

(19)



Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number:

0 138 581
A2

(12)

EUROPEAN PATENT APPLICATION

(21) Application number: **84306946.9**(51) Int. Cl.⁴: **B 41 J 23/20**(22) Date of filing: **11.10.84**(30) Priority: **15.10.83 GB 8327672**(71) Applicant: **MARKEM SYSTEMS LIMITED, Ladywell Trading Estate Eccles New Road, Salford M5 2RD Lancashire (GB)**(43) Date of publication of application: **24.04.85 Bulletin 85/17**(72) Inventor: **Lawrence, Stephen, 306 Upholland Road, Orrell Wigan (GB)**(64) Designated Contracting States: **AT BE CH DE FR IT LI LU NL SE**(74) Representative: **Massey, Alexander et al, MARKS & CLERK Scottish Life House Bridge Street, Manchester, M3 3DP (GB)**(54) **A printing mechanism.**

(57) A printing mechanism, especially an over-printing mechanism for fitment onto packaging machinery for example, the printing mechanism comprising a printing head which is movable by a pneumatic cylinder and a connecting linkage to-and-fro through an arcuate path between a printing position and a parked position and rectilinearly at the printing position. The printing mechanism also includes an ink roller mounted in a pivotal cradle which is movable either by the same or another pneumatic cylinder either towards the printing head on arcuate movement of the latter towards the printing position to permit type carried by the printing head to wipe across the ink roller or clear of the printing head during its arcuate movement away from the printing position and then back to permit the printing head to wipe across same during its return arcuate movement.

With the single pneumatic cylinder arrangement the cradle movement is via a cam and linkage arrangement.

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A PRINTING MECHANISM

This invention relates to a printing mechanism, especially but not exclusively an over-printing mechanism, for use, for example, in packaging machinery or label-production machinery.

A known high speed over-printing mechanism (for example 300 print actions per minute) comprises a heated roller impregnated with a thermoplastics ink and a printing head (also heated) adapted for movement arcuately to wipe the type carried by the printing head across the roller to transfer the softened ink onto the type, and then axially to effect a printing action, the softened ink solidifying as it contacts the material to be printed, and the roller and printing head being controlled, due to the required high-speed action, electrically and electronically.

It is an object of the present invention to provide a printing mechanism (not necessarily an over-printing mechanism) which satisfies a relatively low-speed (for example 120 print actions per minute) need in the packaging industry but which may have other applications.

According to the present invention there is provided a printing mechanism comprising an ink support impregnated with a thermoplastics ink and adapted to be heated to soften the ink, a movable printing head disposed adjacent the ink support and adapted to carry type onto which softened thermoplastics ink can be transferred from the ink support, and pneumatic actuating means connected to the printing head and adapted to effect a first movement of the latter across the ink support to effect an ink transfer and then a second movement to bring the printing head temporarily into contact with

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the material or article to be printed at a printing location.

5 It is preferred that the printing mechanism comprise a pivotal ink support and a pivotal printing head disposed alongside the ink support, the pneumatic actuating means being connected to the printing head so as to pivot same through an arcuate path from a parked location to a printing location whereat it imparts a rectilinear movement to the printing head to effect a printing operation and back again, and connecting means between the pneumatic actuating means and the pivotal ink support to pivot the latter towards the printing head during the first arcuate movement of the latter to effect a wiping, ink transfer, contact between the ink support and the printing head.

10 In an alternative arrangement, the pivotal cradle and the printing head are movable by two separate double-acting pneumatic cylinders, the cradle cylinder moving the cradle clear of the printing head on its arcuate movement away from the printing location and returning it to its original position for contact between the printing head and the ink roller as the printing head moves back to the printing position where, an additional movement of the printing head cylinder moves the printing head to effect a printing operation.

15 Embodiments of the present invention will now be described, by way of example, with reference to the accompanying drawings, in which :-

30 Fig. 1 is a front view of one configuration of printing mechanism according to the present invention;

35 Fig. 2 is a corresponding rear view;

Fig. 3 is a corresponding end view;

Figs. 4 to 7 are views showing the printing

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mechanism in different positions of operation;
Fig. 8 is a part-exploded perspective view of a
second configuration of printing mechanism;
5 Fig. 9 is a detail perspective view from the
rear of the printing mechanism of Fig. 8; and
Fig. 10 is a view of the control circuit for the
printing mechanism of Figs. 1 to 7.

Reference is made to Figs. 1 to 7 of the
10 accompanying drawings.

The printing mechanism is enclosed in a casing
generally indicated at 20 having a transparent and
removable front wall formed with an arcuate slot 21
for a purpose to be described later and a bottom
15 opening 22 at the printing head end of the casing 20.

It will be manifest that this printing mechanism
will be mounted by suitable bracketting (not shown)
at a suitable location in a packaging line or label
production line for example. As such lines do not
20 constitute part of the present invention they are not
illustrated or described.

