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(54) Computer controlled labelling machine

Steuerung einer Etikettenmaschine durch einen Computer

Commande d'une étiqueteuse par ordinateur

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- **Prospektblatt Etikettenschneidemaschine Gallus U 330**
- **Betriebshandbuch Gallus U 330, Seiten 3 und 5**

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Description

Background of the Invention

1. Field of the Invention

This invention relates to a labelling machine which is controlled by a digital data processing system. More particularly, it relates to such a system in which mechanical camming mechanisms and similar components of a conventional labelling machine are replaced by electronic controls embodied in a digital data processing system connected to control tuning, feed and related operations of a labelling machine of the type which is able to apply labels of various sizes to packaging containers of various sizes.

2. Description of the Prior Art

In conventional machines used to apply different size labels to different size cans, glass bottles, boxes or other packaging containers, timing marks, cams, gears and similar interconnected mechanical elements are employed to assure that the containers and labels are supplied to the machine in an orderly fashion and synchronously with respect to each other so that a single label is uniformly placed in a desired location on the container. Some control functions of labelling machines have also been implemented with digital circuits, including microprocessors.

It is also known in the prior art to replace various mechanical timing devices in complex machines, such as internal combustion engines with digital electronics. Many such timing mechanisms have been replaced in automobile engines through the use of digital data processing circuits embodied in microprocessor integrated circuits, in combination with various electronic and electromechanical sensing circuits.

However, labeling machines are very complex devices with many unique problems. Hitherto, it has not been known in the art to replace the mechanical control systems for main drive shafts used in labeling machines with digital data processing and electrical sensing circuits. Examples of such labeling machines are described, for example, in the following commonly assigned issued patents: U.S. 3,765,991; 4,108,709; 4,181,555; 4,188,843; 4,242,167; 4,336,095.

Summary of the Invention

Accordingly, it is an object of this invention to adapt digital data processing technology to a labelling machine.

It is another object of the invention to provide a digital data processing system in which electrical circuits are utilized to provide inputs representing positions and other information about the various components of a labeling machine and the labels and containers passing through the machine.

GB-A-2 096 795 discloses apparatus which uses a sensor to sense the speed of advance of the web to enable the cutter to be operated when triggered by a signal indicative of the required cutting line on the web reaching the cutter. As compared therewith the present invention, provides apparatus more suited to cutting comparatively small sized labels where the cutter is operable continuously and the speed of feed of the web is controlled digitally in accordance with the positions of the registration marks thereon.

EP-A-0 074 165 is a document effective under Article 54(3) EPC which discloses a web cutting apparatus in which the speed of advance of the web is controlled by a stepping motor to cause alignment of the upper ends with the cutter. However, it does not provide the ready adjustability of the apparatus to different sized sheets as provided by the input means, of the present invention.

US-A-4 293 774, which constitutes the closest prior art document, discloses a wrapping machine in which, in a first embodiment, a D.C. motor is used to advance a web to an independently driven cutter. An analog voltage signal forms a basic speed order signal for control of the basic speed of the motor. To correct for a phase shift that may appear in the web, the apparatus further comprises phase shift correction means including a logic control circuit and a microprocessor. This phase shift correction means receives inputs from sensors which sense web position and cutter operation, as well as an input relating to the length of section to be cut, and produces a voltage which forms a correction order signal for the motor. In a second embodiment the web is advanced by a mechanical drive system geared to the cutter. The gearing includes a differential, the gear ratio of which may be adusted by using a stepper motor to rotate a satellite-carrier crown in the differential. Operation of the stepper motor is controlled by a combined logic control circuit and microprocessor.

GB-A-2 074 533 discloses a wrapping machine in which a web is continuously fed from a roll by a motor. The unrolled web then passes through a buffer loop to a pair of drive rollers driven by an intermittently operable stepper motor. Downstream of the pair of drive rollers is an optical web sensor and a cutter operated by a further stepper motor. On detection of a registration mark on the web by the optical sensor a "start" signal is sent by a control means to the web feed stepper motor, which then starts and operates for a predetermined number of steps. A "stop" signal is then sent to the web feed stepper motor by the control means to stop advancement of the end portion of the web. This "stop" signal acts as a "start" signal for the cutter', stepper motor which then cuts off the end portion of the stationary web.

