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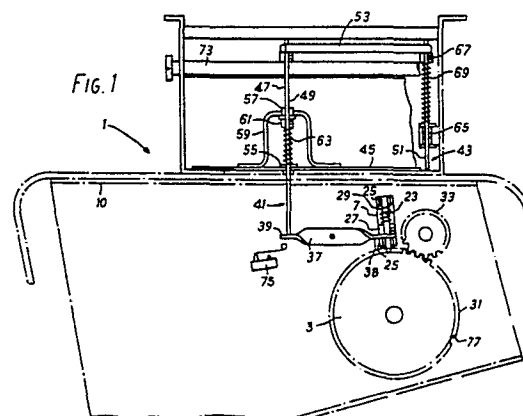
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54 **Single cycle printing machine.**

57 A single cycle printing machine including rotary printing drive mechanism, a detent for locking the mechanism, release means (37) for disengaging the detent (11, 19, 21, 23, 29) thereby to free the drive mechanism and actuating means for operating the release means is characterised by the actuating means being mechanical sensing elements (47, 49, 51, 53, 63, 69) for sensing the presence or absence of sheet to be printed which, in the event of a sheet not being correctly located, inhibit actuation of the release means (37) whilst if sheet is correctly located the sensing elements cause actuation of the release means to allow initiation of a printing cycle. The invention avoids the use of micro-switches for sensing the correct sheet position and enables simpler drive mechanism to be employed.



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This invention relates to printing machines for printing characters on a substrate and more particularly to such machines in which each printing cycle is initiated by an operator. Such machines are hereinafter referred to as "single cycle printing machines".

With single cycle printing machines and particularly those used for printing numbers in sequence on successive sheets such as coupons, lottery tickets or cheques, it is important that the printing cycle be inhibited if the substrate on which printing is to take place is absent from or displaced from a correct printing location. It is also important that these machines should be operable under manual control in the event of power failure.

In the prior art single cycle machines employ one or more micro-switches to detect the presence or absence of the article to be printed, e.g. a coupon, cheque or lottery ticket. Insertion of the article actuates the micro-switches which complete an electrical circuit via a manual pushbutton or operating lever, which can then be depressed to operate a dog clutch which releases the drive of the printing mechanism. In the circuit completed by the depression of the pushbutton or actuation of the operating lever there is a relay which is closed to energise an electric motor, the latter driving the printing mechanism to perform the printing operation. As the cycle nears completion, the printing stroke is completed, the printed article is discharged and the dog clutch is re-engaged to lock the mechanism. Release of the printed article restores the

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micro-switches to their initial positions. The mechanism can now once again be operated when a further article is inserted and actuates the micro-switches and when subsequent actuation of the pushbutton or operating lever causes the cycle to be repeated.

5 The principal disadvantage of the prior art machine described is the complexity of the dog clutch mechanism employed. A typical form of such a mechanism involves, upon engagement of a pawl with the dog provided on a tubular member, the winding of a flat helical spring tightly into engagement with a bush to provide the driving
10 connection between a member driven by the motor and the printing mechanism. A further disadvantage is that reliance for consistent operation is placed on one or more micro-switches for detecting the presence or absence of the article to be printed.

One object of the present invention accordingly is to provide
15 a single cycle printing machine in which simpler and, accordingly, less costly, mechanism is utilised. A further object is to provide a single cycle printing machine in which the detection of the presence or absence of the article to be printed is more reliably effected and this means without dependence upon micro-switch actuation.

20 The present invention consists in a single cycle printing machine for printing characters on sheet material located on a printing platform of the machine, comprising rotary printing drive mechanism including a detent for locking the mechanism, release means operable to disengage the detent thereby to free the drive mechanism and actuating means for
25 operating the release means, characterised in that the actuating means comprise mechanical sensing elements for sensing the presence or

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absence of sheet to be printed which, in the event of a sheet not being correctly located for printing, are located to inhibit actuation of the release means, whilst if sheet is correctly located for printing, the sensing elements are disposed to enable actuation of the release means thereby to allow initiation of a printing cycle.