The printing mechanism would usually be employed
for over-printing, i.e. printing on already printed
packages, packing materials or labels.

25 The casing 20 comprises a mounting plate 23 on
one side of which is pivoted as indicated at 24 a
cradle 25 having a central spindle 26 on which is
mounted, a disposable roller 27 having a body 28 of
foam plastics or other porous material impregnated
30 with a thermoplastics ink which is solid at ambient
temperatures but which softens when heated. The
roller 27 is removably retained on the spindle 26 by
a tubular core 29.

35 The cradle 25 incorporates heating elements
generally indicated at 30 for heating the ink roller
27, 28. Alternatively, the latter is heated via the
spindle 26 which incorporates a heating element or is

itself a heating element.

5 An inclined arm 31 is connected to the cradle 25 and extends upwardly therefrom and is secured to a plate 32 by screws 33, the plate 32 extending upwardly from the arm 31.

10 The screws 33 permit relative adjustment between the arm 31 and the plate 32 to be effected to determine correct disposition between the ink roller 27, 28 and the printing head (to be referred to later) of the printing mechanism during an ink transfer operation.

15 A stop or pin 34 is secured to the plate 36 intermediate its upper and lower ends and towards one edge thereof for a purpose to be described later.

A lever 35 is pivoted intermediate its ends as indicated at 36 to the plate 32 and at one end the lever 35 mounts a cam follower 36A while its other end is connected by a spring 37 to the lower end of the plate 32.

20 The lever 35 bears on the stop 34.

25 An adjustable stop 25A contacts the cradle 25 to determine the position of the ink transfer roller 27, 28 relative to the printing head generally indicated at 38 and disposed alongside the cradle 25 when the printing head 38 is in a parked position as shown in Figs. 1 and 4. The printing head 38 comprises a type carrier 39 which has a handle 40 movable along the arcuate slot 21 which consequently acts as a guide. The type carrier 39 is removably and slidably supported by a heater block 41 which is secured by a screw 42 on an arm 43 having a pivot spindle 44.

30 The arm 43 carries a spring-loaded adjustable screw or stop 45 adapted to contact a buffer 46 which determines the printing position of the printing head 38.

35 A print worktable 47 is provided below the

opening 22 in the casing 20 to support the article to be printed. This table 47 is, as is well known in the art, height-adjustable and has a levelling facility.

5 The rotatable pivot spindle 44 extends through a hole 48 in the plate 23 and is supported in a bush 49 at the rear of the plate 23. The bush 49 is slidable on two vertical rods 50 held in a bracket 51 secured to the back of the plate 23 by screws 52. A spring 10 53 is mounted between the bush 49 and the bracket 51 and serves to hold the printing head 38 clear of its printing position.

15 An arm or plate 54 is secured to the printing head 38 alongside the arm 43 and is pivotally connected at 55 to one end of a link 56, the other end of which is pivotally connected at 57 to a cam 58 which is in contact with the follower 36A on the lever 35. The plate 32 carrying the latter is 20 connected at its upper end by a spring 59 connected to the plate 23 at the back of the cam 58.

25 The cam 58 is rotatably supported by a spindle 60 with which is fast a pinion 61 at the back of the plate 23 and with which meshes a rack 62 movably supported in a guide 63 and connected via a clevis 64 to the spindle 65 of a double-acting pneumatic cylinder 66 supported on a plate 67 by a cylinder holder 68, the plate 67 being mounted on the plate 23.

30 The cylinder 66 is fitted with two flow-control or regulating valves 69 which are set to give the required cam movements.

35 A shock absorber 70 has its cylinder 71 supported on the cylinder holder 68 and its spindle 72 and contact head 73 are directed towards the clevis 64 for contact therewith as the latter moves towards the shock absorber 70.

It will be manifest that the action of the

double-acting air cylinder 66, rack 62 and pinion 61 serves to rotate the cam 58 alternately clockwise and anti-clockwise.

5 The flow of compressed air to and from the air cylinder 66 via the ports 69 is controlled by a five port solenoid valve diagrammatically illustrated at 74, a suitable pressurised air source (not shown) being provided.

10 It will be manifest that a signal is necessary to cause actuation of the printing mechanism, which signal AS in known manner will be provided by the packaging or production line when the articles to be over-printed are at dwell under the printing head 38. Such signal to the solenoid valve 74 may be a
15 specified voltage signal or a non-voltage signal determined by an option selector OS.

20 The electrical control circuit (Fig. 10) for the printing mechanism is supplied from the mains EM and the supply also includes a voltage selector VS and feeds a power supply PS to the control circuit. The latter includes a "run" switch RS operable by the signal (or non-signal) AS from the packaging or label production machine to activate or de-activate the
25 solenoid valve 74 and consequently the printing mechanism.

 The heater circuits for the ink roller 27, 28 and the printing head 38 are separately controlled by snap thermostats 75 and 76 respectively (see Fig. 1).

