Aug. 27, 1963 E. PFARRWALLER 3,101,746

DOBBY

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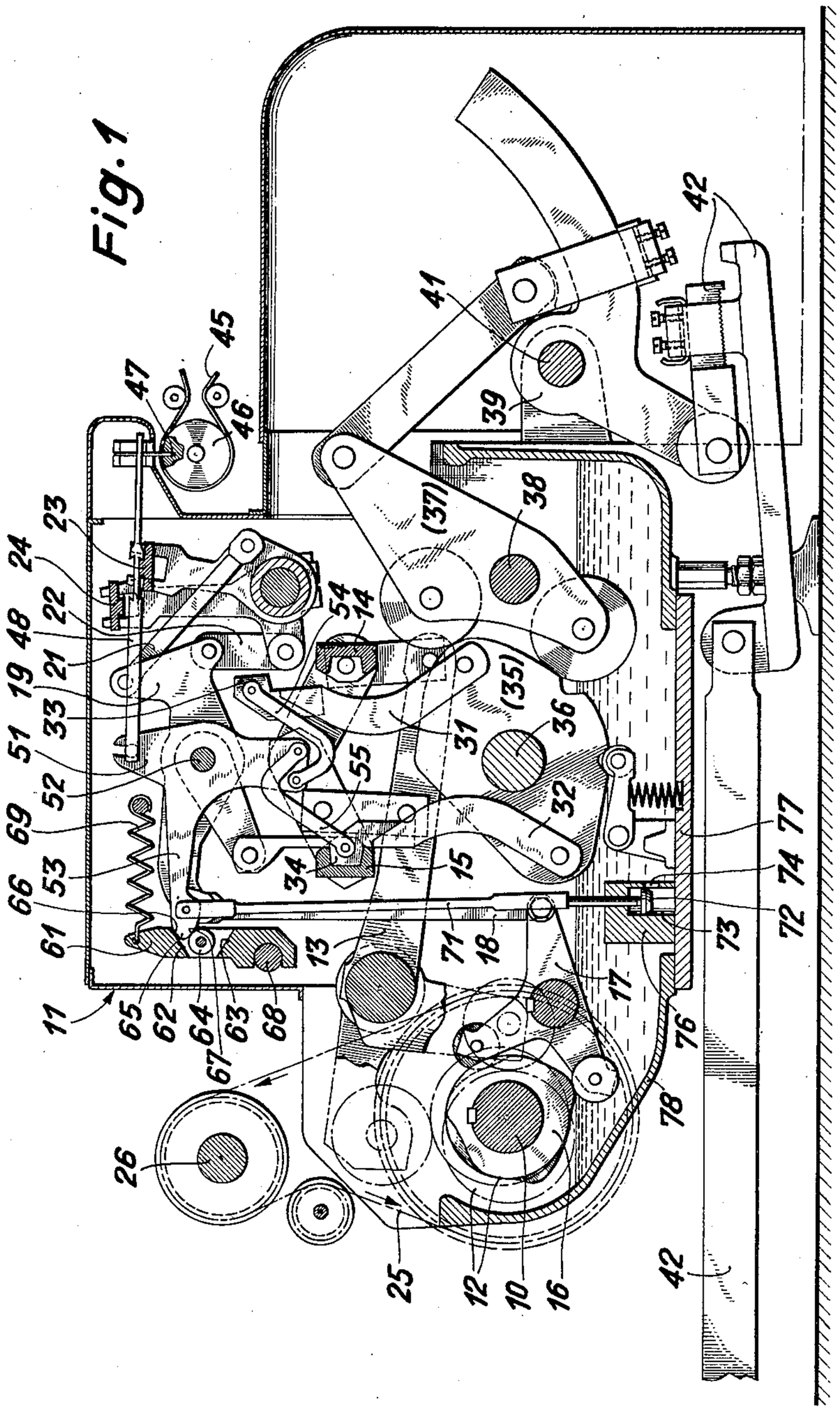
Fig. 1