Advantageously, the mechanical sensing elements of the actuating means include a bridge mounted on the printing platform and having a cross-piece and differentially spring-loaded support posts whereby upon moving of the cross-piece against the spring-loading of the support posts, in the event of sheet not being correctly located for printing, the weaker spring-loaded post is moved without sufficient force being exerted at the stronger spring-loaded post to actuate the release means, whilst if sheet is correctly located for printing, the resistance of the sheet to movement of the weaker spring-loaded post enables movement of the stronger spring-loaded post to actuate the release means thereby to allow initiation of a printing cycle.

Suitably, the stronger spring-loaded post extends through an aperture in the printing platform below which it lugages the release means which operate the detent and the weaker spring-loaded post is disposed over a further aperture in the printing platform over which, in the correct printing position thereof, an edge of sheet to be printed is located to inhibit movement of the weaker spring-loaded post into the further aperture, displacement of the sheet from the correct printing position thereof allowing passage of the weaker spring-loaded post into the further aperture thereby to prevent actuation of the release means. The release means, advantageously, comprise a pivoted lever one end

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of which is engaged by the stronger spring-loaded post and rotation of which by movement of said post displaces a spring-loaded rod of the detent to free the printing drive mechanism.

Preferably, there is provided a pivotally supported arm which
5 engages the cross-piece of the bridge and pivotal movement of this arm moves the cross-piece against the bias of the spring-loaded bridge posts and is under the control of a movable element which is operator actuated.

Advantageously, the printing drive mechanism comprises a driven
10 pulley which completes one revolution for each printing cycle and the spring-biassed rod of the detent is urged towards the rotational axis of the pulley the detent further including an arm (pivotally mounted) on the pulley which projects beyond the periphery of the pulley where it is engaged by the rod to lock the pulley and prevent rotation
15 thereof, movement of the rod against the biasing spring thereof freeing the pulley for rotation. Preferably the arm extends and is pivotal within a radially extending slot in the pulley against the action of a biasing spring so that towards completion of a revolution of the driven pulley, the arm engages the rod and the biasing spring of the arm is
20 stressed to cushion the final part of the movement of the driven pulley.

Suitably, the driven pulley is formed in a face thereof with a cam track engaged by a cam follower the latter being reciprocated during rotation of the pulley to drive the printing mechanism counter and ribbon feed. The pulley is also preferably formed with peripheral
25 gear teeth which engage a gear which drives printing mechanism for effecting printing on the sheet on the printing platform.

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

Figure 1, is a side elevation of a single cycle printing machine according to the invention,

5 Figure 2, is a side elevation of the machine of Fig. 1 seen from a somewhat different angle and with the mechanism in a different position,

Figure 3, is an end elevation of a driven pulley of the operating mechanism of the machine of Figures 1 and 2,

10 Figure 4, is a side elevation of the pulley of Figure 3 with a part removed to show interior construction,

Figure 5, is a sectional side elevation taken on the line V - V of Figure 3, and

15 Figure 6, is a side elevation of the pulley of Figure 3 as seen looking from the left of that Figure.

Referring to the drawings, a single-cycle printing machine 1 is employed for printing successive machine readable members on sheets such as cheques, coupons, lottery tickets etc. and includes a driven pulley 3 formed with a central peripheral groove 5 through which the pulley is driven from an electric motor which drives by way of a reduction gear box a drive pulley which is engaged by an endless belt of circular cross-section which co-operates with the drive pulley and with the groove 5 of the driven pulley 3. A handle is provided which in the event of power failure is fitted to the shaft of the drive pulley so that

20 the latter can be manually rotated to turn the driven pulley and this

25 operates the printing mechanism which itself forms no part of the

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invention and is therefore not further described.

