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ROTATABLE WORKHOLDER IN COMBINATION WITH  
A TRAVELLING SEWING MACHINE

3,180,292

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3 Sheets-Sheet 1

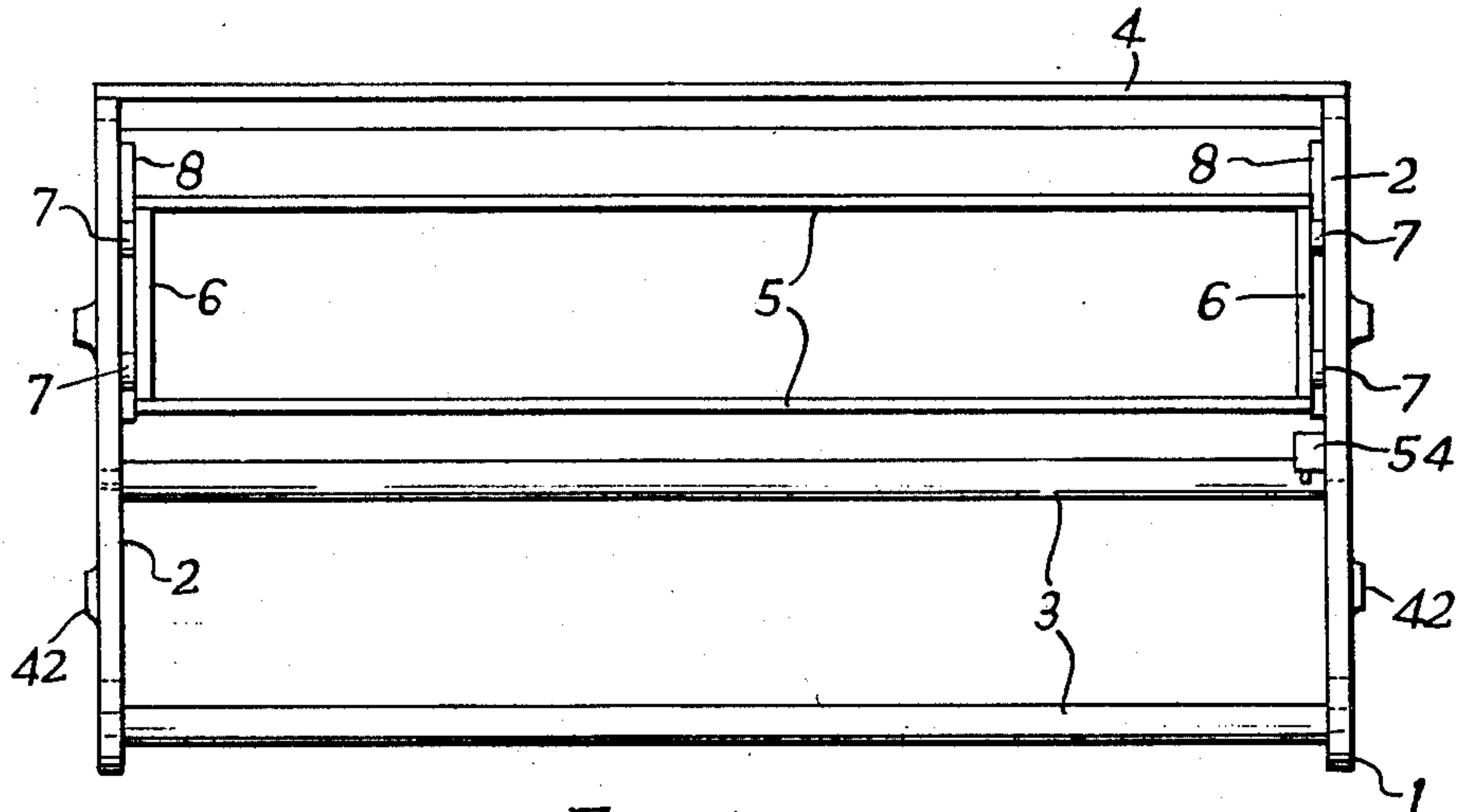


Fig. 1.