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DOBBY

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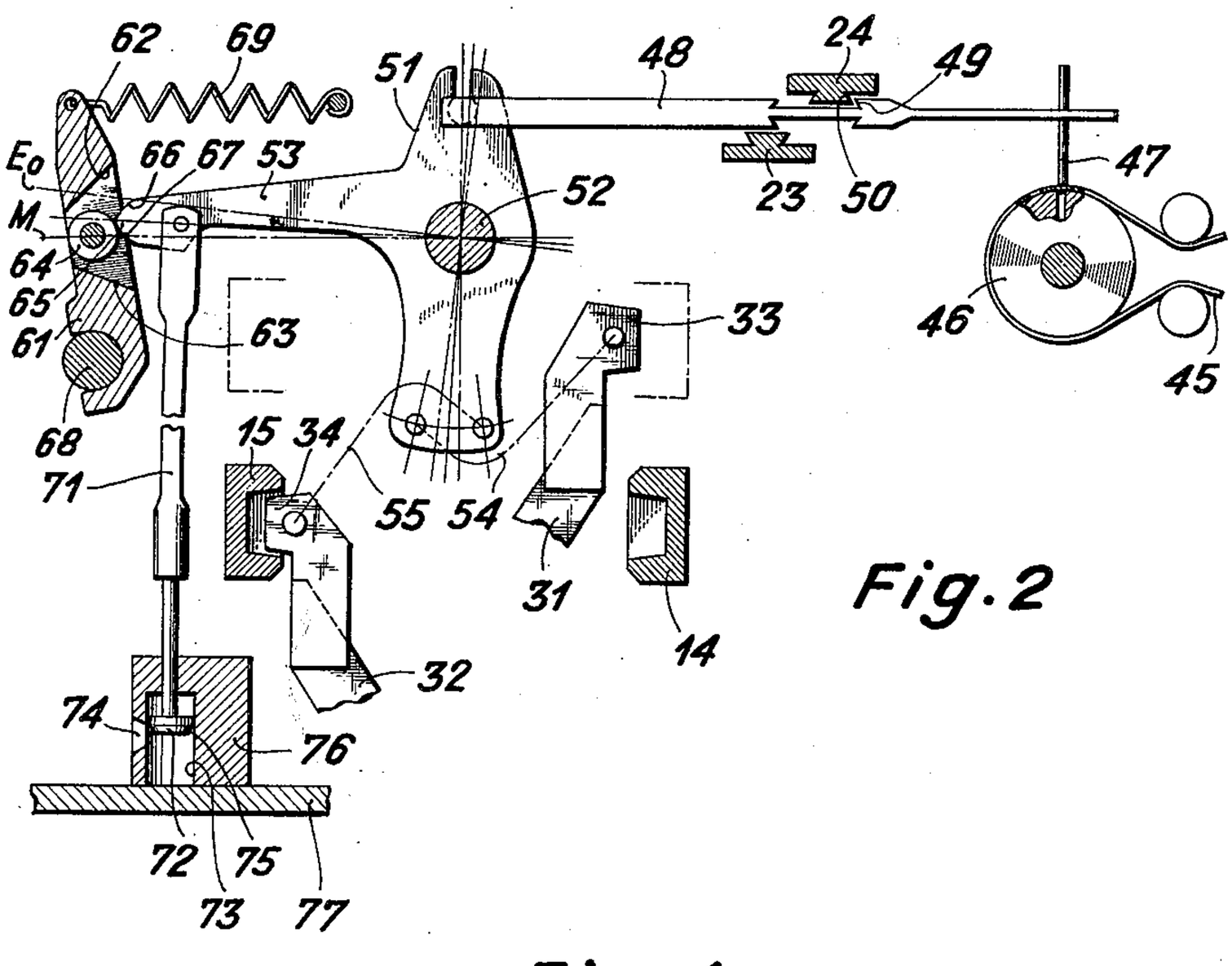
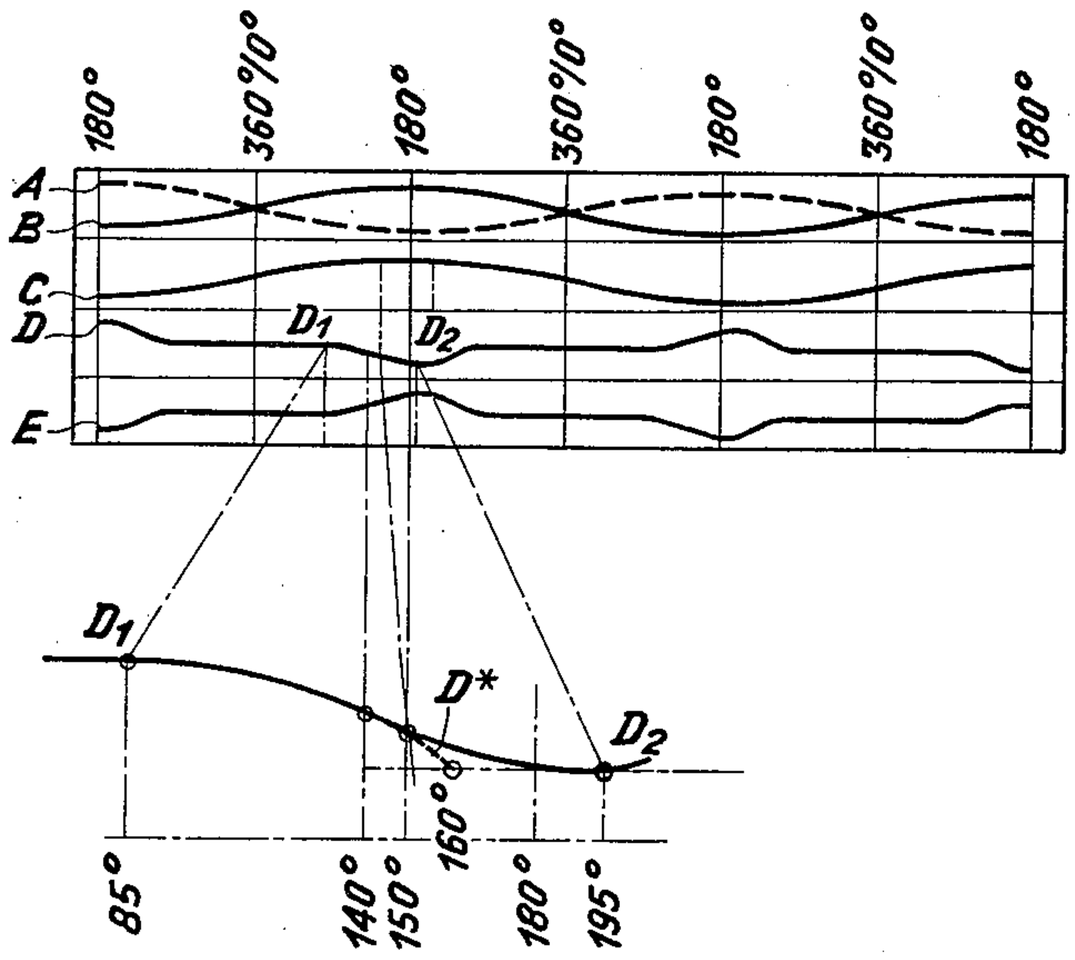