In the hereinafter described and illustrated embodiment of apparatus in accordance with the present invention, as claimed, the stepping motor used to advance the label in the machine is directed by a program in the digital data processing means to advance the label. The stepper motor is directed by the program to make a pre-

determined number of steps per machine cycle or per container.

The ability of the user to select any desired label length and have the machine operate properly for that length label without any mechanical adjustments to the labelling machine means that changing labels in the labelling machine is reduced from an operation taking 30 minutes or so to about 30 seconds.

The invention should be more readily apparent to those skilled in the art, after review of the following more detailed description of the invention, taken together with the accompanying drawings, in which:

Figure 1 is a block diagram of a computer controlled labelling machine in accordance with the invention.
Figure 2 is a plan view of a portion of the system shown in Figure 1.

Detailed Description of the Invention

Turning now to the drawings, more particularly to Figure 1, there is shown a system 50 in accordance with the invention. The system 50 includes a labeling machine 52 and a digital data processing system 54. The digital data processing system 54 is implemented in this embodiment with a Gould Modicon-P190/484, although it should be understood that the digital data processing system 54 could be implemented with any one of a large number of commercially available control oriented data processing systems which, for example, utilize commercially available microprocessor integrated circuits, such as an Intel 8086, Intel 8088, Motorola 68000, Fairchild 9445, National Semiconductor 16000, or the like, to form the processing unit of such control oriented data processing systems.

The labelling machine 52 includes a cutter 56 having a shaft 58 including a mark 60, which is sensed by an encoder 62, which supplies shaft 58 position and rotation rate data signals as inputs to the digital data processing system 54 on line 63, through an interface 65. The encoder 62 could be replaced with any suitable sensor, such as a magnetic sensing means, with a structure of the shaft 58 serving the function of the mark 60 by perturbing a magnetic field to which the magnetic sensing means is responsive. In practice, the encoder 62 is preferably implemented with a C and A Model HT-11B encoder, obtainable from C and A Products. The interface 65 is preferably implemented with a PCEF Encoder interface Module, which converts the shaft 58 position and rate information to binary coded decimal (BCD) form. The digital data processing system 54 supplies a rotation rate control signal at a rate of, for example, 2,000 pulses per revolution of a label-feed roll 66 on line 64 to a stepping motor 67, which is connected to feed roll 66 by a shaft 69, through a stepping motor control 71. The rotation rate control signal on line 64 is such that the feed roll 66 will supply continuous label sheet 68 to the cutter at a proper rate so that the cutter 56 will separate an individual label 70 from the sheet 68 at the kerf 72 dividing each individual label from its next adjacent neighbors.

Each label 70 includes a positioning mark 74. The positioning mark 74 is sensed by in optical sensor 76 as a means of preventing the sheet 68 from "creeping" with respect to the cutter 56, so that the cutter 56 begins to silt the sheet 68 at other locations then the kerf 72. The optical sensor 76 is connected to the data processing system 54 by line 78. The optical sensor 76 supplies a signal on line 78 when a mark 74 is sensed. The digital data processing system 54 compares the shaft 58 at the time the mark 74 is sensed with the position shaft 58 should have in order for label 70 feed and shaft 58 position to be synchronized for proper label 70 slitting. The optical sensor 76 is preferably implemented with a Banner CVG-1 sensor, obtainable from Banner, Inc., Minneapolis, Minnesota.

When it is desired to replace a roll 80 of the labels 70 with a roll of labels having a different length then that of the labels 70, the length of the new labels in inches is entered into the digital data processing system 54 by means of thumbwheel switches 82 on the front panel 84. An angular position in degrees for shaft 58 when a mark 74 should be sensed by sensor 76 is dialed in with thumbwheel switches 83. A tolerance for the angular position in degrees is also entered by means of thumbwheel switch 85.

Figure 2 shows the data processing system 54 in the system of Figure 1 in more detail.