30 The control circuit includes a first potentiometer P1 which serves as a delay timer which delays the signal from the package or label production machine until the article to be over-printed has come to rest; and a second
35 potentiometer P2 which serves to adjust the dwell time of the printing head, i.e. the time of contact between the printing head 38 and the article being

printed.

The solenoid valve 74 is operated by the control circuit via a solenoid valve driver SVD as is well known in the art.

5 The electrical wiring of the printing mechanism has been omitted for convenience and so as not to over-complicate the drawing but the wiring would normally be connected to the control circuit via the terminal block 77.

10 Let us assume that the printing mechanism has just completed a printing operation so that it is in parked position with the various components in the disposition shown at Figs. 1 and 4, and the heaters for the ink roller 27, 28 and the printing head 38
15 being operational.

 When now the signal AS is given to the printing mechanism to effect an over-printing operation, the solenoid valve 74 operates to cause the rack 62 to rotate the cam 58 clockwise (see Fig. 5) to move the
20 printing head 38 towards the printing position shown in Fig. 6, the connection point 57 being moved downwardly by the cam 58 to effect such bodily movement of the printing head. At the same time, the
25 nose of the cam 58 acts on the follower 36A to lock the pivotal lever 35 against the stop 34 so that the lever 35, plate 32, arm 31 and the cradle 25 become temporarily unitised so that the latter is pivoted about its axis 24 towards the downwardly moving
30 printing head 38. The latter is thus wiped across the surface of the ink roller 27, 28 to effect an ink transfer operation from the latter to the type of the printing head 38.

 When the inked printing head 38 is in its printing position a final movement of the cam 58 and
35 the abutment action of the stop 45 and buffer 46 causes a short vertical downward movement of the

printing head 38 onto the article to be printed, the compression spring 53 then moving the printing head 38 via the slidable bush or bearing 49 upwardly clear of the worktable 47.

5 As the nose of the cam 58 has now moved past the follower 36A by this time, the lever 35 is free to pivot relative to the stop 34 thus de-unitising the cradle assembly 35, 32, 31 and 25 and allowing the
10 spring 59 to pivot the cradle 25 back to its original parked position.

Reversal of the direction of cam rotation (see Fig. 7) now has the result of raising connection point 57 and so pivots the printing head 38 upwardly
15 about its pivot point 44 past and clear of the parked ink roller 27, 28 into its parked position.

The nose of the cam 58 during this movement serves to pivot the lever 35 away from the stop 34 so that there is no movement of the cradle 25 from its
20 parked position, the spring 37 returning the lever 35 to its normal, non-operational disposition and the cam follower 36A simply following the cam surface non-actively.

The printing mechanism is now at rest until
25 another "run" signal is received from the packaging machine or the label production machine.

Reference is now made to Figs. 8 and 9 which show an alternative configuration of over-printing mechanism according to the present invention.

30 The printing mechanism again comprises a vertical plate 100 which would be located at a desired location on a packaging or label production line.

The printing mechanism comprises an ink support
35 or carrier 101 and a printing head 102.

The ink support or carrier 101 is a disposable roller 103 of foam plastics or other porous material

impregnated with a thermoplastics ink which is solid at ambient temperatures but softens when heated.

5 The roller 103 is freely supported on a spindle 104 carried by a cradle 105 pivoted along an axis 106 on a bracket or arm 107 fixed to the plate 100.

10 The cradle 105 has an aluminium shroud 108 adjacent the periphery of the roller 103 and has cartridge heaters (not shown) for providing the heating for melting the thermoplastics ink in the roller 103. The latter is thus peripherally heated. The electrical connections to the cartridge heaters are generally indicated at 109. Alternatively, or additionally, heating may be effected through the spindle 104 at the centre of the roller 103.

15 The cradle 105 has an upper arm 110 to which is connected the piston rod 111 of a double-acting pneumatic ram 112 connected at its other end to the plate 100 as indicated at 113.

20 A spring 114 is connected between the plate 100 and the arm 110 to assist anti-clockwise movement of the cradle 105.

25 Air supply pipes to the cylinder 115 of the ram 112 are indicated at 116 and each pipe 116 is connected to a flow restrictor 117 which controls the speed of operation of the ram 112.

The printing head 102 has a type carrier 118 which is heated electrically as can be viewed at 119 and the type is generally indicated at 120.

30 The printing head 102 is rotatably supported in a bearing 121 which extends through the plate 100. This bearing 121 is supported for axial movement by a bracket assembly 122 slidably on two rods 123 carried by a fixed bar 124 and a fixed plate 125.

35 A spring 126 is provided between the fixed bar 124 and bearing 121 to urge the latter upwards.

A vertical pneumatic double-acting ram 127 is

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mounted on the plate 100 at 128 and air supply pipes to the ram 127 are indicated at 129, each having a flow restrictor 130.

5 The piston rod 131 of the ram 127 is pivotally connected to the printing head 102 as indicated at 132, laterally of the bearing 119.