To lock the printing drive mechanism of the machine so as to prevent more than a single printing cycle taking place, there is provided a detent generally indicated at 7 having respective elements
5 mounted on the driven pulley 3 and on the frame 10 of the machine. The detent element on the drive pulley comprises an arm 11 which extends in a radially extending slot 13 in the pulley the slot being sector shaped. The arm 11 is pivotally supported at its inner end at a location 15 which is spaced from the axis of rotation of the driven
10 pulley. The sector shaped slot 13 intersects an arcuate slot 17 which contains ball bearings 19 forced apart by a helical spring 21 so that one of the ball bearings engages the arm 11 whilst the other engages the end of the arcuate slot 17 remote from the arm.

The slot 13 opens to the exterior of the driven pulley and
15 the free end of the arm 11 projects a short distance radially beyond the open end of the slot where it is engaged by the detent element mounted on the frame 10. This latter element comprises a rod 23 which extends through coaxial holes in fixed abutments 25 provided on the frame 10. Between a fixed abutment 27 provided on the rod 23
20 and the abutment 25 remote from the driven pulley is provided a biasing spring 29 which biases the rod 23 towards the axis of rotation of the driven pulley 3. The inner end of the rod 23 lies in the rotational path of the outermost end of the arm 11 so that, as the driven pulley completes a rotation, the end of the arm 11 is engaged by the inner
25 end of the rod 23. As the driven pulley 3 completes a rotation the arm 11 causes the spring 21 to be compressed, thus cushioning the final

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part of the rotational movement of the driven pulley 3.

The arcuate slot 17 in the driven pulley 3 is closed by means of a gear 31 which is secured by screws to the pulley and is of the same overall diameter as the pulley. The gear 31 engages
5 with a gear 33 which is one third of the diameter of the gear 31. The drive pulley is also one third of the diameter of the driven pulley 3 so that, as the gear 33 drives the printing mechanism of the machine, that mechanism performs a single cycle of operation for one complete revolution of the pulley 3.

10 At the side of the pulley 3 remote from the gear 31 is formed a cam track 35 which is engaged by a cam follower connected with linkage mechanism which is reciprocally moved by the cam follower to effect indexing of the ink tape and operation of the number wheels of the counter mechanism forming the print box of the machine.

15 For disengaging the elements of the detent there are provided release means in the form of a lever 37 which is pivotally mounted on the frame 10 of the machine and which, at an end 38 thereof, engages the abutment 27 secured to the rod 23 on the side of the abutment remote from the biasing spring 29. Thus, rotation of the lever 37 to move the
20 rod 23 against the action of the biasing spring 29 effects removal of the inner end of the rod 23 from the path of movement of the free end of the arm 11, thus freeing the driven pulley 3 to rotate the printing mechanism of the machine.

The end 39 of the lever 37 remote from the end 38 thereof is
25 engaged by actuating means (generally indicated at 41) which include sensing mechanism (generally indicated at 43) for sensing the presence

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or absence of a sheet, such as a coupon, to be printed on a printing platform 45 of the machine.

The actuating means comprise a bridge 47 which straddles the printing platform 45 of the machine and comprises upright posts 49
5 and 51 on upper ends of which is engaged a cross-piece 53, the upper ends of the posts passing through slots in the cross-piece 53. The post 49 extends through an aperture in the platform 45 and through coaxial bearings 55 and 57 respectively provided in the platform 45 and a bracket 59 secured to the platform 45. An abutment 61 is secured to the post
10 49 between which and the bearing 55 is disposed a relatively strong helical biasing spring 63 which urges the post 49 in a direction away from the end 39 of the lever 37. When the spring 63 is unstressed the post 49 at the lower end thereof engages the end 39 of the lever 37.

The post 51 of the bridge 47 passes through an aperture in an
15 abutment 65 secured to the frame 10 of the machine. Between the abutment 65 and an abutment 67 fixed to the post 51 is a relatively weak helical biasing spring 69 which biases the post 51 in a direction away from the platform 45. In the unstressed position of the spring 69, the post 49 is disposed a short distance from the platform 45. The post 51 is also
20 disposed in alignment with a small aperture (not shown) in the platform 45.