The system 54 includes a processor 100 and input modules 102, 104, and 106 are connected to supply input to the processor 100. An input/output module 108 is also connected to supply inputs to the processor 100 and supply outputs from the system 54 on line 112 for certain machine control functions conventional in the art and not forming a part of this invention. However, these other control functions are provided using the same data processing system 54 used for the rest of the invention. An output module 110 is connected to receive outputs from the processor 100, to be supplied to the stepper motor control on line 113.

Interface module 65 is connected to the input module 104 of data processing system 54 by line 63. The thumbwheel switches 82, 83, and 85 are respectively connected to the input multiplexer module 102 by lines 114, 116, and 118, inputs from other sensors attached to the labelling machine 52 (see also Figure 1) are supplied on line 120 to the I/O module 108. Outputs for labelling machine 52 control functions are supplied by the I/O module 108 on line 112. Optical sensor 76 supplies the input signal to input module 106 on line 78 when it senses the presence of a registration mark 74.

The system 50 feeds labels 70 from roll 80 on a continuous basis to the cutter 58 in such a manner that the cutter will cut the labels 70 at the kerf 72 and supply the cut labels 70 to a container in a consistent manner. Changing the lable machine 52 to accommodate different size labels is a simple matter of entering the new label length into the digital data processing system 54.

It should further be apparent to those skilled in the art that various changes in form and detail of the invention as shown and described may be made. For example, the mark 74 can be placed on any desired location on the label.

Claims

1. Apparatus for cutting a web into individual sheets comprising drive means (66) for advancing a web through the apparatus, a cutter (56) for cutting the web (68) into individual sheets (70), digital data processing means (54) an optical sensor (76) for sensing registration marks (74) on the web (68) corresponding with the sheets (70) to be cut therefrom, input means (82) connected to the processing means for entering a user selectable interval between registration marks on the web corresponding with the length of sheets to be cut, the processing means being operative to maintain a desired relationship in use of the apparatus between the advancing of registration marks on the web and operation of the cutter, wherein the apparatus is a labelling apparatus with the cutter (56) comprising a master shaft (58) the rotary position of which corresponds with the stage of operation of the cutter and the apparatus comprises a sensor (60, 62) for sensing the position of the master shaft (58) and operatively connected to the processing means (54), and a stepping motor (67) connected between the processing means (54) and the web drive means (66) solely for driving the web drive means (66) to cause advancement of the web, said processing means (54) being responsive to inputs from the master shaft position sensor (60, 62), the registration mark optical sensor (76) and the input means (82) to provide input pulses to the stepping motor (67) to provide sole control of the speed of the drive means to maintain a desired alignment between the ends of the label sheets (70) and the cutter at the time of operation of the cutter as determined by the position of the master shaft.

2. Apparatus according to claim 1, characterised in that said data processing means is connected to an input means (83) for entering the required position of the master shaft when the optical sensor (76) is to sense a registration mark (74).

Patentansprüche

1. Vorrichtung zum Schneiden einer Bahn in einzelne Flächenkörper, umfassend eine Antriebseinrichtung (66), um eine Bahn durch die Vorrichtung laufen zu lassen, eine Schneideinrichtung (56) zum Schneiden der Bahn (68) in einzelne Flächenkörper (70), eine digitale Verarbeitungseinrichtung (54), einen optischen Sensor (76) zum Abtasten von Kennzeichnungsmarken (74) auf der Bahn (68), die den davon abzuschneidenden Flächenkörpern (70) entsprechen, eine Eingabeeinrichtung (82), die an die Verarbeitungseinrichtung angeschlossen ist, um ein vom Benutzer wählbares Intervall zwischen Kennzeichnungsmarken auf der Bahn einzugeben, die der zu schneidenden Länge der Flächenkörper entsprechen, wobei die Verarbeitungseinrichtung so arbeitet, daß sie im Betrieb der Vorrichtung eine gewünschte Relation zwischen dem Vorschub der Kennzeichnungsmarken auf der Bahn und dem Betrieb der Schneideinrichtung beibehält, wobei die Vorrichtung eine Etikettiervorrichtung ist, wobei die Schneideinrichtung (56) eine Hauptwelle (58) aufweist, deren Drehstellung dem Betriebsstadium der Schneideinrichtung entspricht, und wobei die Vorrichtung einen Sensor (60, 62), der die Position der Hauptwelle (58) abtastet und der betriebsmäßig mit der Verarbeitungseinrichtung (54) verbunden ist, und einen Schrittmotor (67) aufweist, der nur zum Antreiben der Bahn-Antriebseinrichtung (66) vorgesehen ist, um den Vorschub der Bahn zu bewirken, wobei die Verarbeitungseinrichtung (54) auf die Eingangssignale von dem Sensor (60, 62) für die Position der Hauptwelle, von dem optischen Sensor (76) für Kennzeichnungsmarken und von der Eingabeeinrichtung (82) anspricht, um dem Schrittmotor (67) Eingangsimpulse zu liefern, um allein für die Steuerung der Geschwindigkeit der Antriebseinrichtung zu sorgen, um eine gewünschte Ausrichtung zwischen den Enden der Etikettenflächenkörper (70) und der Schneideinrichtung zum Zeitpunkt der Betätigung der Schneideinrichtung beizubehalten, die durch die Position der Hauptwelle bestimmt ist.