10 It will be manifest that the pneumatic rams 112 and 127 constitute part of a pneumatic and electrical control circuit so that the cradle 105 and printing head 102 movements are in timed sequence.

15 The control circuit is substantially as previously referred to, and will be activated by an electric or pneumatic signal from the packaging or label production machinery or other source to operate a solenoid valve (not shown) to initiate the working cycle of the rams 112 and 127.

20 Briefly, the cradle 105 is pivoted anti-clockwise to move the roller 103 clear of the printing head 102 as the ram 127 pivots the printing head 102 through an arcuate path tangentially passed the roller 103, the printing head 102 moving slightly axially downwards during this arcuate movement. Ram 112 then pivots the cradle 105 clockwise so that as 25 the ram 127 pulls the printing head 102 back along the arcuate path the latter is wiped across the roller surface and the type picks up softened or melted thermoplastic ink. The ram 127 then urges the printing head 102 downwards onto the article or material to be printed whereupon the thermoplastic 30 ink on contacting the latter solidifies, the ram 127 then withdraws the printing head 12 axially upwards.

This sequence is repeated for each printing operation.

35 The type employed may be metallic or polymeric and is usually at a temperature slightly in excess of the surface temperature of the roller 103, say, for

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example 150C.

The printing mechanism described above can print onto solid objects or objects, e.g. flexible stock, which are solidly supported underneath.

5 It prints onto stationary objects or objects which are temporarily at rest.

While it is illustrated and described in a vertical attitude it can, of course, be otherwise arranged.

10 Temperature controllers will be provided at the cradle 105 and printing head 102.

This printing apparatus is more economical to manufacture than known electrically/electronically controlled apparatus and is easier to install and maintain.

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CLAIMS:

1. A printing mechanism comprising an ink support impregnated with a thermoplastics ink and adapted to be heated to soften the ink, a movable printing head disposed adjacent the ink support and adapted to carry type onto which softened thermoplastics ink can be transferred from the ink support, and pneumatic actuating means connected to the printing head and adapted to effect a first movement of the latter across the ink support to effect an ink transfer and then a second movement to bring the printing head temporarily into contact with the material or article to be printed at a printing location.

2. A printing mechanism as claimed in claim 1 comprising a pivotal ink support and a pivotal printing head disposed alongside the ink support, the pneumatic actuating means being connected to the printing head so as to pivot same through an arcuate path from a parked location to a printing location whereat it imparts a rectilinear movement to the printing head to effect a printing operation and back again, and connecting means between the pneumatic actuating means and the pivotal ink support to pivot the latter towards the printing head during the first arcuate movement of the latter to effect a wiping, ink transfer, contact between the ink support and the printing head.

3. A printing mechanism as claimed in claim 2 comprising a mounting plate or structure, a first arm pivotally mounting the printing head on the plate or structure, a second arm pivoted to the printing head alongside the first arm, and a pneumatic actuator connected to said second arm for causing the printing head to move to-and-fro through the arcuate path and

rectilinearly at the printing location.

4. A printing mechanism as claimed in claim 3 in which the second arm is eccentrically connected to a cam rotatable alternately clockwise and anti-clockwise.

5. A printing mechanism as claimed in claim 4, in which the cam has connected thereto the pinion of a rack-and-pinion mechanism, the rack being connected for movement to a double-acting pneumatic cylinder.

6. A printing mechanism as claimed in claim 4 or 5 in which the ink support comprises a heated ink roller rotatably supported in a pivotal cradle movingly connected to the cam by the connecting means including a cam follower.

7. A printing mechanism as claimed in claim 6, in which the connecting means comprises arm means pivotally supporting a lever carrying at one end the cam follower, a stop being provided on the arm means to resist pivotal movement of the lever, when the cam rotates to pivot the printing head to the printing location, and thus temporarily unitise the cradle, the arm means and the lever to cause movement of the cradle towards the printing head to effect an ink transfer operation from the ink roller to the printing head.

8. A printing mechanism as claimed in claim 7 comprising a spring connecting the lever and the arm means to maintain the cam follower in contact with the cam.

9. A printing mechanism as claimed in claim 7 or 8 comprising a spring connecting the arm means to the supporting plate or structure to return the cradle to its normal, printing head remote, position.

10. A printing mechanism as claimed in any preceding claim in which the pivot axis of the first arm of the printing head is slidably supported to

permit a rectilinear movement of the printing head to effect a printing operation.

5 11. A printing mechanism as claimed in claim 10 in which a compression spring is provided to return the printing head to its normal position after completion of a printing operation.

10 12. A printing mechanism as claimed in claim 10 or 11 comprising an adjustable stop on the printing head adapted to contact a buffer on the supporting plate or structure to assist said rectilinear movement of the printing head.

15 13. A printing mechanism as claimed in any one of claims 6 to 12 comprising an adjustable stop on the supporting plate or structure acting on the cradle to determine the spacing between the ink roller and the printing head.