Fig. 2

Fig. 4



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DOBBY

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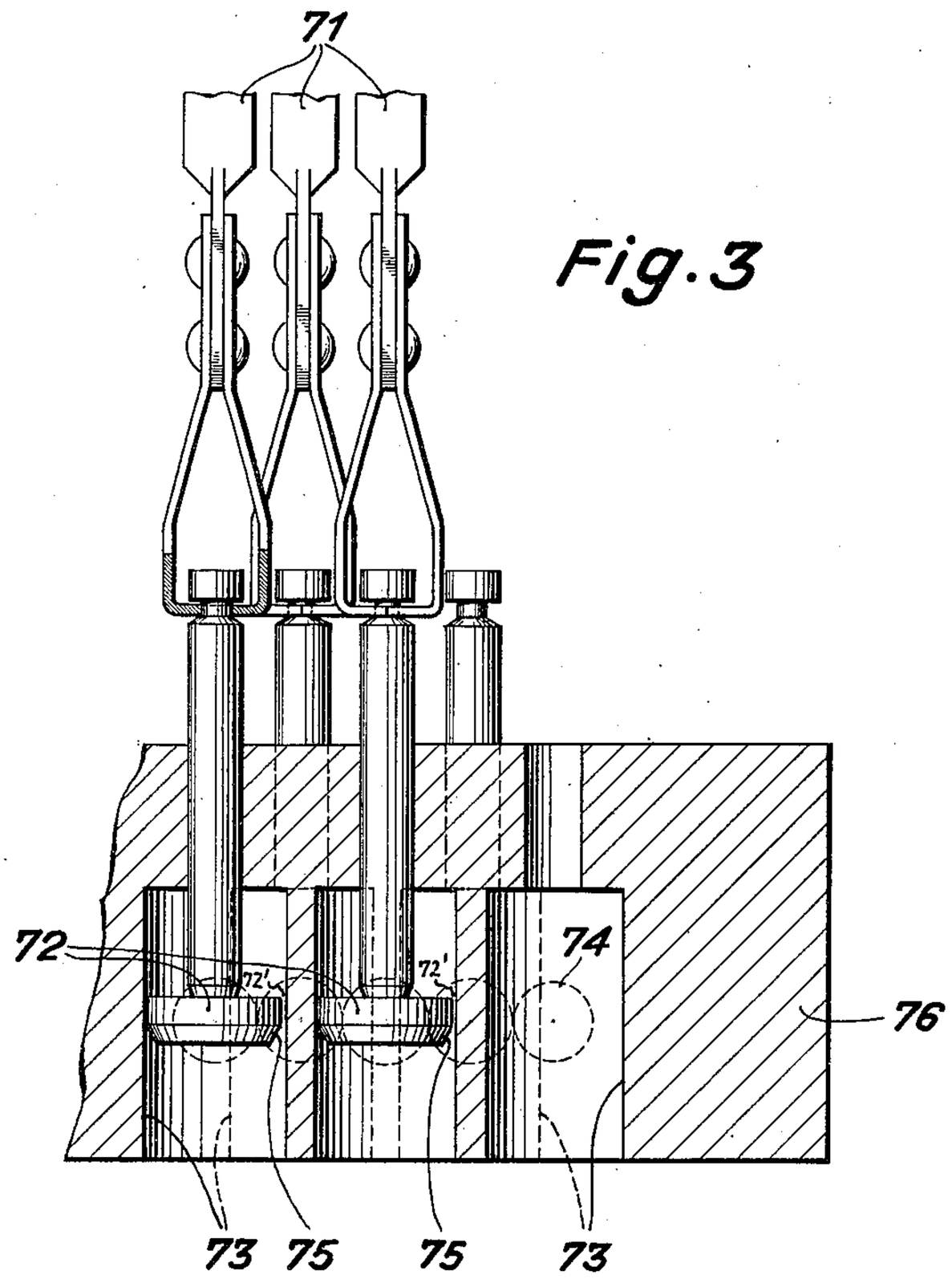

Fig. 3

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United States Patent Office

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DOBBY

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7 Claims. (Cl. 139—68)

The present invention relates to a mechanism for controlling the operation of lifting blades forming part of a dobby for actuating heddle frames in looms for weaving.

It is known to yieldingly arrest control levers for actuating lifting blades, which lift and lower the heddle frames in a weaving machine, in their end positions. The control levers are positively moved all the way from one end position to the other end position and ample standstill periods must be provided for the lifter rails to permit reliable engagement of the lifting blades by the lifter rails, or the channels in the rails which engage the blades must be so wide as to provide a large clearance between the rails and the portions of the blades which are engaged by the rails.

