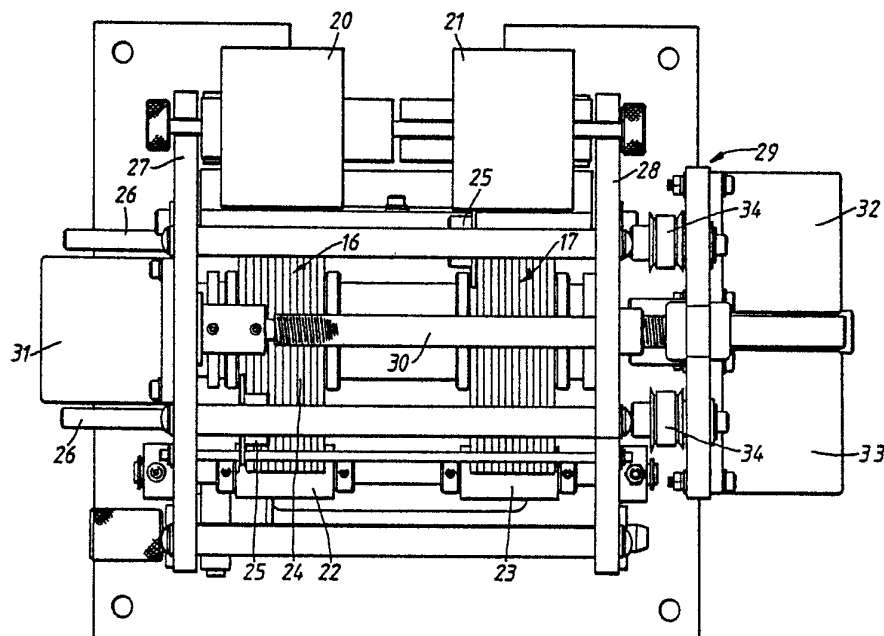


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(54) Title: IDENTIFICATION PRINTING APPARATUS



(57) Abstract

Apparatus for printing an identification on a cable or the like. In one embodiment the apparatus comprises a printing machine (10) through which a cable (11) is drawn by a driven reel (12) or a supply reel (13). A computer (14) is provided for controlling the operation of the machine (10) and reel (12). The machine (10) has a pair of print heads (16, 17) each consisting of a series of side-by-side print wheels (24). The position of these wheels (24), and hence the identification printed, is automatically adjustable by means of respective sprocket wheels (25) whose axial position is defined by a carriage (29) and whose rotation is controlled through a shaft (26). The carriage position is defined by a stepper motor (31), whilst the rotation of the wheels (25) is controlled by respective motors (32, 33). The cable is pressed against the print heads by means of an anvil (18) which can be operated so as to vary the pressure applied in accordance with the extent of the identification to be printed.

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Identification Printing Apparatus

This invention relates to identification printing apparatus and in particular, but not exclusively, to apparatus for printing identification on a cable or the like.

5 It is known to print identification on cables or on tubing for attachment to cables by a variety of means. One group of machines uses a print head comprising a number of wheels which are heated so as to print characters on the periphery of the wheel when
10 pressed against foil overlying the cable or tubing. At present, these wheels are indexed by means of a toothed wheel which is manually aligned with the selected print wheel in the print head and then manually rotated to rotate the print wheel.

15 The present invention consists in apparatus for printing an identification on a cable or the like, including a print head having a plurality of side-by-side individually rotatable wheels with notches around their peripheries and print characters formed on the interposed
20 lands, the wheels being mounted in the head with their notches axially aligned and an automatic indexing mechanism, including a carriage axially movable relative to the print head, a shaft rotatably mounted on the carriage, an indexing element mounted on the shaft
25 for rotation therewith and engagable in a notch of a

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print wheel according to the axial position of the carriage, a first motor for moving the carriage, and hence the indexing element, axially to select the print wheel to be engaged by the indexing element and a
5 second motor for rotating the shaft, and hence the indexing element, such that the indexing element indexes the selected print wheel to move a selected character to a print position.

In a preferred embodiment the indexing element
10 is a sprocket wheel, at least one of the motors is a stepper motor and the carriage is mounted on a lead screw driven by the first motor. The second motor may be mounted on the carriage.