20 14. A printing mechanism as claimed in any one of claims 5 to 13 in which the rack is connected to the double-acting pneumatic cylinder by a clevis, a shock absorber being provided for contact by the clevis during to-and-fro movements of the rack.

25 15. A printing mechanism as claimed in claim 1, in which the ink support is a rotatable heated ink roller pneumatically bodily movable clear of the printing head as it moves to the ink transfer location and into the path of the printing head as the latter moves back to the printing location so that type carried by the printing head is wiped across the roller surface.

30 16. A printing mechanism as claimed in claim 15, in which the ink support roller is carried on a spindle within a cradle pivotally supported on a stationary plate or structure, a double-acting pneumatic ram being connected between the stationary plate or structure and the cradle to effect the
35 required bodily pivoting movement of the cradle.

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5 17. A printing mechanism as claimed in claim 16, in which the printing head is pivotally supported on the stationary plate or structure alongside but spaced from the ink roller and is pivotally connected laterally of its pivotal support to a double-acting pneumatic ram which is also connected to the stationary plate or structure, the pivotal support being axially bodily movable during movement of the printing head for ink transfer and printing purposes.

10 18. A printing mechanism as claimed in claim 17, in which the printing head is movable along an arcuate path for ink transfer and an axial path for printing by the double-acting pneumatic ram.

15 19. A printing mechanism as claimed in claim 18 comprising a spring associated with the printing head to assist its movement clear of the material or article after printing of the latter.

20 20. A printing mechanism as claimed in any one of claims 6 to 19 in which the ink roller is heated peripherally by heaters embodied in the cradle structure and/or centrally via a spindle.

25 21. A printing mechanism as claimed in claim 1, in which the ink support is a pad or roller with the printing head being moved rectilinearly to effect ink transfer.

30 22. A printing mechanism as claimed in any preceding claim comprising a control circuit for the pneumatic operating means comprising a solenoid valve operable by a signal from a packaging or label production machine to which the printing mechanism is fitted to initiate inking and printing operations at predetermined intervals.

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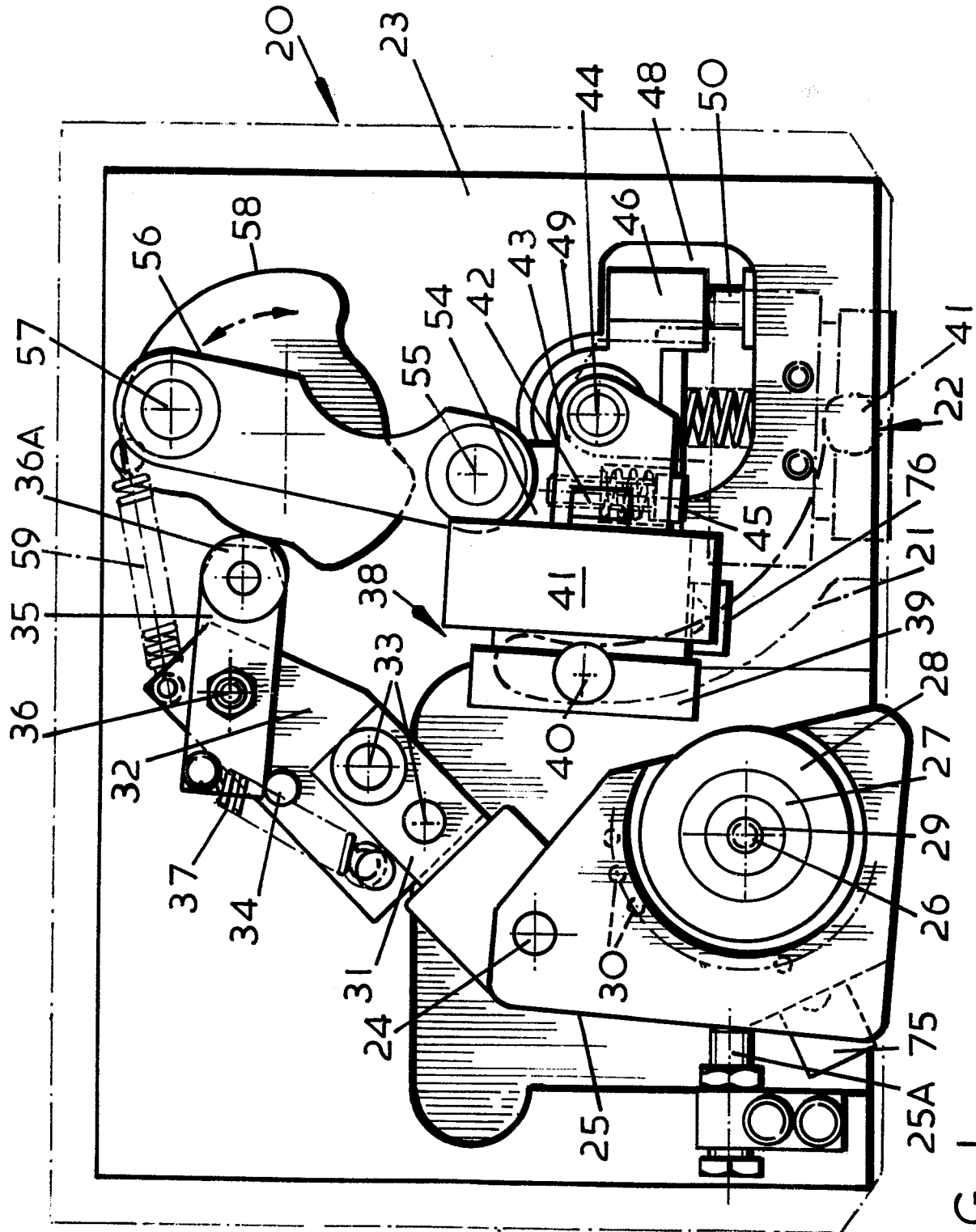