Engaging the cross-piece 53 is an arm 71 which at the end thereof remote from the cross-piece 53 is keyed to a rotatable shaft 73. Secured to the shaft 73 at the exterior of the machine is a lever (not
25 shown) by means of which the shaft 73 can be rotated to cause the arm 71 to urge the cross-piece 53 in a direction against the action of the

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biasing springs 63 and 69.

When the shaft 73 is so rotated in the absence of a sheet to be printed such as a coupon correctly located on the platform 45, the cross-piece 53 is moved by the arm 71 against the biasing action of the
5 springs 63 and 69. However, as the spring 69 is weaker than the spring 63, the post 51 is moved longitudinally against the action of the spring 69 and the end of the post remote from the cross-piece 53 passes through the aperture coaxial therewith in the printing platform 45. Accordingly, no longitudinal movement of the post 49 takes place and
10 therefore the lever 37 is not rotated and the rod 23 remains in engagement with the free end of the arm 11 so that the driven pulley 3 is not freed.

When the shaft 73 is rotated in the presence of a sheet to be printed such as a coupon, an edge the latter covering the hole in the
15 printing platform 45 coaxial with the post 51, the arm 71 moves the cross-piece 53 against the action of the biasing springs 63 and 69. As the biasing spring 69 is weaker than the spring 63, the post 51 is brought into engagement with the coupon, which provides resistance to movement of the post 51 additional to that of the spring 69. The
20 combined resistance to movement of the post 51 afforded by the coupon and the spring 69 is sufficient to prevent further compression of the spring 69, with the result that the resistance of the spring 63 is overcome and the post 49 is moved axially, thus rotating the lever 37 so that the rod 23 is moved out of engagement with the arm 11, thus
25 freeing the driven pulley 3. Immediately after the driven pulley 3 is freed for rotation, further axial movement of the post 49 actuates

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a micro-switch 75 in the energising circuit of the electric motor, which circuit includes a relay which holds the circuit energised after return movement of the post 49.

5 The hole in the printing platform 45 which is coaxial with the post 51 is so located that when a coupon is correctly located on the platform 45 for printing, the hole is covered by an extreme corner portion of the coupon. This ensures that the coupon is fully inserted on to the printing platform before printing can occur.

10 As the driven pulley 3 is rotated by the electric motor subsequent to disengagement of the detent formed by the arm 11 and rod 23, the printing cycle proceeds and, during printing, the cam follower is engaged in that part of the cam track 35 which is circular with respect to the rotational axis of the driven pulley 3. After the printing stroke is completed, the cam follower moves relatively to the
15 lobe of the cam track 35, thus reciprocating the mechanism connected with the cam follower which indexes the printing ribbon and also the number wheels of the print box.

In a latter part of a revolution of the driven pulley 3, a notch 77 in the periphery of the pulley is engaged by a micro-switch
20 (not shown) which operates a circuit which de-energises the electric motor. As the pulley 3 completes its revolution, the arm 11 is engaged by the rod 23 so that the final part of the rotation of the pulley 3 is cushioned as the helical spring 21 is compressed. The machine is now ready to perform a further printing cycle.

25 The endless belt which engages the motor pulley and the groove 5 of the driven pulley 3 is of circular cross-section as this

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facilitates slip of the belt relative to the groove 5 in the event that the motor continues to drive after the detent has arrested the pulley 3.

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CLAIMS:

1. A single-cycle printing machine for printing characters on sheet material located on a printing platform of the machine, comprising rotary printing drive mechanism including a detent for locking the mechanism, release means operable to disengage the detent thereby to free the drive mechanism and actuating means for operating the release means, characterised in that the actuating means comprise mechanical sensing elements for sensing the presence or absence of sheet to be printed which, in the event of a sheet not being correctly located for printing, are located to inhibit actuation of the release means, whilst if sheet is correctly located for printing, the sensing elements are disposed to enable actuation of the release means thereby to allow initiation of a printing cycle.
2. A machine as claimed in claim 1, characterised in that the mechanical sensing elements of the actuating means include a bridge mounted on the printing platform and having a cross-piece and differentially spring-loaded support posts whereby upon moving of the cross-piece against the spring-loading of the support posts, in the event of sheet not being correctly located for printing, the weaker spring-loaded post is moved without sufficient force being exerted at the stronger spring-loaded post to actuate the release means, whilst if sheet is correctly located for printing, the resistance of the sheet to movement of the weaker spring-loaded post enables movement of the stronger spring-loaded post to actuate the release means thereby

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to allow initiation of a printing cycle.