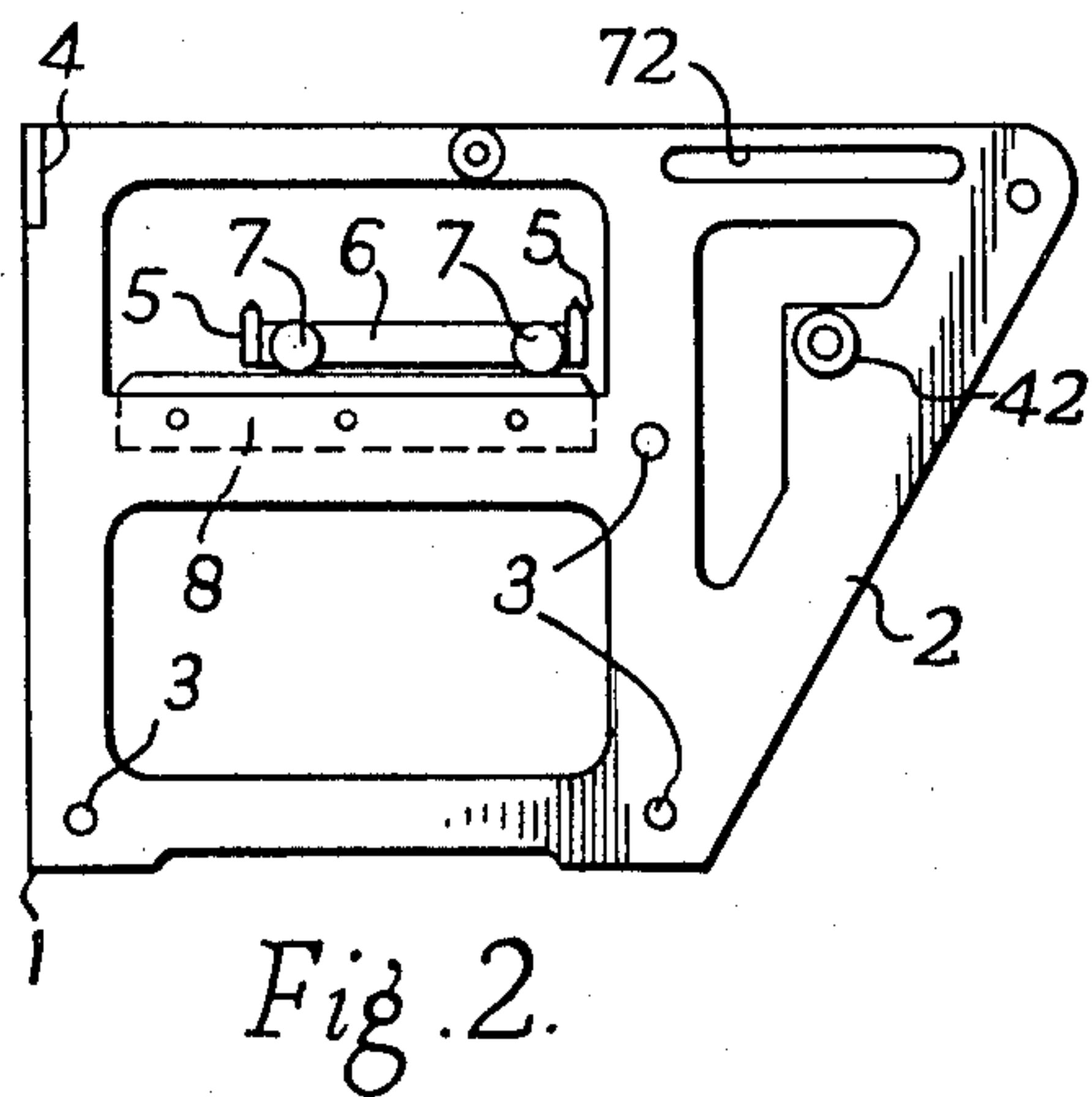


Fig. 2.

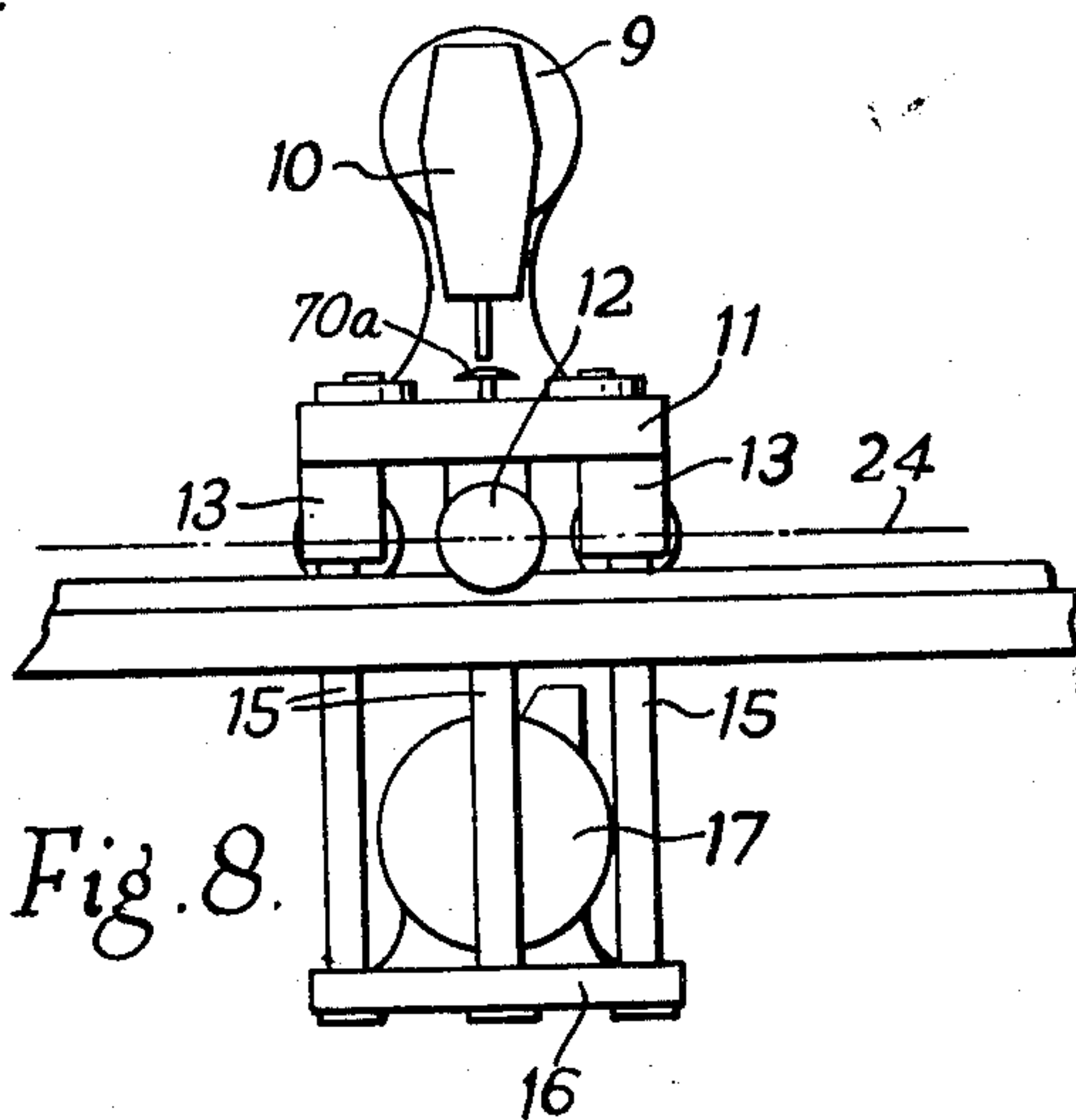


Fig. 8.