2. Vorrichtung nach Anspruch 1,
dadurch gekennzeichnet,
daß die Datenverarbeitungseinrichtung an eine Eingabeeinrichtung (83) angeschlossen ist, um die erforderliche Position der Hauptwelle einzugeben, wenn der optische Sensor (76) eine Kennzeichnungsmarke (74) abtasten soll.

Revendications

1. Appareil pour découper une bande en feuilles individuelles comprenant un moyen d'entraînement (66) pour faire avancer une bande à travers l'appareil, un couteau (56) pour découper la bande (68) en feuilles individuelles (70), un moyen (54) de traitement de données numériques, un détecteur optique (76) pour détecter des repères d'alignement (74) sur la bande (68) correspondant aux feuilles (70) à découper de celle-ci, un moyen d'entrée (82) relié au moyen de traitement pour introduire un intervalle que peut choisir l'utilisateur entre les repères d'alignement sur la bande correspondant à la longueur des feuilles à découper, le moyen de traitement servant à maintenir pendant le fonction-

nement de l'appareil des relations voulues entre la progression des repères d'alignement sur la bande et le fonctionement du couteau, l'appareil étant un appareil d'étiquetage où le couteau (56) comporte un arbre moteur (58) dont la position en rotation correspond au stade de fonctionnement du couteau et l'appareil comporte un détecteur (60, 62) pour détecter la position de l'arbre moteur (58) et coopérant avec le moyen de traitement (54), et un moteur pas-à-pas (67) monté entre le moyen de traitement (54) et le moyen (66) d'entraînement de bande uniquement pour entrainer le moyen (66) d'entraînement de bande pour provoquer l'avance de la bande, ledit moyen de traitement (54) réagissant aux données d'entrée provenant du détecteur (60, 62) de position de l'arbre moteur, du détecteur optique (76) de repères d'alignement et du moyen d'entrée (82) pour fournir au moteur pas-à-pas (67) des impulsions d'entrée pour réaliser la seule commande de la vitesse du moyen d'entraînement afin de maintenir un alignement voulu entre les extrémités des feuilles d'étiquettes (70) et le couteau à l'instant du fonctionnement du couteau déterminé par la position de l'arbre moteur.

2. Appareil selon la revendication 1, caractérisé en ce que le moyen de traitement de données est relié à un moyen d'entrée (83) pour introduire la position requise de l'arbre moteur quand le détecteur optique (76) doit détecter un repère d'alignement (74).