The above apparatus may be in the form of
15 original equipment or in the form of a retrofittable unit for converting existing manual machines.

The invention may also include apparatus as defined above, having a plurality of print heads and a respective indexing element/shaft assembly and second
20 motor for each print head. In a preferred arrangement there are a pair of heads and the indexing elements are on opposite sides of the carriage and hence of the heads. Such apparatus may further comprise control means for the indexing mechanism for operating

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the first and second motors such that the upstream head in the direction of movement of cable through the apparatus prints the same identification as that printed immediately previously by the downstream head.

- 5 The control means may further operate the first motor such that the carriage moves a minimum distance in any given indexing cycle.

In any of the above forms of apparatus the print wheels may be moveable towards the cable but
10 it is preferred that the apparatus includes a moveable anvil for engaging the cable with the print head either directly or through the medium of a coloured foil. The anvil may have a groove or channel for receiving the cable and may be provided with clips or
15 the like for retaining the cable in the channel during movement to and from the print head.

The apparatus may include means for varying the pressure applied by the anvil in accordance with the number and/or size of the characters to be printed.
20 For example, the anvil may be solenoid activated and the pressure varying means may include means for varying the voltage supplied to the solenoid. Thus, the voltage may be chopped and means may be provided for varying the period for which the chopped voltage
25 is off or on, so as to vary the average voltage supplied to the solenoid.

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The apparatus may further include means for feeding the cable past the print heads in a timed sequence with the operation of the apparatus.

From a further aspect, the invention consists
5 in apparatus for printing an identification on a cable or the like, including a print head, an anvil for pressing the cable against the print head (either directly or indirectly) and means for varying the pressure applied by the anvil in accordance with the
10 physical characteristics of the identification to be printed.

From another aspect, the invention consists in apparatus for printing identification on a cable or the like, including a pair of side-by-side print
15 heads past which a cable can be moved and means for altering the identifications printed by the heads such that the upstream head, in the direction of cable movement, prints the same identification as that printed immediately previously by the downstream
20 head.

The result of this arrangement is that there are lengths of cable having the same identification printed at either end with a small space before the next identification. The cable can then be chopped
25 between unlike pairs of identifications to provide lengths of cable correctly identified at each end.

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From a still further aspect the invention consists in apparatus for printing an identification on a cable or the like, including a print head and means for moving the cable into direct or indirect
5 contact with the print head.

Although the invention has been defined above, it is to be understood that it includes any inventive combination of the features set out above or in the following description.

10 The invention may be performed in various ways and a specific embodiment will now be described, with reference to the following drawings, in which:

Figure 1 is a schematic view of printing apparatus;

15 Figure 2 is a plan view from above of a printing machine of the apparatus of Figure 1;

Figure 3 is a side view of the machine of Figure 2;

Figure 4 is a partial end view on the arrow
20 A of the machine of Figure 2;

Figure 5 illustrates a 'manual' print unit fitted automatic indexing apparatus; and

Figure 6 illustrates the engagement between a print wheel and sprocket wheel.

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Referring to Figure 1 cable printing apparatus comprises a printing machine 10 through which a cable 11 is intermittently drawn by a driven reel 12 from a supply reel 13. The operation of the machine 10 and
5 reel 12 is controlled by a computer 14 having a keyboard 15. In order to keep the cable taut, the supply reel 13 may also be driven and under computer control.

Turning to Figures 2 to 4, the printing machine 10 has a pair of print heads 16, 17 spaced
10 along the path of travel of the cable 11 and a movable anvil 18, which receives the cable in a channel 19. Foil reels are provided at 20 and 21 so that coloured foil can be drawn between the print heads and the anvils and over tensioning rollers 22, 23.

15 Thus, in use the anvil 18 is moved upwardly to press the cable against the print heads 16, 17 through the coloured foil to print the identification set on the print heads.

Each print head comprises a series of side-
20 by-side print wheels 24, each of which is notched about its periphery to provide interposed lands on which print characters are formed. The wheels are heated (by means not shown) to assist the transfer of colour onto the cable. They are each individually rotatable to allow

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the identification at the lower print position to be altered.