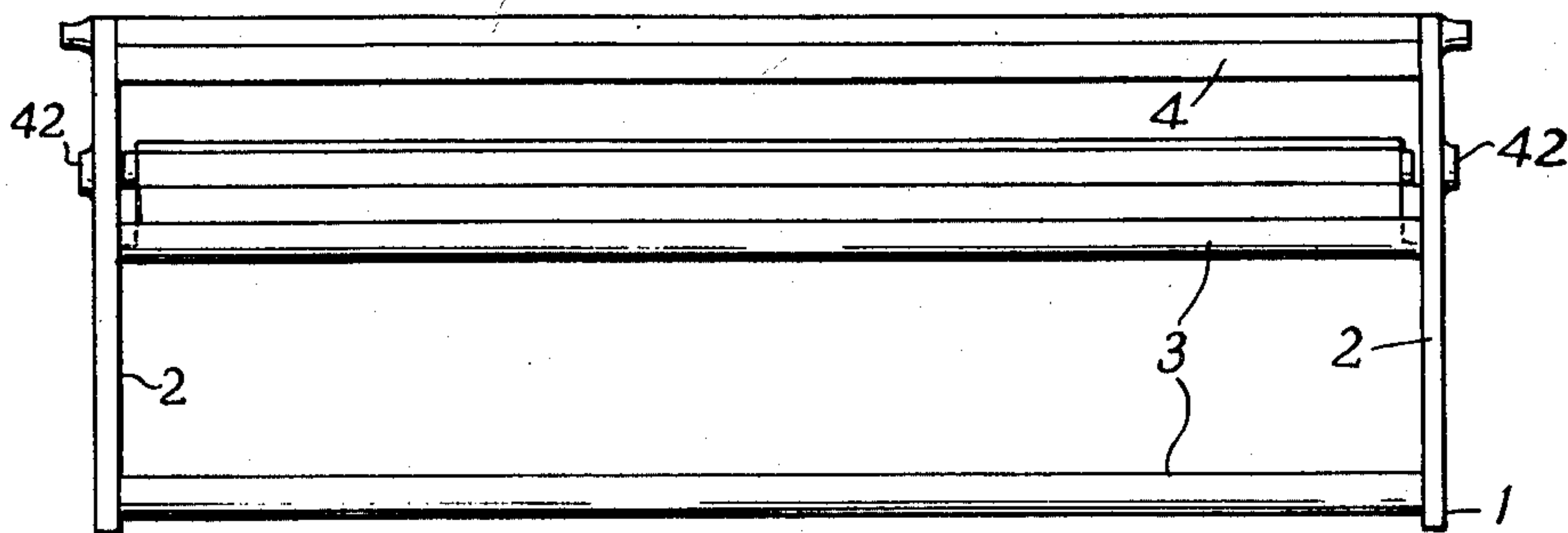


Fig. 3.

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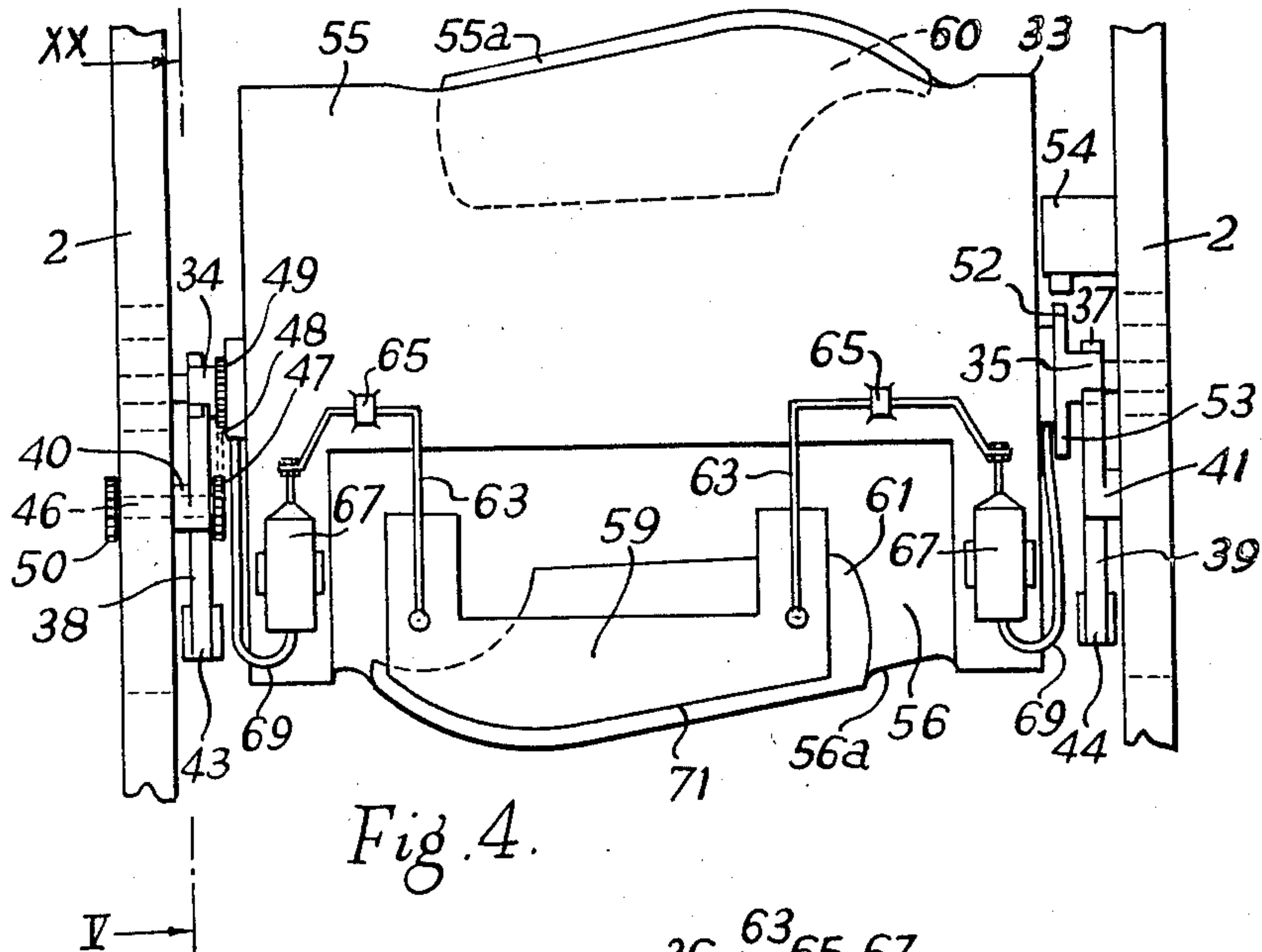