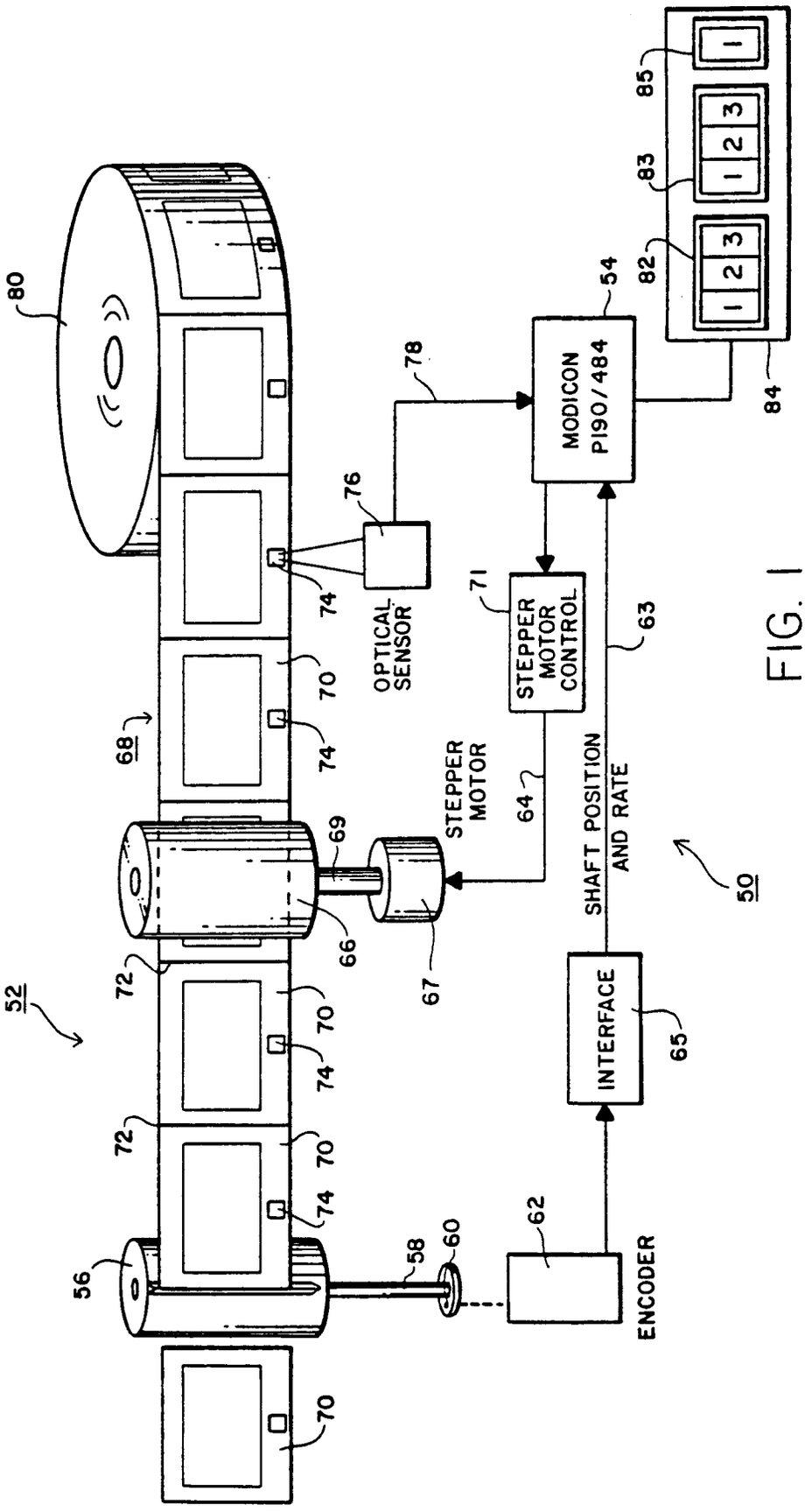
80
52
56
58
60
62
ENCODER
INTERFACE
65
63
SHAFT POSITION AND RATE
50
MODICON P190/484
54
78
82
83
85
84
1 2 3
1 2 3
1
STEPPER MOTOR CONTROL
71
OPTICAL SENSOR
76
74
70
68
STEPPER MOTOR
64
69
66
67
72