5 This adjustment is achieved by engaging a toothed or sprocket wheel 25 in the notches or recesses in the periphery of any given print wheel and rotating the sprocket wheel 25 to cause rotation of that print wheel. This is illustrated in Figure 6. In the printing machine 10, an individual sprocket wheel 25 is provided for each print head 16, 17 and it will be seen that they are located on opposite sides of the print heads with respect to each other. The sprocket wheels 25 are carried on respective shafts 26, for rotation therewith, which extend between walls 27 and 28 of a carriage 29. This carriage is mounted for axial movement with respect to the print head 16, 17 by means of a lead screw 30 to which it is threadingly engaged. A stepper motor 31 is provided for rotating the lead screw 30 to achieve axial movement of the carriage 29 and the carriage in turn supports a pair of further stepper motors 32, 33 which are arranged to rotate respective shafts 26 by means of belt drives 34.

20 Thus, it can be seen that by appropriate rotation of the lead screw 30, the sprocket wheels 25 can be located adjacent any respective print wheel 24 in the head 16 or 17 and can index that wheel by appropriate rotation caused by its respective motor

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32, 33. As the sprocket wheels have individual rotational motors, the indexing in any particular operation can be varied between heads. Indeed, if for example, one head is changing both tens and units in an identification whilst the other is only changing units, then one of the sprocket wheels will not rotate when they are opposite 'the tens' print wheel.

The computer 15 is arranged to select the identification to be located in the print positions on the print head 16, 17 and then to compute the shortest carriage travel which can achieve the requisite identifications. As has been explained above, by having the identification of print head 17 lagging that on the downstream head 16 it is possible to print either end of a cable length so that it may be subsequently cut. The operation of the drive reel 12 determines the length of cables achieved.

The construction and the operation of the anvil 18 will now be described in more detail, with reference to Figure 4. As can be seen in that Figure, the anvil 18 is mounted on a chassis 35 which is pivoted about a horizontal axis at 36. The generally triangular chassis 35 is engaged at its lowest corner 37 by a link 38a of a solenoid, generally indicated at 38, such that contraction of the solenoid causes

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upward (printing) movement of the anvil 18 into the position shown in Figure 4. Switching off of the solenoid 38 returns the chassis 35 to its ghost line position where it engages adjustable stop 39. The
5 tensioning rollers 22, 23 are operatively connected to the chassis 35 and anvil 18.

Surprisingly, it has been determined that the pressure applied by the anvil is desirably adjusted in accordance with the number or size of characters
10 which are to be printed in any cycle. This pressure is a function of the extent of movement of the chassis 35 and hence the solenoid 38. Accordingly, the computer controls the average voltage supplied during the 'on' period of the solenoid as a function of the
15 identifications to be printed and it can efficiently alter this by controlling the 'on' or 'off' period of a chopped voltage supply to the solenoid.

Thus, the applicants' apparatus not only allows ready automatic indexing of the print head, but
20 the provision of two controlled print heads enables the printing of the same identification at either end of the cable with considerable flexibility and speed. To assist easy reading the printed characters in the 'same' identifications may be in the opposite order that the
25 identification is always read from the nearest end.

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Further, the use of a moving anvil, as opposed to a moving print head, not only simplifies the mechanism but also allows for very precise pressure control.

Figure 6 illustrates a retrofittable
5 automatic drive unit 40 for automating existing manually operated printing apparatus. The unit 40 is coupled to and hence incorporates the existing sprocket wheel shaft 41 by a coupling 42. The unit
10 40 has a frame 43 mountable on the existing apparatus and comprising support shafts 44, 45 and end plate 47. The shaft 45 supports a carriage 48 which is drivingly engaged at 49 to the output shaft 50 of a first motor 51 mounted on plate 47 to move the carriage 48 along shaft 45. Carriage 48 carries a second motor 52
15 which is engaged to shaft 41 by coupling 42 to rotate the sprocket wheel 25. By suitable operation of the motors 51, 52 the sprocket wheel 25 can index any of the print wheels 24 in the manner described above. Control apparatus of the type shown in Figure 1 is again
20 used.

In either case the apparatus may be arranged to produce a synchronising signal so that printed lengths of cable can be cut whilst the cable drive is halted for printing to occur.

