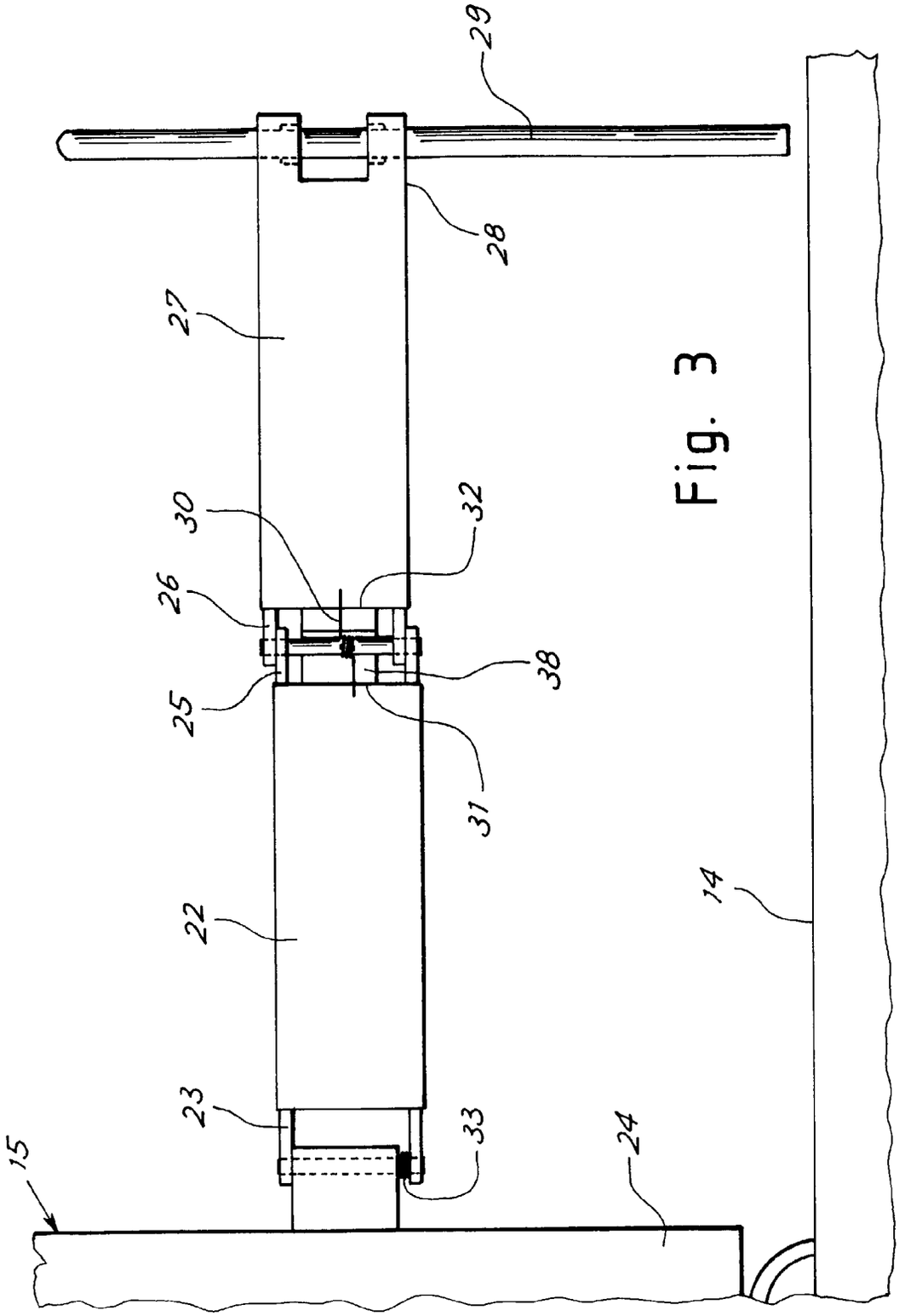

Fig. 3