3. A machine as claimed in claim 2, characterised in that the stronger spring-loaded post extends through an aperture in the printing platform below which it engages the release means which operate the detent and the weaker spring-loaded post is disposed over a further aperture in the printing platform over which in the correct printing position thereof, an edge of sheet to be printed is located to inhibit movement of the weaker spring-loaded post into the further aperture, displacement of the sheet from the correct printing position thereof allowing passage of the weaker spring-loaded post into the further aperture thereby to prevent actuation of the release means.

4. A machine as claimed in claim 3, characterised in that a pivoted lever one end of which is engaged by the stronger spring-loaded post and rotation of which by movement of said post displaces a spring-loaded rod of the detent to free the printing drive mechanism.

5. A machine as claimed in any one of claims 2 to 4, characterised in that there is provided a pivotally supported arm which engages the cross-piece of the bridge and pivotal movement of this arm moves the cross-piece against the bias of the spring-loaded bridge posts and is under the control of a movable element which is operator actuated.

6. A machine as claimed in any preceding claim, characterised in that the printing drive mechanism comprises a driven pulley which completes one revolution for each printing cycle and the spring-biased rod of the detent is urged towards the rotational axis of the pulley the detent further including an arm (pivotally mounted) on the pulley which projects beyond the periphery of the pulley where it is engaged

by the rod to lock the pulley and prevent rotation thereof, movement of the rod against the biasing spring thereof freeing the pulley for rotation.

7. A machine as claimed in claim 6, characterised in that the arm extends and is pivotal within a radially extending slot in the pulley against the action of a biasing spring so that towards completion of a revolution of the driven pulley, the arm engages the rod and the biasing spring of the arm is stressed to cushion the final part of the movement of the driven pulley.

8. A machine as claimed in claim 6 or claim 7, characterised in that the driven pulley is formed in a face thereof with a cam track engaged by a cam follower the latter being reciprocated during rotation of the pulley to drive the printing mechanism counter and ribbon feed. The pulley is also preferably formed with peripheral gear teeth which engage a gear which drives printing mechanism for effecting printing on the sheet on the printing platform.