25 It will be appreciated that the apparatus is designed to operate on a continuous cyclic basis to produce batches of individually identified cable lengths or it can be programmed to produce 'one-off' cable lengths.

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Claims

1. Apparatus for printing an identification
on a cable or the like, including a print head having
a plurality of side-by-side individually rotatable
wheels with notches around their peripheries and print
5 characters formed on the interposed lands, the wheels
being mounted in the head with their notches axially
aligned and an automatic indexing mechanism, including
a carriage axially movable relative to the print head,
a shaft rotatably mounted on the carriage, an indexing
10 element mounted on the shaft for rotation therewith
and engagable in a notch of a print wheel according to
the axial position of the carriage, a first motor for
moving the carriage, and hence the indexing element,
axially to select the print wheel to be engaged by the
15 indexing element and a second motor for rotating the
shaft, and hence the indexing element, such that the
indexing element indexes the selected print wheel to
move a selected character to a print position.

2. Apparatus as claimed in Claim 1 wherein at
20 least one of the motors is a stepping motor.

3. Apparatus as claimed in Claim 1 or Claim 2
wherein the carriage is mounted on a threaded shaft
driven by the first motor.

4. Apparatus as claimed in any one of the
25 preceding claims wherein the second motor is mounted on

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on the carriage.

5 5. Apparatus as claimed in any one of the
preceding claims further comprising a plurality of
print heads and a respective indexing element/shaft
assembly and a second motor for each print head.

6. Apparatus as claimed in Claim 5 wherein
there is a pair of heads and the indexing elements
are on opposite sides of the carriage and hence of the
heads.

10 7. Apparatus as claimed in Claim 6 further
comprising control means for the indexing mechanism
for operating the first and second motors when a cable
is moved past the print heads such that the upstream
head in the direction of movement of the cable prints
15 the same identification as that printed immediately
previously by the downstream head.

20 8. Apparatus as claimed in Claim 7 wherein
the control means operates the first motor such that
the carriage moves a minimum distance in each indexing
cycle.

25 9. Apparatus as claimed in any one of the
preceding claims further comprising an anvil for
engaging the cable with the print head after indexing
and means for varying the pressure applied by the anvil
in accordance with the number and/or size of the
characters to be printed.

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10. Apparatus as claimed in Claim 9 wherein the anvil is solenoid activated and the pressure varying means includes means for varying the voltage supplied to the solenoid.

5 11. Apparatus as claimed in Claim 10 wherein the voltage varying means comprises means for chopping the voltage input to the solenoid and means for varying the period for which the chopped voltage is off or on, so as to vary the average voltage supplied
10 to the solenoid.

12. Apparatus as claimed in any one of the preceding claims further including means for feeding the cable past the print heads in a timed sequence with the operation of the apparatus.

15 13. Apparatus for printing an identification on a cable or the like, including a print head, an anvil for pressing the cable against the print head (either directly or indirectly) and means for varying the pressure applied by the anvil in accordance with the
20 physical characteristics of the identification to be printed.

14. Apparatus for printing identification on a cable or the like, including a pair of side-by-side print heads past which a cable can be moved and means
25 for altering the identifications printed by the heads

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such that the upstream head, in the direction of cable movement, prints the same identification as that printed immediately previously by the downstream head.

5 15. Apparatus for printing an identification on a cable or the like, including a print head and means for moving the cable into direct or indirect contact with the print head.

10 16. Apparatus for printing an identification on a cable or the like substantially as hereinbefore described with reference to the accompanying drawings.