FIG. 1

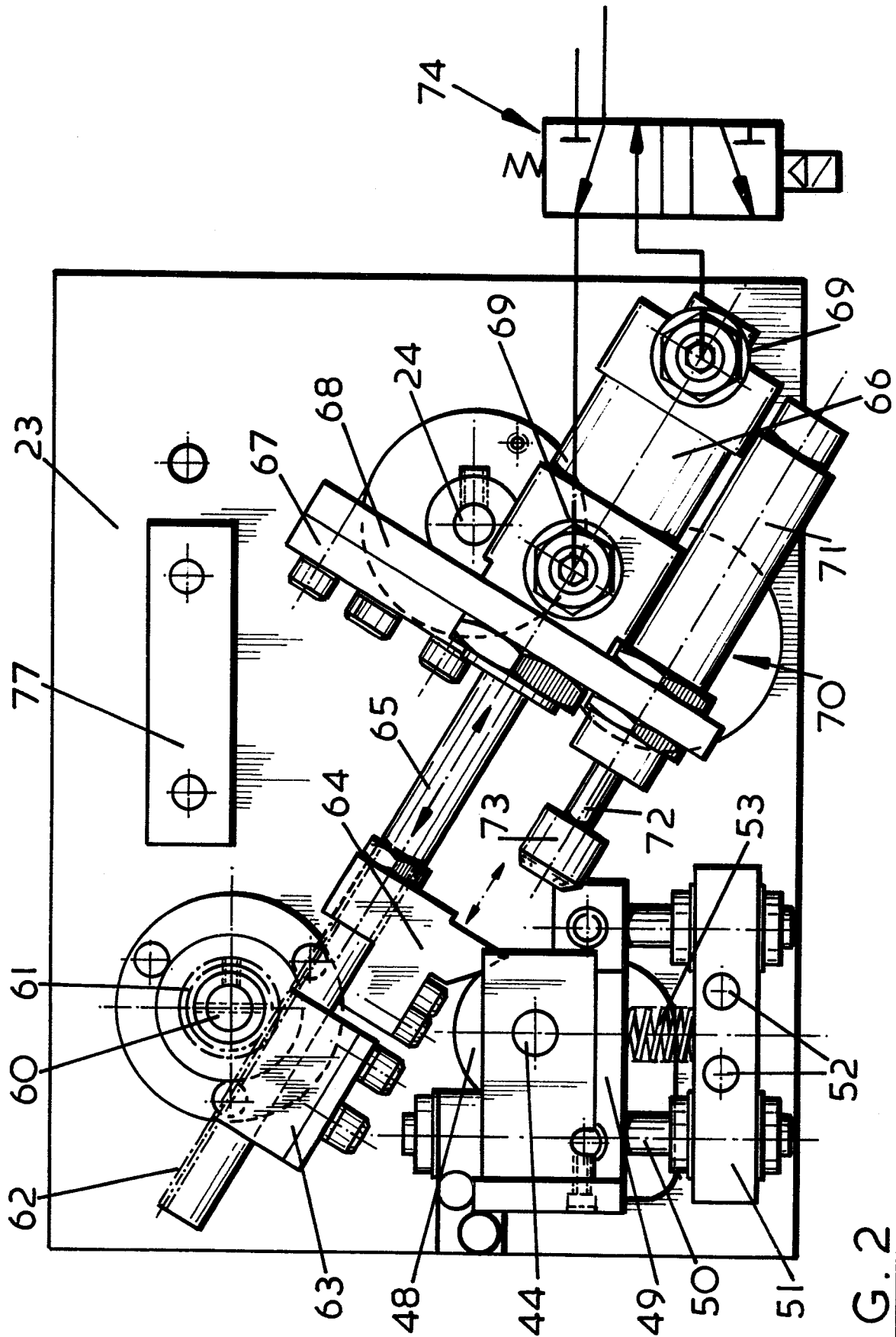


FIG. 2

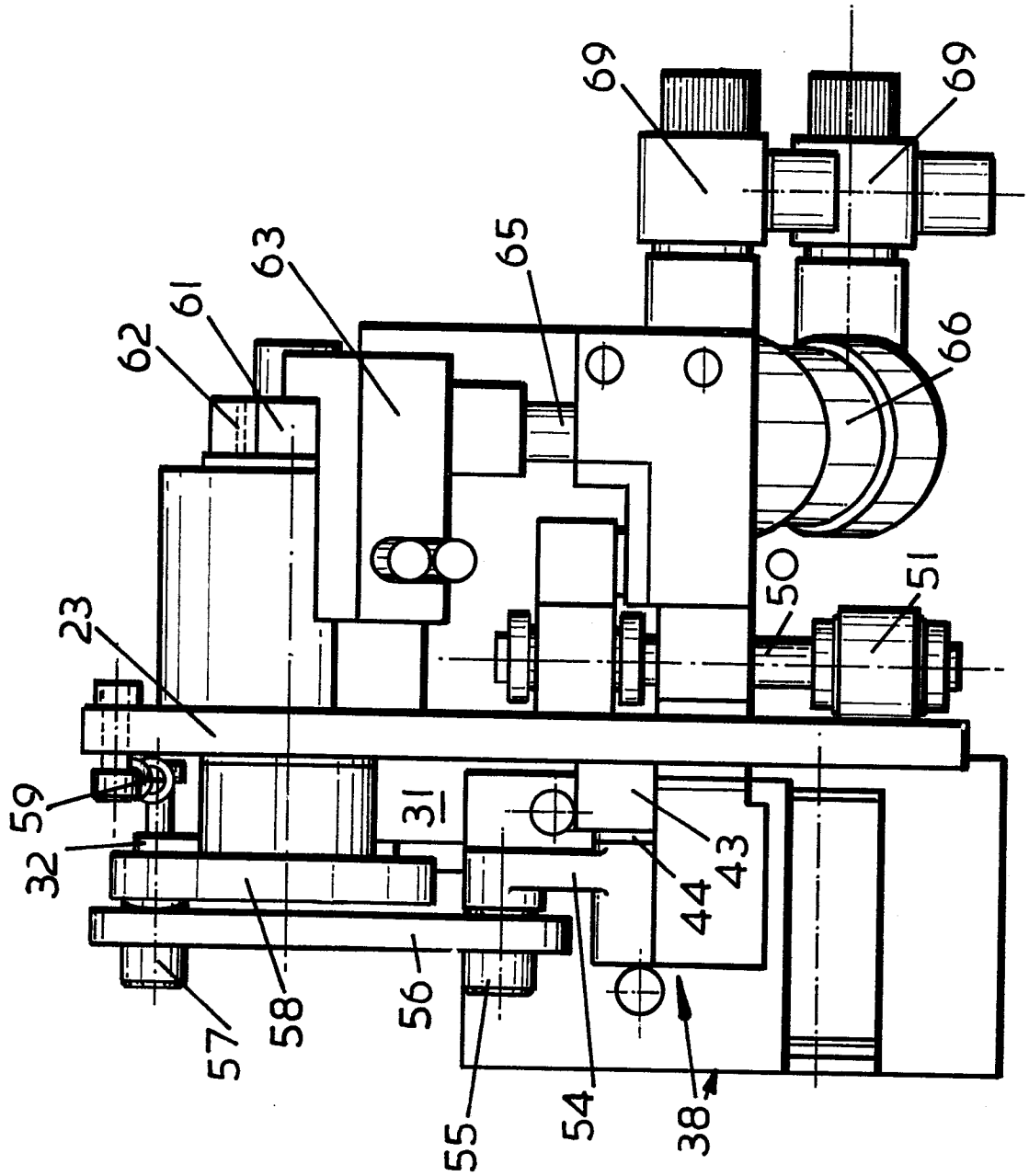