It is an object of the present invention to provide a mechanism for moving the lifting blades forming part of a dobby for actuating the heddle frames in a weaving machine to positions where the blades are engaged or disengaged by lifter rails whereby engagement is obtained quickly and accurately so that neither undesired long standstill periods of the rails nor large clearances between the rails and the portions of the blades engagable by the rails need be provided. The mechanism according to the invention includes a snap device provided with force-accumulating means which is loaded during movement of the lifting blades from one end position to a position half-way between the two end positions of the blades and which applies the accumulated force to the mechanism when the blades have passed the half-way position for snappingly moving the blades into the second end position. The mechanism also includes damping means for counteracting the force applied by the snap device and damping the movement of the blades when the blades approach their end positions. The new mechanism affords reliable and accurate operation of a dobby for actuating heddle frames of a weaving machine at greater speed and with less noise and vibrations than is possible with conventional dobbies.

The novel features which are considered characteristic of the invention are set forth with particularity in the appended claims. The invention itself, however, and additional objects and advantages thereof will best be understood from the following description of embodiments thereof when read in connection with the accompanying drawings wherein:

FIG. 1 is a diagrammatic longitudinal sectional view of a dobby according to the invention.

FIG. 2 is a diagrammatic part sectional, large scale elevation of a detail of the mechanism shown in FIG. 1.

FIG. 3 is a large scale, diagrammatic, longitudinal sectional elevation of a damping device forming part of the dobby shown in FIG. 1.

FIG. 4 is a diagram illustrating the relative movements of parts of the dobby shown in FIG. 1.

Referring more particularly to FIG. 1 of the drawing, numeral **10** designates the main drive shaft of a card-

controlled dobby **11**. Fast on the shaft **10** are cams **12** for actuating a cam follower lever **13** which operates lifter rails **14** and **15**, and cams **16** for actuating a follower lever **17** which actuates, by means of a rod **18**, a lever **19** which actuates control rails **23** and **24** by means of links **21** and **22**. The shaft **10** is driven by a chain **25** receiving its drive from a shaft **26** which is connected to the main drive shaft of the loom, not shown. The shaft **26** rotates twice as fast as the shaft **10**.

The lifter rails **14**, **15** cooperate with lifting blades **31**, **32** which are provided with lugs **33**, **34**, respectively, adapted to be received in the channels of the rails **14** and **15** which have a U-shaped cross sectional configuration. A pair of lifting blades **31**, **32** is provided for each heddle frame. The lifting blades forming a pair are pivotally connected to a rocking cam **35**. The cams **35** are swingable on a shaft **36** which is made fast on the casing of the dobby. Each cam **35** actuates a lever **37** which is swingable on a stationary shaft **38**. The levers **37** are adjustably connected to levers **39** rocking on a shaft **41**. A linkage **42** is adjustably and pivotally connected to each lever **39** and to a heddle frame, not shown, for actuating the latter. The adjustable connections afford adjustment of the stroke of the heddle frame.

The lifting blades **31**, **32** are controlled by needles **47** in response to the pattern of the holes in a pattern card **45** which is stepwisely advanced by a card cylinder **46**. The needles **47** actuate control rods **48**. If a needle drops into a hole of the pattern card, the end of the rod **48** to which the needle is operatively connected is lowered and moves into the operating range of the lower control rail **23** to afford actuation thereby. If there is no hole, the end of the rod **48** is lifted and is in the operating range of the upper control rail **24**. The rails **23**, **24** laterally and substantially horizontally reciprocate in opposite directions between end positions in which the rails are shown in FIG. 2.

Each rod **48** actuates a control lever **51** which is rockable on a shaft **52** and provided with a horizontal arm **53**. The lower end of a downwardly extending arm of the lever **51** is connected by links **54** and **55** to the lugs **33** and **34**, respectively, of the lifting blades **31** and **32**.