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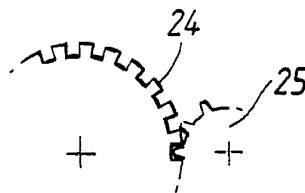
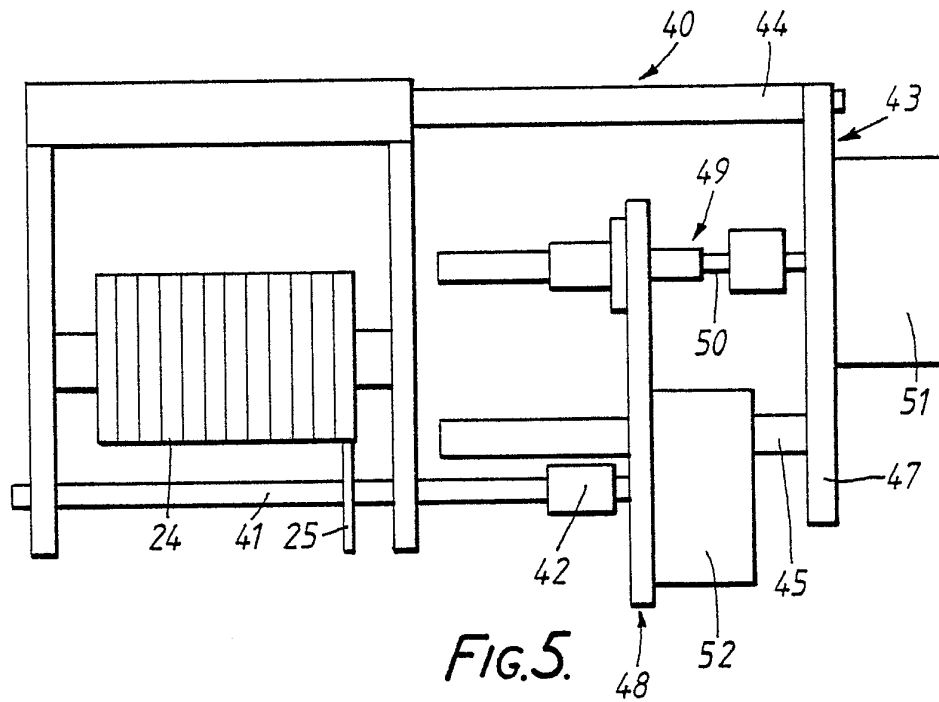
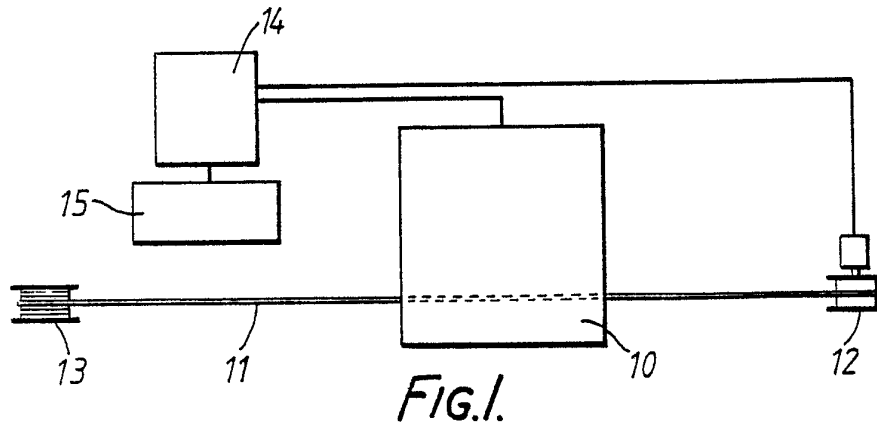


Fig. 6.