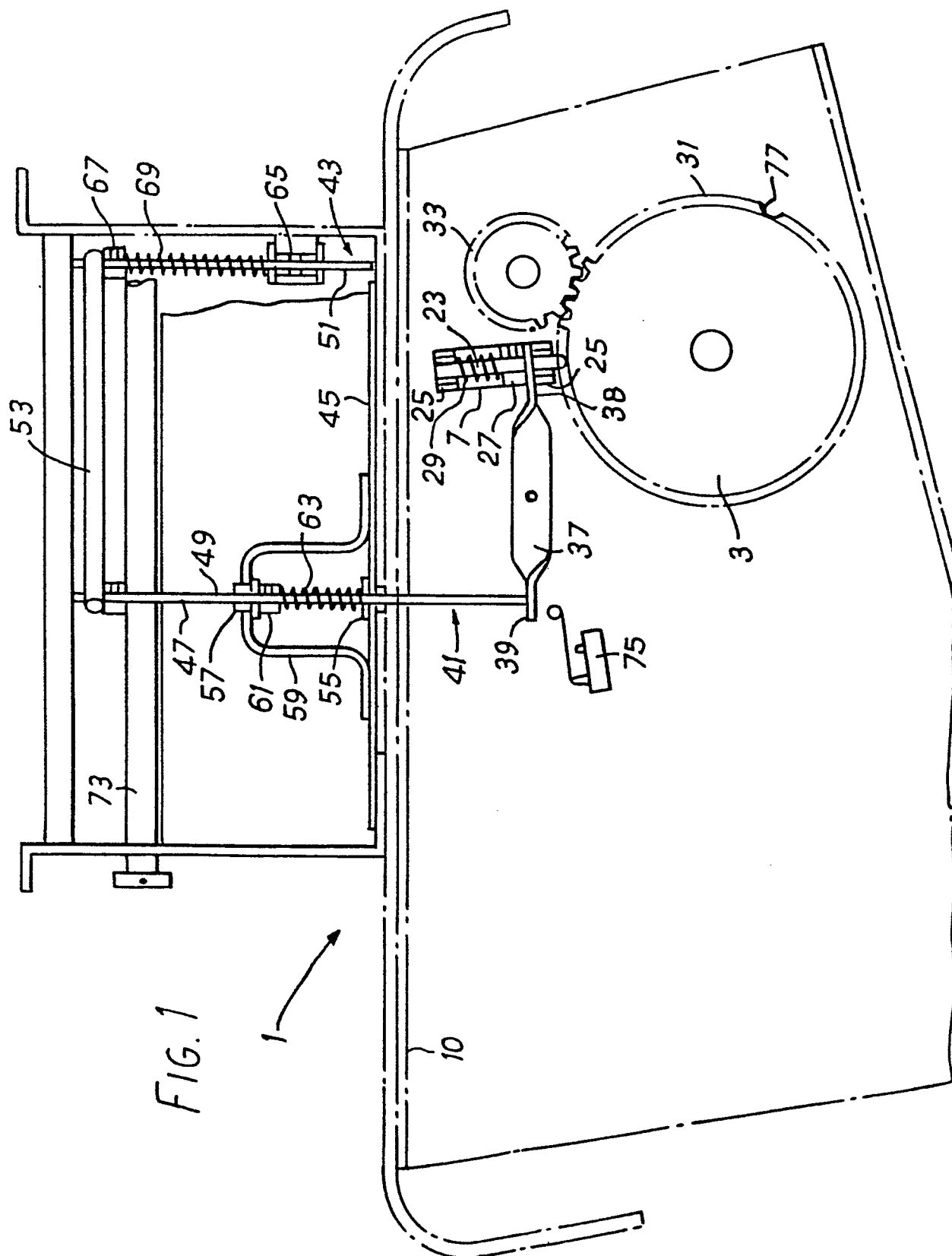
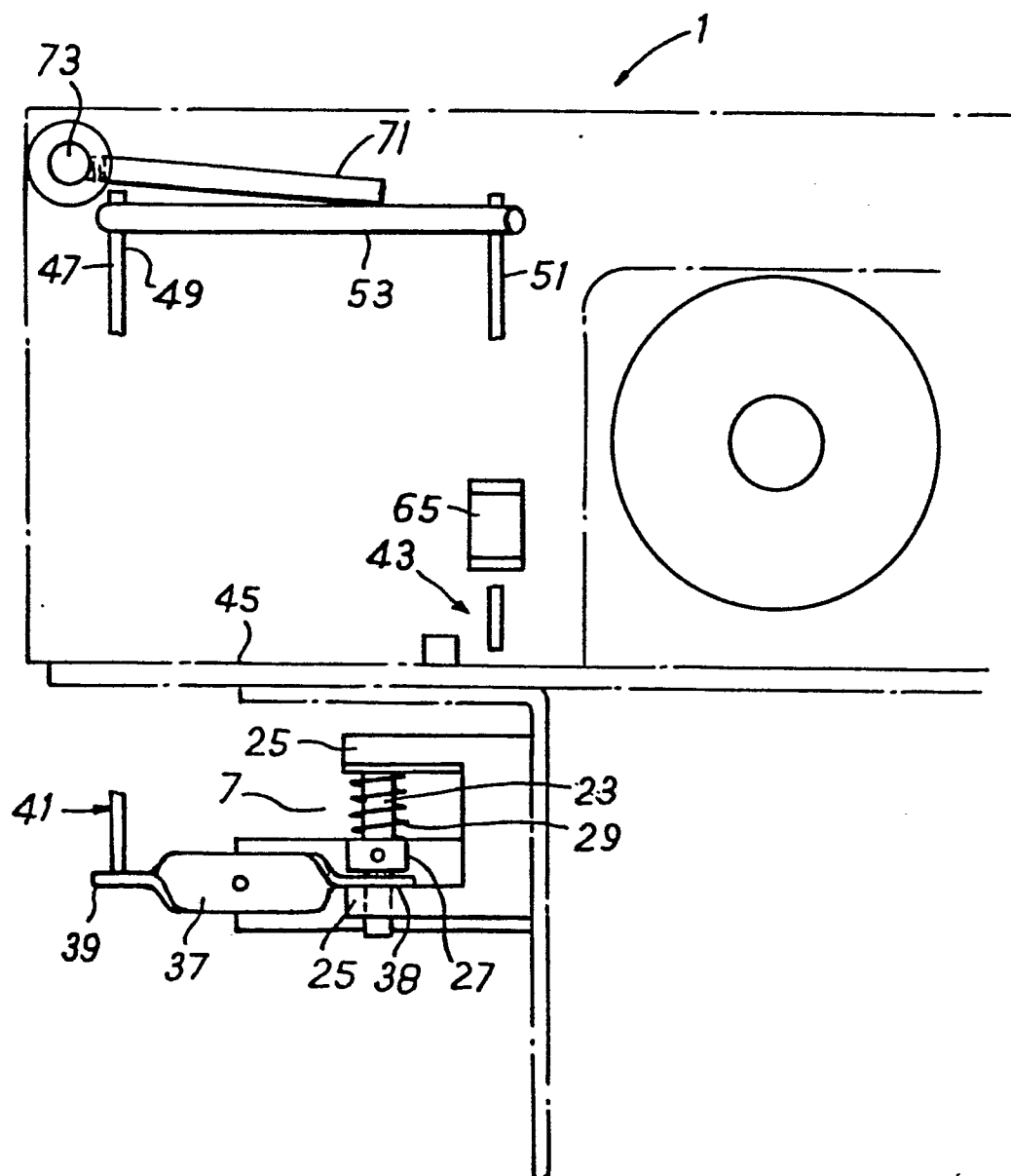
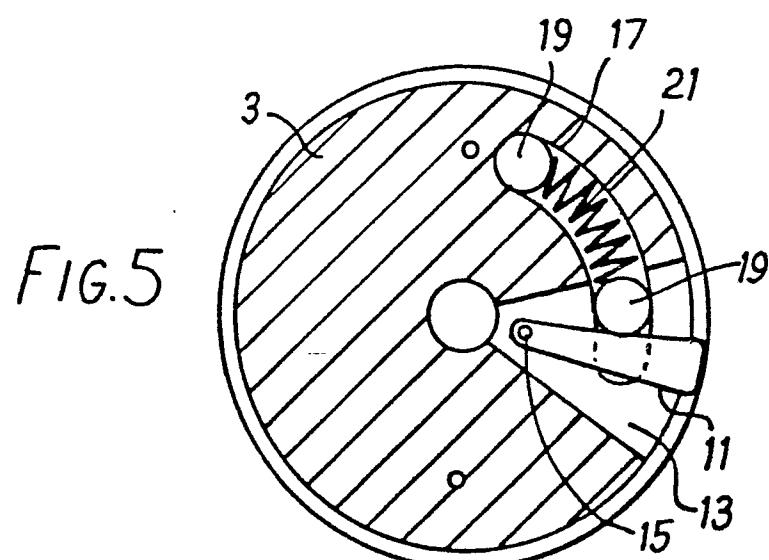
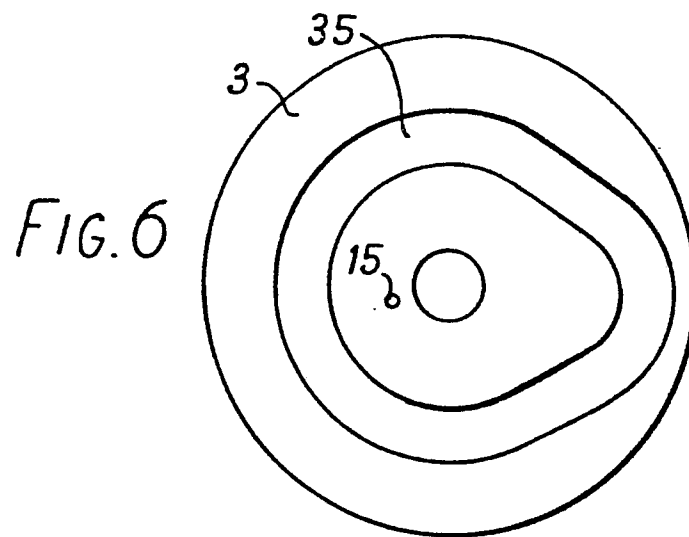
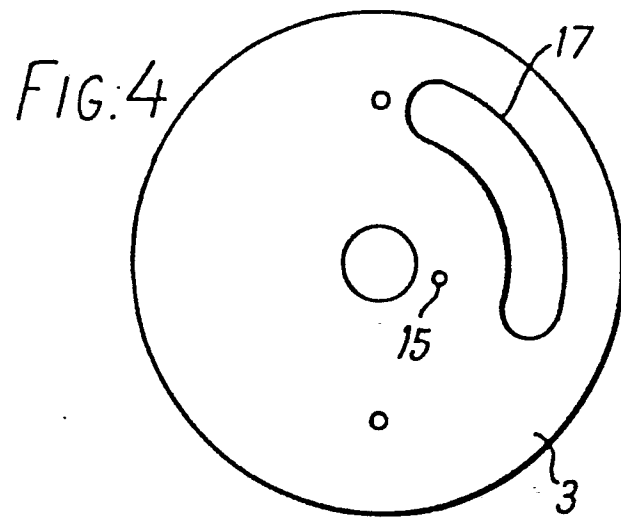
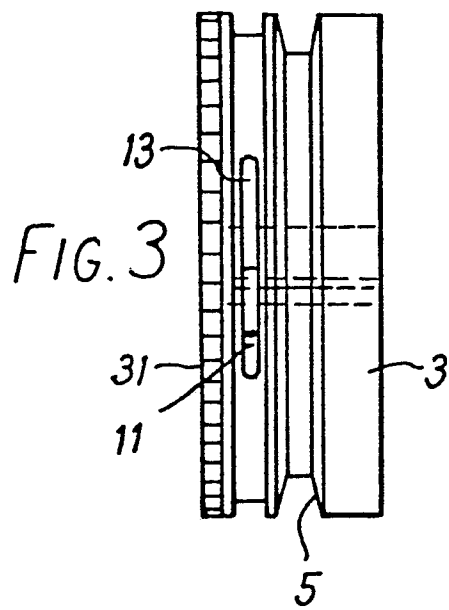


FIG. 2







European Patent
Office

EUROPEAN SEARCH REPORT

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Application number

EP 80 30 1405

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl. 3)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
	<u>US - A - 3 180 574 (SATAS)</u> * Column 2, line 42 to column 3, line 10; figures 4-6 * -- <u>GB - A - 11 401/AD 1912 (REGINA)</u> * Page 2, line 32 to page 3, line 3; figures * ----	1 1	B 41 K 3/64
			TECHNICAL FIELDS SEARCHED (Int. Cl. 3)
			B 41 K B 41 L B 41 F
			CATEGORY OF CITED DOCUMENTS
			X: particularly relevant A: technological background O: non-written disclosure P: intermediate document T: theory or principle underlying the invention E: conflicting application D: document cited in the application L: citation for other reasons
X The present search report has been drawn up for all claims			&: member of the same patent family, corresponding document
Place of search		Date of completion of the search	Examiner
The Hague		07-08-1980	LONCKE