The horizontal arm **53** of the control lever **51** cooperates with a pawl **61**, as seen in FIG. 2. The pawl **61** has two abutments **62** and **63**. A guide means is placed between and spaced from the abutments. In the illustrated example the guide means is in the form of a roller **64** mounted on the pawl between the abutments **62** and **63**. The end of the arm **53** of the lever **51** is provided with two inclined surfaces **66** and **67**. The surface **66** engages the abutment **62** and the surface **67** engages the roller **64** when the arm **53** is in the uppermost position. When the arm **53** is in the lower extreme position the surface **67** engages the abutment **63** and the surface **66** engages the roller **64**. The pawls **61** have recesses fitting a shaft **68** which is rigidly connected to the casing of the dobby. A spring **69** having one end connected to the casing of the dobby and the other end to a pawl maintains engagement of the respective pawl with the shaft **68** and with the free end of the arm **53**.

Each arm **53** is connected by means of a rod **71** to a piston **72** placed in a cylinder **73** provided with a lateral opening **74** and filled with oil. The axial extension of the piston **72** is smaller than the axial extension of the

opening 74 in the axial direction of the cylinder 73. Since, due to the piston rod connected to the upper side of the piston, the amount of oil to be displaced below the piston is greater than the amount of oil to be displaced above the piston and an equal damping effect is desired in both directions of movement of the piston, the lower edge 75 of the piston 72 is bevelled (FIG. 3). A clearance 72' is provided between each piston and its cylinder to obtain the desired dashpot effect.

Since a control lever 51 is required for each heddle frame the number of cylinders 73 is equal to the number of controlled heddle frames. The cylinders 73 are formed by bores in a block 76 which is mounted on a bottom plate 77 which is removably connected to a part 78 of the dobby housing which forms an oil sump.

FIG. 2 shows the mechanism in a position in which the control rail 24 has turned the lever 51 in clockwise direction so far beyond its middle position M that the force accumulated in the spring 69 while the arm 53 has moved from its lower end position to its middle position causes the pawl 61 to swing clockwise and the roller 64 to run along the surface 67 for snapping the arm 53 to the position E_0. In order to avoid vibrations of the lever 51 and to reduce the noise produced by the knocks of the free end of the arm 53 against the abutment 62 and 63, the movement of the rod 71 is braked by the device 72, 73 before the free end of the arm 53 knocks against the abutment 62 or 63. If the roller 64 is omitted and merely a guide surface is provided, the surfaces 66 and 67 slide along the guide surface.

With the arrangement according to the invention the lugs 33 and 34 can be made to snuggly fit the channels of the lifter rails 14, 15 whereby vibrations are eliminated. When the lifter rails 14 and 15 have reached their end positions the lugs 33 and 34 are quickly pushed into the grooves of the lifter rails 14 and 15 by the force accumulated in the spring 69 and no undesired standstill periods must be provided for the lifter rails.

The ordinates of the diagram FIG. 4 represents the strokes of certain parts of the mechanism and the abscissae represent the angular positions of the main shaft of the weaving machine. At each revolution of the main shaft of the weaving machine a weft thread is inserted into the shed and beaten up.

The shed is open at the position 180° shown at the left side of the diagram FIG. 4. Line A indicates the position of the heddle frames which are in the extreme upper position at this moment and the line B represents the positions of the heddle frames which are in the lowermost position at this moment. Line C shows the positions of the lifter rails 14 and 15 which are in the lowermost position at the 180° position of the loom shaft shown on the left side of FIG. 4. Line D shows the positions of the upper control rail 24 which is in the position shown in FIG. 1 when the loom shaft is in the 180° position shown on the left side of the diagram FIG. 4. The lower control rail 23 whose positions are indicated by the line E in FIG. 4 is in the right end position shown in FIG. 1 at the 180° position of the loom shaft on the left side of FIG. 4.

Since the shaft 10 makes one half revolution at each full revolution of the main shaft of the loom, the lifter rails 13 and 14 (line C in FIG. 4) move from the lowermost position to the uppermost position upon a full revolution of the main loom shaft. The lifter rails 14 and 15 move from the uppermost position to the lowermost position upon the subsequent full revolution of the main loom shaft. The heddle frames can be lifted or lowered during a full revolution of the main loom shaft, depending on which of the lugs 33, 34 is received in the channel of one or the other of the lifter rails 14, 15.