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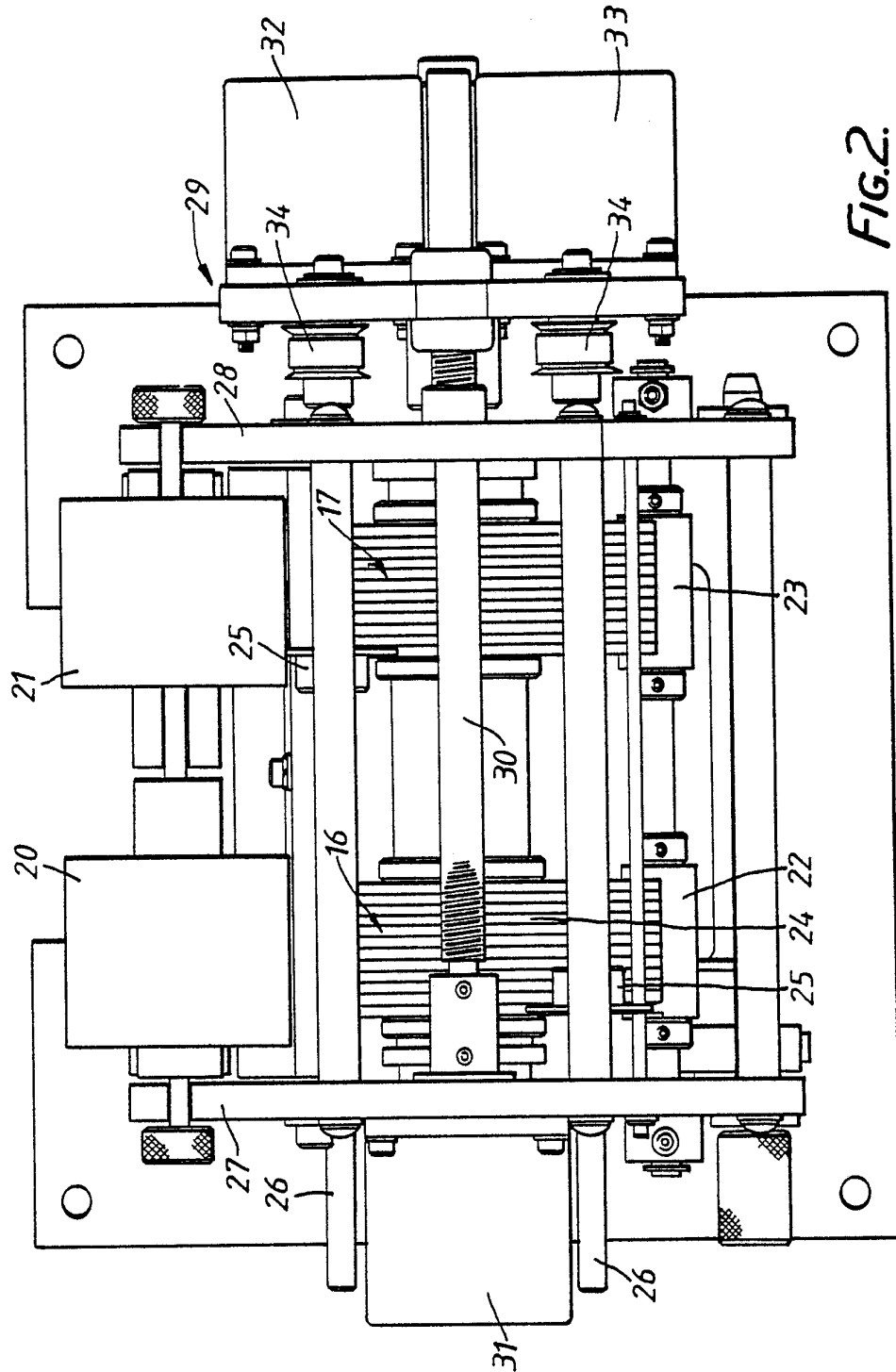


FIG. 2.