FIG. 1

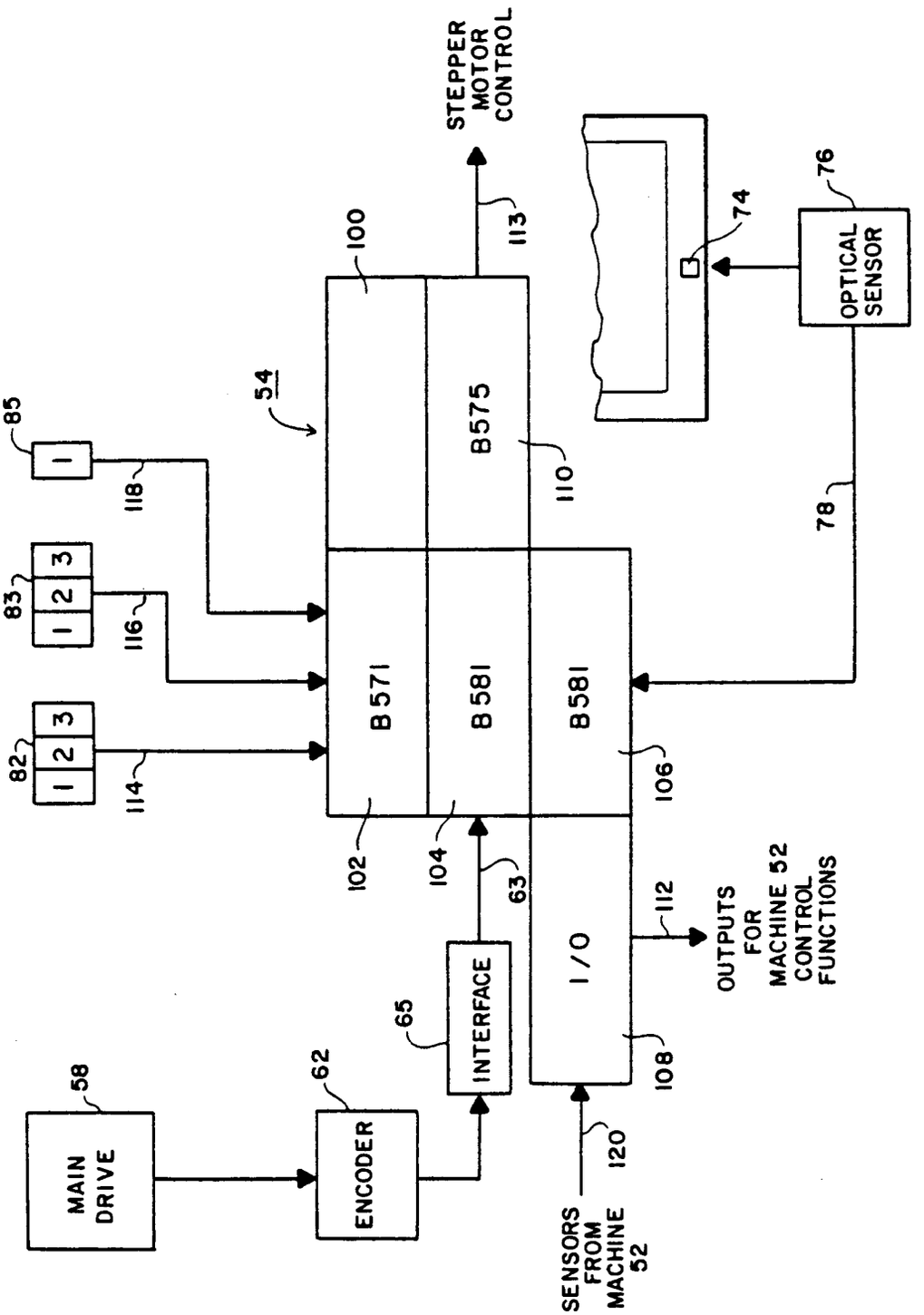
STEPPER MOTOR CONTROL
OPTICAL SENSOR
B575
B571
B581
B581
I/O
INTERFACE
ENCODER
MAIN DRIVE
SENSORS FROM MACHINE 52
OUTPUTS FOR MACHINE 52 CONTROL FUNCTIONS
54
58
62
63
65
74
76
78
82
83
85
100
102
104
106
108
110
112
113
114
116
118
120

FIG. 2