The control rail 24 moves from the left end position to the middle position during the first full revolution the main loom shaft, stays at the middle position for a period of time during which control rods 48 may be lifted, and moves from the middle position to the right during completion of the revolution of the main loom

shaft. The lower control rail 23 moves at the same time from the right end position to the middle position and therefrom to the left end position. The control rails move in the opposite direction during the subsequent revolution of the loom shaft. In the position of the mechanism shown in FIG. 2 the needle 47 is in the lifted position, because there is no hole in the card 45 and the control rail 24 has moved the control rod 48 so far to the right beyond its middle position that the pointed free end 65 of the arm 53 is so far above the roller 64 that the force accumulated in the spring 69 during the previous counterclockwise swing of the pawl 61 snaps the latter in clockwise direction and accelerates the upward movement of the end 65 of the arm 53 whereby a hook 49 on the control rod 48 is disengaged from a corresponding protuberance 50 of the control rail 24. This is also obvious from the diagram FIG. 4 in the lower part of which this moment is illustrated in a larger scale. The line D has a sinusoidal configuration between the angular positions 85° and 195° (D_1 and D_2). The middle position is at the angular position 140°. The force accumulated in the spring 69 begins to act at the angular position 150° and accelerates the control rod 48 with the hook 49 as indicated by the dotted line D* in FIG. 4 relatively to the control rail 24 with the protuberance 50. Therefore, the control rod 48, the control lever 51 and the lug 34 of the lifting blade 32 have reached their end positions already at the angular position 160° due to the snap action of the pawl 61 caused by the spring 69, whereas the protuberance 50 of the control rail 24 does not reach its right end position until the loom shaft is in the position 195°.

With the mechanism according to the invention the lugs 33 and 34 are completely inserted in the channels of the lifter rails 14 and 15 independently of the speed of the movement of the control rails 23 and 24. This insertion of the lugs requires less time and is effected more reliably than in conventional dobbies.

I claim:

1. In a dobby for selectively actuating the heddle frames of a weaving machine reciprocatingly movable lifter rails, movable lifting blades individually engageable with said rails, and a control mechanism operatively connected to said lifting blades for moving said lifting blades into positions where the blades are engaged or disengaged by said rails, said mechanism including a member rockable between two end positions, movable snap means engaged and adapted to be moved by said member, said snap means including force-accumulating means adapted to be loaded upon movement of said member from one end position to a position half-way between the end positions and to apply the accumulated force to said member when the latter has passed the halfway position for snappingly moving said member towards the second end position, and damping means connected to said member for damping the movement thereof towards the second end position.

2. In a dobby as defined in claim 1 and wherein said snap means includes a pawl swingable on a stationary fulcrum, said force-accumulating means being connected to said pawl to be actuated thereby, said member having an arm having a free end provided with converging inclined surface portions, and said pawl having a guide portion adapted to be slidingly engaged by said free end for swinging said pawl by said arm upon rocking of said member.

3. In a dobby according to claim 2 and wherein said guide portion is formed by a roller mounted on said pawl.

4. In a dobby according to claim 2 and wherein said pawl is provided with two end abutments and said guide portion is placed between and spaced from said abutments, one of said end abutments being engaged by said free end when said member is in one end position and the other abutment being engaged by said free end when said member is in the second end position.

5. In a dobby as defined in claim 1 a casing having an oil sump, said damping means being in the form of a dashpot placed in said sump.

6. In a dobby as defined in claim 5 and wherein said dashpot includes a cylinder, a double acting piston reciprocable in said cylinder, said cylinder having an aperture substantially in the middle of the axial extension of the cylinder, the extension of said aperture with respect to the longitudinal axis of said cylinder being greater than the axial extension of said piston.

7. In a dobby according to claim 6 a piston rod connected to one side of said piston and operatively connected

to said member, the side of said piston averse from the side whereto said piston rod is connected being bevelled.

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