Fig. 4.

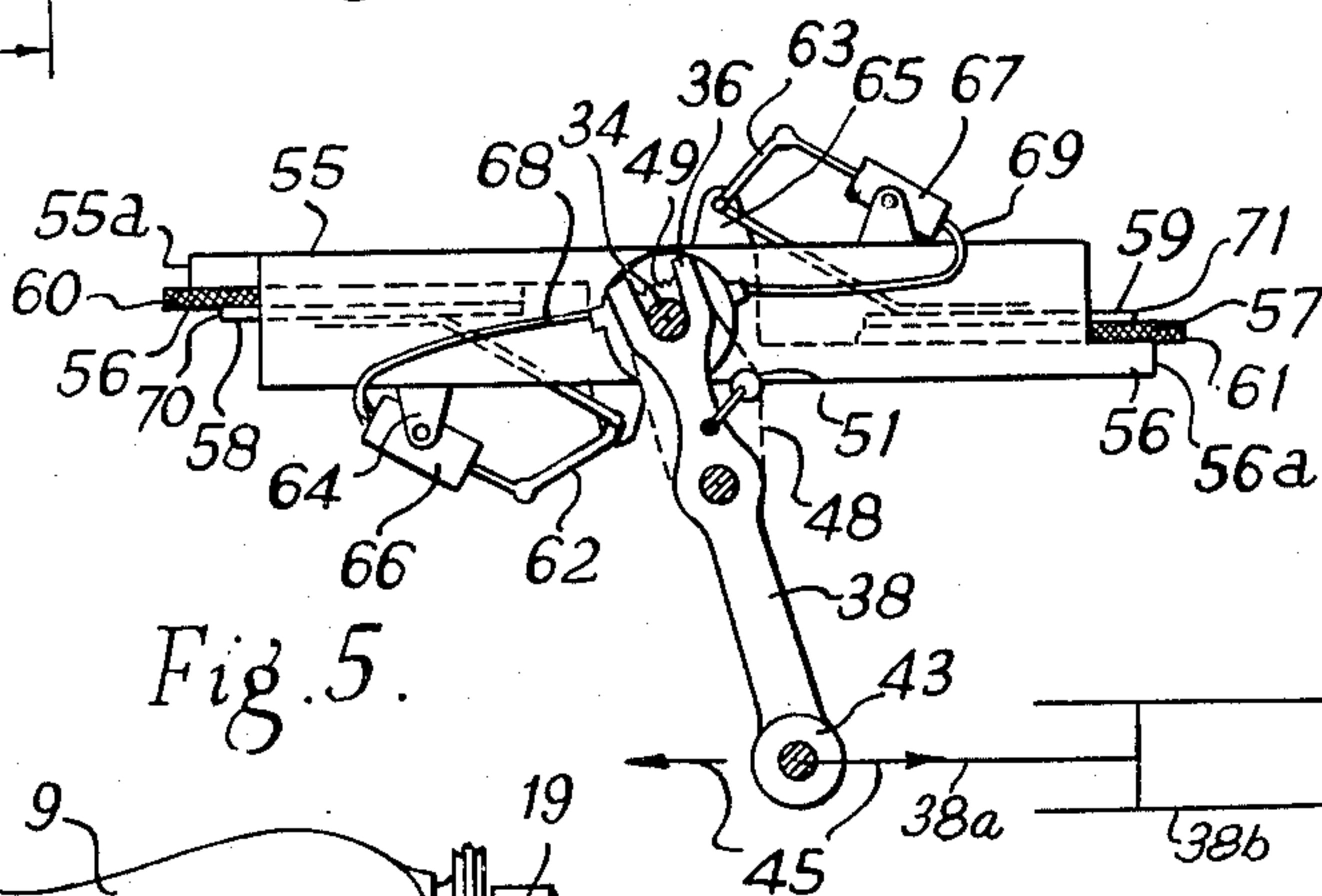


Fig. 5.