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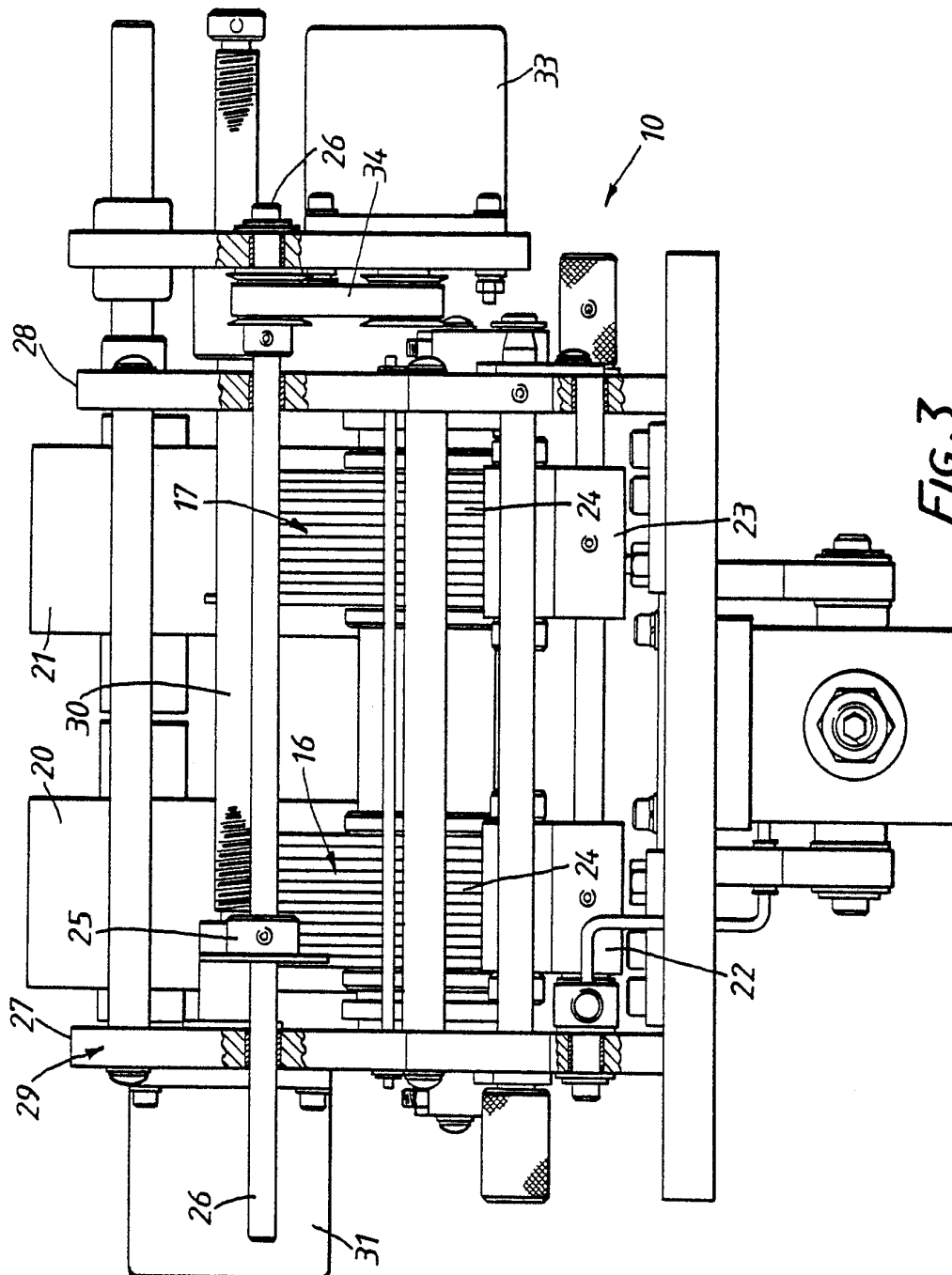


FIG. 3.