FIG. 3

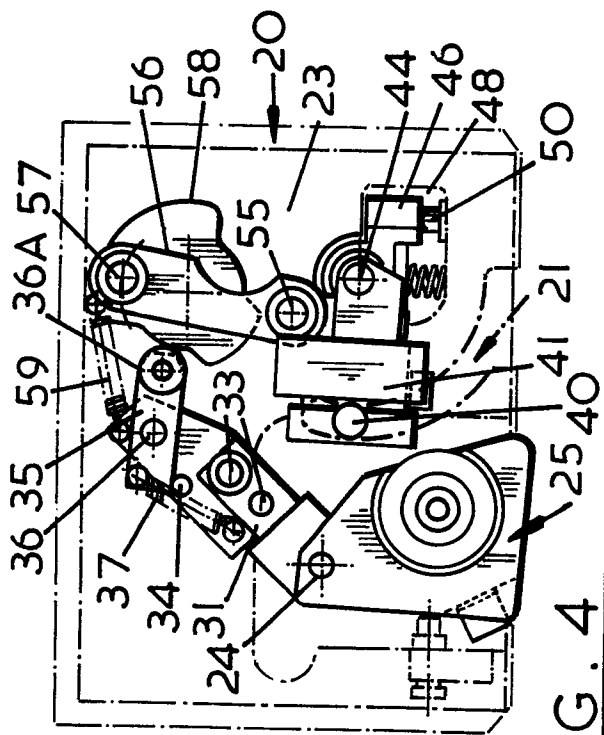


FIG. 4

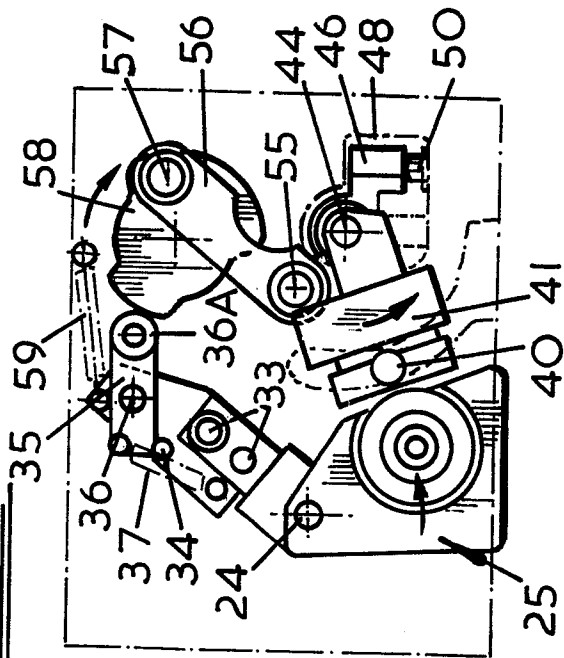


FIG. 5