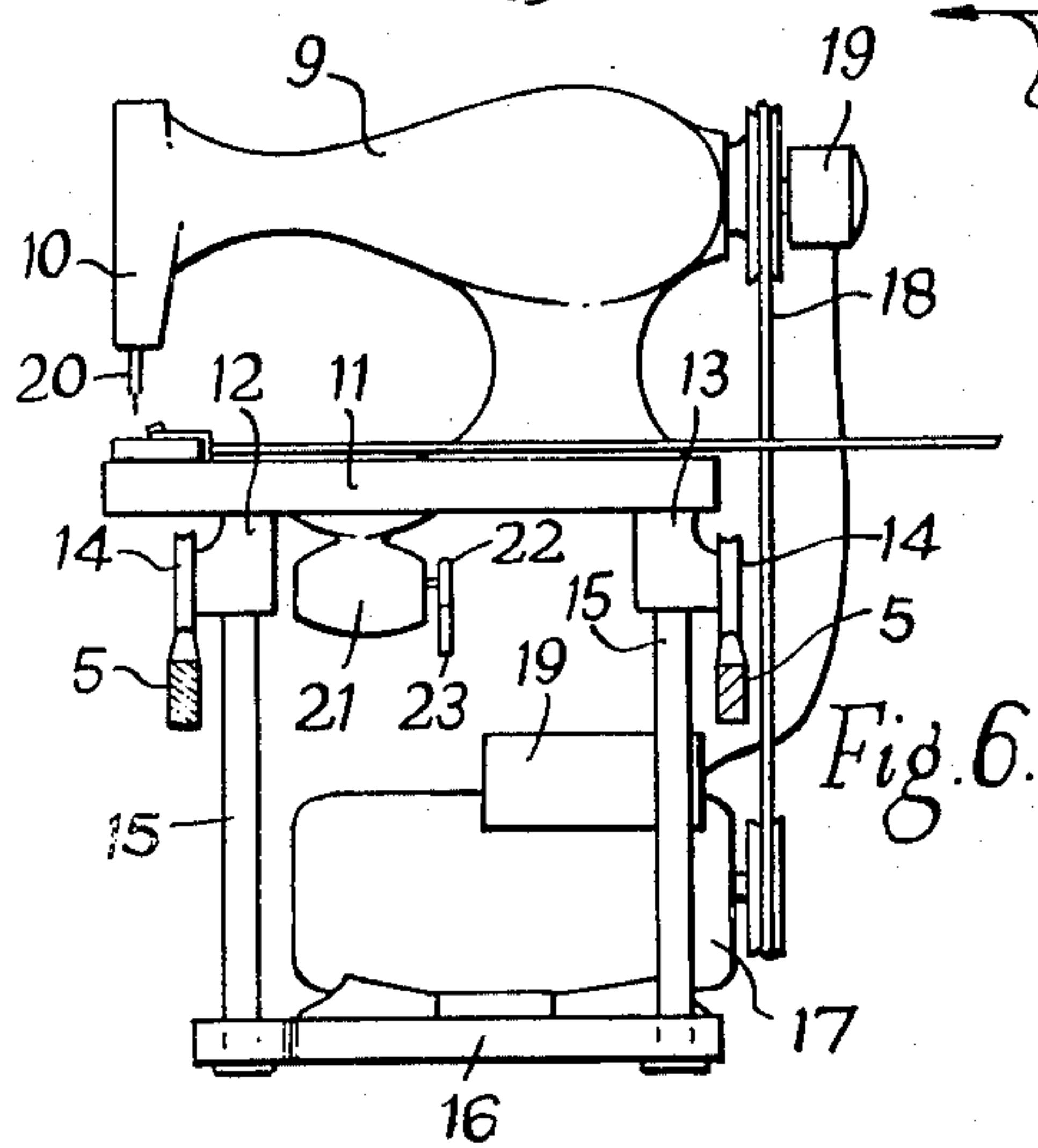


Fig. 6.

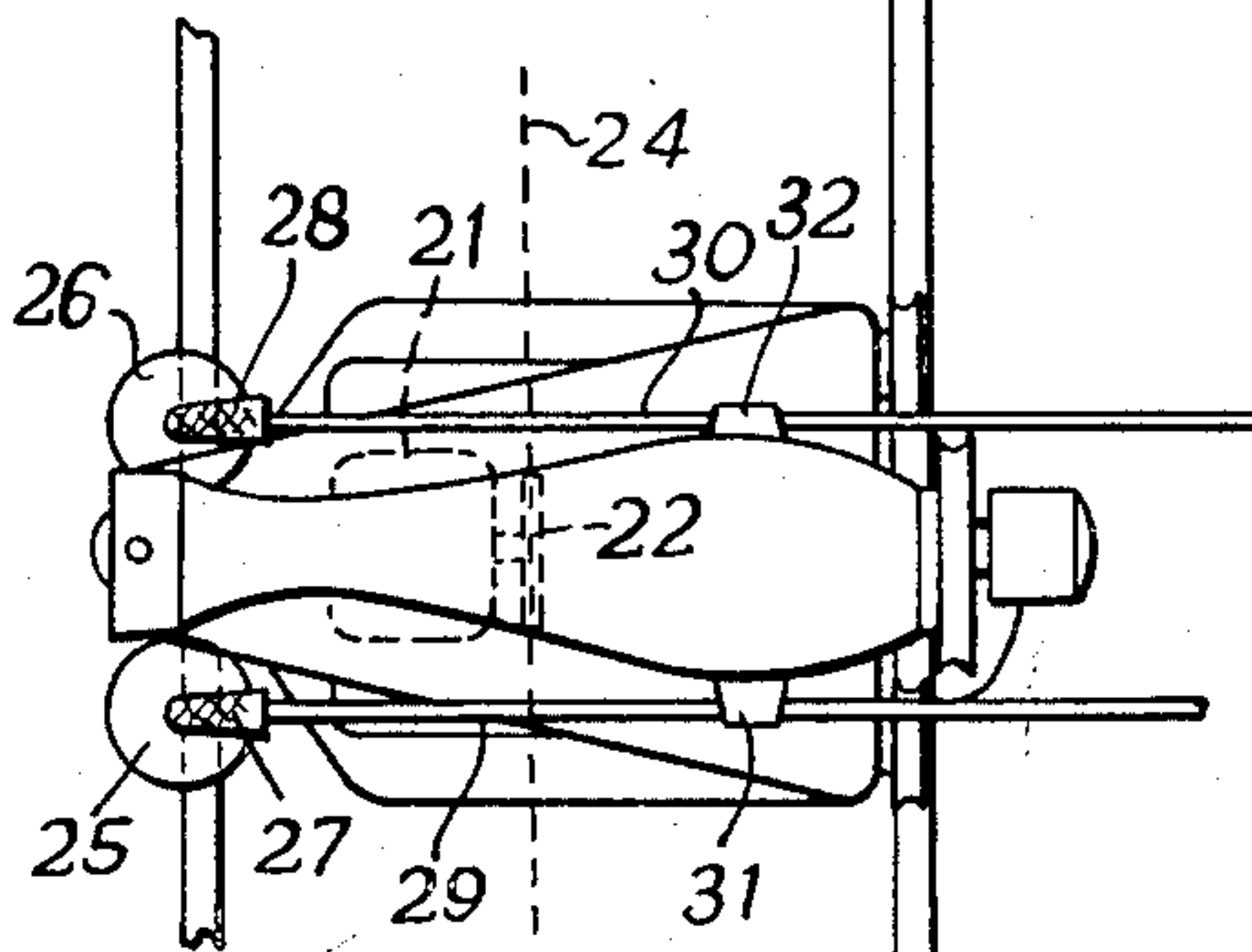


Fig. 7.