4/4

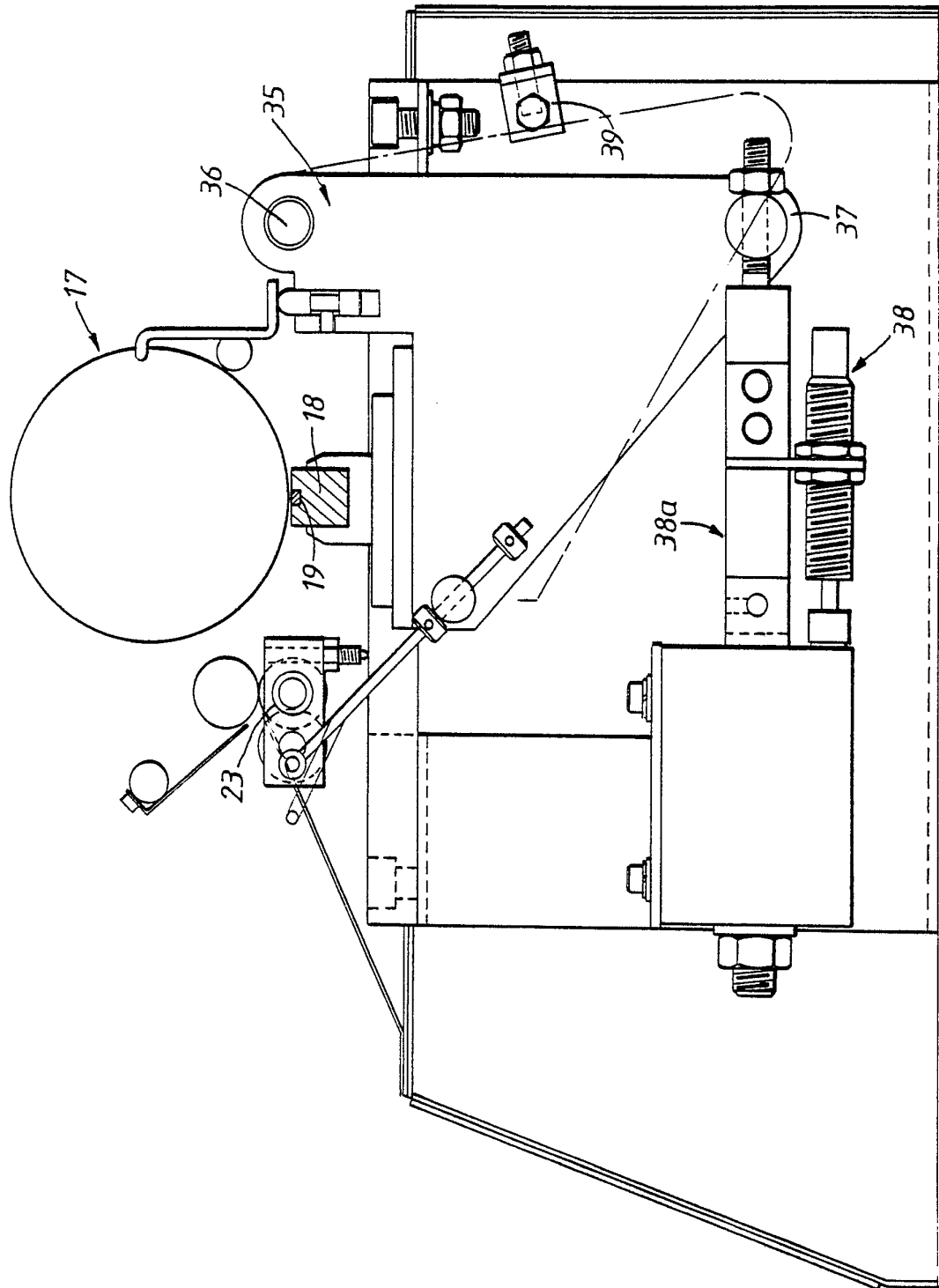
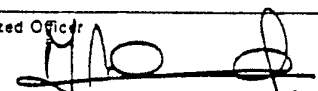


FIG. 4.

INTERNATIONAL SEARCH REPORT

International Application No PCT/GB 87/00090

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) *		
According to International Patent Classification (IPC) or to both National Classification and IPC		
IPC ⁴ : B 41 F 17/10; B 41 K 3/10		
II. FIELDS SEARCHED		
Minimum Documentation Searched ⁷		
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IPC ⁴	B 41 F; B 41 K; H 01 B	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched ⁸		
III. DOCUMENTS CONSIDERED TO BE RELEVANT *		
Category ⁹	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³
X	EP, A1, 0090706 (AEROSPATIALE) 5 October 1983 see the whole document	1-4, 12, 15
A		14
Y		9, 13
	--	
X	DE, A, 3346424 (MESSERSCHMITT) 4 July 1985 see page 6, line 20 - page 9, line 21; figures	1-3
	--	
Y	FR, A, 1492155 (THUARD) 18 August 1967 see page 4, left-hand column, line 27 - page 4, right-hand column, line 9; figure 1	9, 13

* Special categories of cited documents: ¹⁰ "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step "Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art. "A" document member of the same patent family		
IV. CERTIFICATION		
Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report	
24th April 1987	01 JUN 1987	
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ANNEX TO THE INTERNATIONAL SEARCH REPORT ON

INTERNATIONAL APPLICATION NO. PCT/GB 87/00090 (SA 16103)

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP-A- 0090706	05/10/83	FR-A, B 2523901 JP-A- 58177382 US-A- 4485735	30/09/83 18/10/83 04/12/84
DE-A- 3346424	04/07/85	None	
FR-A- 1492155		None	

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