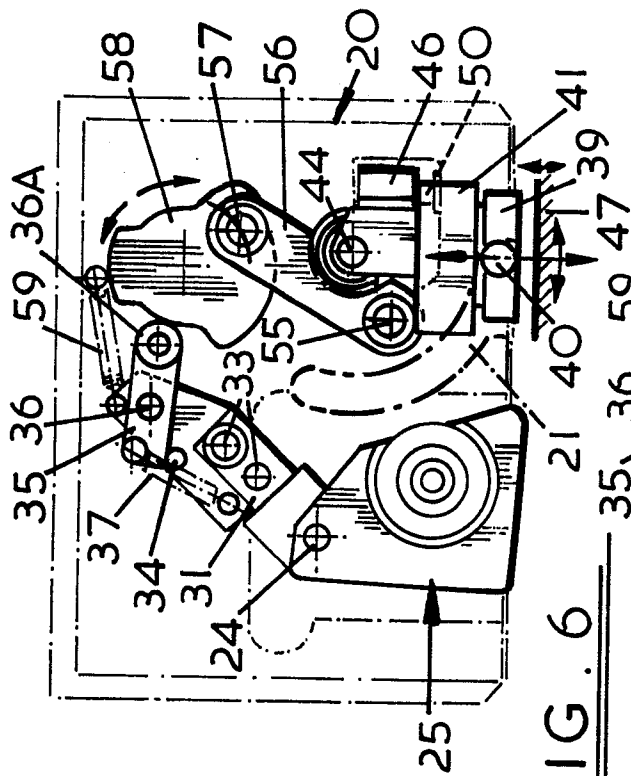


FIG. 6

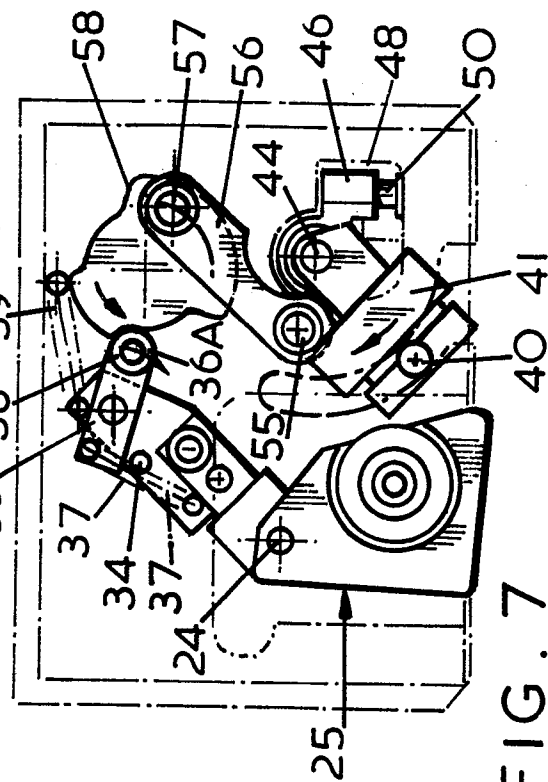


FIG. 7