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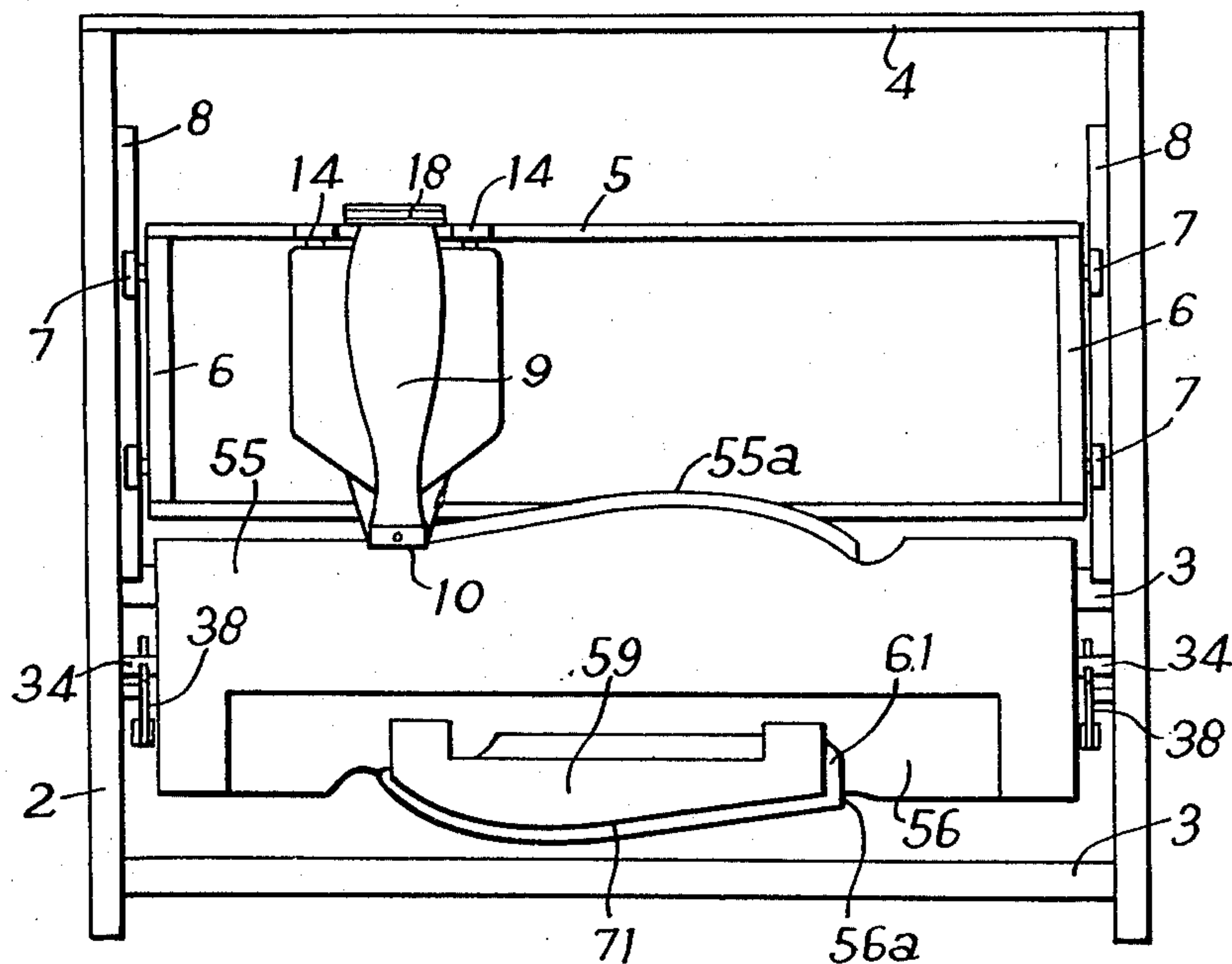
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Fig. 9.



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## ROTATABLE WORKHOLDER IN COMBINATION WITH A TRAVELLING SEWING MACHINE

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5 Claims. (Cl. 112—2)

This invention relates to automatic sewing apparatus.

In the garment industry it is frequently desired to perform on workpieces repetitive sewing operations including a line of stitching along a multi-curved path. Such work is laborious and time consuming is carried out by hand and tends to increase the cost of the resultant article and moreover with hand work even when using appropriate patterns to secure the necessary stitch outline it is easy for mistakes to occur causing variations between one garment and another.

It has therefore been proposed, for many specific stitching operations, to arrange for relative movement along a predetermined path to be made automatically between a sewing machine and work to be sewn thereby. Generally the work is held stationary and the sewing machine arranged to move in two directions at right angles under the action of control means to cause the sewing head of the machine to follow the desired path.

Although identical stitching operations can readily be performed repeatedly with such apparatus the output of the apparatus has often been limited by the time taken to load and unload workpieces therefrom.

It is therefore an object of the present invention to provide improved automatic sewing apparatus capable of stitching along a predetermined curved path. A further object is to provide such apparatus with which a particularly high output may be obtained.

According to one aspect of the present invention there is provided automatic sewing apparatus including a sewing machine movable in a single plane in two directions at right angles, a clamp for holding one or more workpieces to project beyond an edge thereof at a position to co-operate with the stitching head of the sewing machine a cam shaped to the desired stitching path, a cam follower movable with the sewing machine to engage said cam means for driving the stitching head of the sewing machine and means for moving the machine along a path dictated by engagement of the cam follower with said cam to perform a stitching operation following the outline of the cam in that part of the workpiece projecting beyond the clamp. Preferably the cam is carried by the clamping means and it may comprise said edge of the clamp. The apparatus may include a rotatable holder for carrying at least two workpieces and means for rotating the holder successively to bring the workpieces into stitching relationship with the stitching head of the sewing machine.

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

FIG. 1 shows a plan view of a frame,

FIG. 2 is an end elevational view of the frame,

FIG. 3 is a front elevational view of the frame,

FIG. 4 is a plan view of part of the frame including a work-carrying table,

FIG. 5 is a view on the line V—V of FIG. 4,

FIG. 6 is a side elevational view of a sewing machine,

FIG. 7 is a plan view of the sewing machine,

FIG. 8 is a front elevational view of the sewing machine, and

FIG. 9 is a diagrammatic plan view showing the sew-

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ing machine and work carrying table mounted on the frame.

Referring first to FIGS. 1 to 3 of the drawings a frame indicated generally at 1 comprises a pair of end frames 2 joined by horizontally extending bars 3 and by a plate 4.

A pair of rails 5 are joined at their ends by bars 6 carrying wheels 7 for engagement with the upper surfaces of corresponding runners 8 carried by the end frames 2 so that the rails are bodily movable in a direction normal to their length from back to front of the frame.

Turning now to FIGS. 6 to 8 a sewing machine 9 having a stitching head 10 is mounted upon a base 11 provided with a single downwardly extending support 12 centrally towards its forward end and a pair of downwardly extending supports 13 symmetrically below its rearward end. Each of the supports carries a freely rotatable wheel 14 for engagement with the rails 5 and as will be apparent from FIG. 6, the upper edges of the rails 5 are tapered and the wheels 14 are flanged to maintain the sewing machine and its associated apparatus thereon. The supports 12 and 13 carry downward extensions 15 disposed between the rails 5 to hold a plate 16 supporting a motor 17 for driving the stitching head 10 of the sewing machine 9 via an endless belt 18 extending outside one of the rails 5. The motor and sewing machine also include associated apparatus 19 of known type which ensures that when the motor 17 is de-energised the needle indicated generally at 20 carried by the stitching head 10 is brought to rest in its "up" position and out of engagement with a workpiece. The mechanism of the sewing machine and its associated drive does not form part of the present invention and will not therefore be further described.

The base 11 also carries below its lower surface a motor 21 driving a cog 22 for engagement with a chain 23 the position of which is indicated by chain lines 24 in FIGS. 7 and 8 and which is carried by the bars 6 to extend between the rails 5 parallel therewith. Suitable energisation of the motor 21 drives the sewing machine 9 and its driving unit along the rails 5 in either direction.

A pair of heatable seam opening rollers 25 and 26 are respectively rotatably mounted in brackets 27 and 28 carried at the ends of water pipes 29 and 30 slidable in guides 31 and 32 above the base 11. The pipes are movable under the action of mechanism (not shown) so that one or other of the rollers 25 and 26 may be moved into a forward operative position as will be explained later.

Referring now to FIGS. 4 and 5 of the drawings, a table indicated generally at 33 is carried in trunnions 34 and 35 supported in the forked upper ends 36 and 37 of levers 38 and 39 respectively pivoted intermediate their lengths at 40 and 41 in bosses 42 in the end frames 2. The lower ends 43 and 44 of the levers 38 and 39 are coupled by link mechanism such as 38a with means such as 38b for pivoting the levers about the pivots 40 and 41 in opposite directions indicated by the arrows 45 in FIG. 5. The pivot connection 40 is hollow and a shaft 46 is journaled therein carrying a sprocket 47 at its inner end coupled by a chain 48 with a sprocket 49 carried on the trunnion 34. The outer end of the shaft 46 carries a sprocket 50 to be coupled by driving means (not shown) for rotating the table 33 about its trunnions. As shown in FIG. 5 the chain 48 is tensioned by a spring urged idler 51. The drive for the table 33 is arranged alternately to rotate the latter through 180° the rest position of the table in each direction of rotation being determined by the engagement of arms 52 and 53 carried by the trunnion 35 with a switch 54



on one of the end frames, to energise an electro-magnetic lock (not shown) for the table.

The table 33 comprises two similar parts 55 and 56 one on each side of the line joining the trunnions 34 and 35 and these are respectively formed with work supporting surfaces 56 and 57 on opposite sides of the table and as will be clear from FIG. 5 the parts 55 and 56 extend parallel with but are displaced from one another. Flat workpiece clamps 58 and 59 respectively co-operating with the surfaces 56 and 57 to hold workpieces 60 and 61 are carried by pivoted levers 62 and 63 mounted in brackets 64 and 65 and are movable under the action of pneumatic piston and cylinder servo motors 66 and 67 supplied with compressed air through conduits 68 and 69 passing through the trunnion 35 to a suitable source of compressed air (not shown).

It will be assumed that the workpieces 60 and 61 each comprise two layers of material to be stitched together along a curved line the shape of which is represented by the shaped edges 55a and 56a of the parts 55 and 56 of the table 33 and the correspondingly shaped edges 70 and 71 of the clamps 58 and 59. As shown particularly in FIG. 5 the edges of the clamps are set back from the edges of the co-operating table parts and the workpieces extend beyond the edges of the table parts. The edges of the workpieces are pre-cut to be roughly parallel with the desired line of stitching.

It will be apparent that as shown in FIG. 4 the part 56 of the table 33 extends toward the sewing machine 9 carried by the rails 5 and the dimensions of the various parts are such that the projecting edges of the workpiece 61 may be brought into the path of the sewing head 10 by pivoting the levers 38 and 39 from the position shown in FIGS. 4 and 5 to move the table bodily from front to back of the frame 1. It will here be appreciated that the trunnions 34 and 35 engage in slots such as 72 in the end frames 2 to ensure that this bodily movement of the table 33 is linear.

The motor 17 is coupled with the stitching head 10 of the sewing machine 9 through a suitable clutch unit (not shown) and the motor 21 is a variable speed motor capable of being energised to rotate in both directions. The mechanism 19 is operated electro-magnetically to ensure that the needle stops in the "up" position and the sewing machine 9 also incorporates a thread cutter operable electro-magnetically at the end of each stitching cycle.

In addition the stitching head 10 of the sewing machine 9 does not incorporate the usual adjustable foot and cloth feed dogs are not fitted. Instead a self-adjusting support plate drilled to clear the needle 20 is arranged to engage the edge 70 of the clamp 58 beneath the workpiece 60. The rails 5 are lightly loaded by means (not shown) such as a dead weight or spring to maintain this contact. To ensure smooth action a small roller 70a constituting a cam follower may be provided.

The rollers 25 and 26 are electrically heated and fitted with adjustable thermostats and to ensure that movement of the sewing machine is not hindered the water pipes 29 and 30 when moved to their forward operating position are loaded directly from the frame 1 and not from the carriage including the rails 5. FIG. 9 of the drawings shows diagrammatically a plan view of the entire machine illustrating the relative dispositions of the sewing machine and the work table on the frame.

Operation of the sewing machine clutch and the levers 38 and 39 may be pneumatic to correspond with the method described above for operating the clamps 58 and 59. Alternatively all these mechanisms may be operated electrically or hydraulically. Control mechanism to bring about a desired sequence of operations of the various parts of the apparatus may comprise a rotatable cam shaft incorporating a multiplicity of circumferentially displaced cams arranged to co-operate with associated pneumatic, electrical or hydraulic switch gear.

An operator standing in front of the apparatus positions

material to be joined between the clamp 59 and the table part 56 with the edge of the material in which the desired line of stitching is to be made protruding unsupported for the required seam width. Automatic operation of the apparatus is then initiated so that the magnetic lock for the table 33 is deenergised the levers 38 and 39 are pivoted to move the table linearly away from the stitching head of the sewing machine and the table is rotated through 180°. When rotation of the table is completed the levers 38 and 39 are pivoted in the reverse direction to enter the protruding edges of the material beneath the sewing head. The table is then magnetically locked in position for the sewing and seam opening functions to be completed.

The motors 17 and 21 are then energised to cause the stitching mechanism of the sewing machine 9 to be driven and the machine to be moved along the rails 5. Depending upon the direction of movement of the machine so the trailing one of the rollers 25 and 26 is moved to a forward position to engage and press open the stitched seam. At the end of one stitching operation during which the stitching head is guided as described above to complete a single row of stitches in the overlapping edges of the material of the workpiece the machine is stopped with its needle in the "up" position and the cotton chopper is operated.

During this time another workpiece is loaded by an operative on the other part of the table so that the table may then be unlocked and the sequence of operations described above repeated in this case with the sewing machine travelling along the track 5 in the opposite direction and the other one of the rollers 25 and 26 in its forward position.

It will be appreciated that the apparatus described above may be used successively to perform identical stitching operations in workpieces, a finished workpiece being unloaded and a new workpiece being loaded on to the apparatus while each stitching operation is in progress. It has been found that curved or zig-zag stitching done to a radius of one and a half inches can readily be undertaken without a loss of accuracy and compared with conventional hand methods output can be increased to between 50% and 200% dependent upon the type of seam being stitched. In addition a further increase in output over conventional methods is obtained by pressing open the seam during the stitching operation so eliminating what has hitherto been a separate operation.

I claim:

1. Automatic sewing apparatus including a sewing machine movable in a single plane in two directions at right angles, a holder rotatable about an axis parallel with one of said directions, at least two clamps on the holder each for holding a workpiece to project beyond a different edge of the holder, means for rotating the holder successively to bring the workpieces into stitching relationship with said stitching head, a cam shaped to the desired stitching path, a cam follower movable with the sewing machine to engage said cam means for driving the stitching head of the sewing machine and means for moving the machine along a path dictated by engagement of the cam follower with said cam to perform a stitching operation following the outline of the cam in that part of the workpiece projecting beyond the clamp.

2. Apparatus according to claim 1 comprising a frame, a pair of levers having forked upper ends pivoted to said frame and in which the holder comprises trunnions and a table, said table being carried in said trunnions, said trunnions being supported in the forked upper ends of said levers.

3. Automatic sewing apparatus comprising a frame, a pair of levers having forked upper ends pivoted to said frame, a sewing machine carried by the frame and movable in a single plane in two directions at right angles, a holder comprising trunnions and a table, said table being carried in said trunnions, said trunnions being supported



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in the forked upper ends of said levers and rotatable about an axis parallel with one of said directions, at least two clamps on the holder each for holding a work-piece to project beyond a different edge of the holder, means co-operating with the lower ends of said levers for rotating the table successively to bring the workpieces into stitching relationship with said stitching head, a cam shaped to the desired stitching path, a cam follower movable with the sewing machine to engage said cam means for driving the stitching head of the sewing machine and means for moving the machine along a path dictated by engagement of the cam follower with said cam to perform a stitching operation following the outline of the cam in that part of the workpiece projecting beyond the clamp.

4. Apparatus according to claim 3 in which the table comprises two similar parts one on each side of the line joining the said trunnions and respectively formed with work-supporting surfaces on opposite sides of the table said parts extending parallel with but displaced from one another.

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5. Apparatus according to claim 3 in which said clamps are flat and respectively co-operate with work-supporting surfaces on opposite sides of the table to hold work-pieces thereagainst said clamps being movable towards and away from said surfaces.

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