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(54) Cutting mechanism.

(57) An apparatus for parallel cutting of the laminated edge of a previously laminated article. The apparatus includes a cutting blade oriented substantially perpendicularly to the path of the article as it passes under that blade. It also comprises drive rollers for advancing that article to and beyond that blade. The improvement comprises three elements, in combination. The first is a plurality of sensors for determining the extent of deviation of the leading edge of the article from parallelism with the cutting blade. The second is an electronic feedback circuit communicative with the sensors. The electronic feedback circuit determines the extent of rotation of the cutting blade necessary so that the blade will be oriented parallel to the leading edge of the article. Finally, blade positioning elements are provided, which are communicative with the electronic feedback means. The blade positioning means rotate the cutting blade to a position where that blade is parallel to the leading edge of the article.

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CUTTING MECHANISM

The present invention relates generally to a laminated sheet trimmer. More specifically, the invention relates to a trimming machine or apparatus having a pivotable cutting blade to ensure that the edges of the laminate are cut parallel with the leading or trailing edge of the laminated article.

The use of laminating machines to apply laminate material to such items as menus, place mats, and the like for their protection and increased durability has been common practice for many years. Generally, the discrete articles are laminated to a single, continuous web of the polymeric laminate sheet material. In such instances, the borders or margins of adjacent or successive articles are overlapped, forming a continuous web of laminated articles. For example, the trailing edge of an opaque first article is separated from the leading edge of an opaque second article by the transparent laminate sheet material. Cutting and trimming machines using cutting blades are used to slit the laminate sheet material and separate the articles.

Some prior art machines use the opacity of the articles and the transparency of the laminate sheet material to trigger the cutting operation. A light source and a light sensing device are placed on opposite sides of the continuous web of laminated articles. Preferably, the light source and light sensing device are placed at a location proximate the cutting blade.

When the opaque articles are passing between the light source and light sensing device, the light beam is interrupted. When the transparent laminate material passes between the light source and the light sensing device, the light beam is received by the sensing device. This characteristic is used by electronic control devices to trigger the cutting action of the blade at an appropriate time.

It is aesthetically preferable that the edge of the transparent laminate material is cut parallel to the leading or trailing edge of the underlying article. It is thus important that the web being fed to the blade is perpendicular to that blade. The path of the web can occasionally be offset from this preferred path, however. As a result, standard blades will not cut the laminate material parallel to the leading edge of the article. Rather, that blade will cut the web at a slight, acute angle to the leading or trailing edge.

Generally, the prior art apparatus which cuts the web into discrete articles includes provisions for correcting such web offset conditions. An example of such correcting means is metal guides upstream of the cutting blade. These guides are spaced apart from each other at a distance which corresponds to the width of the web. Thus, they abut against the edges of the web as the web is fed towards the blade. The guides can be adjusted several degrees, to thereby force those edges and the entire web in the proper direction.

This arrangement suffers from several deficiencies. First, the articles must be continually monitored by an operator as they are being cut. Second, the operator will typically not discern a problem until many of the articles have been improperly cut, resulting in undesirable waste. Third, this arrangement requires stopping the web cutter, resulting in lost machine time and decreased productivity. Fourth, the metal guides must be manually adjusted.

The invention is an apparatus for parallel cutting of the laminated edge of a previously laminated article. The apparatus includes a cutting blade oriented substantially perpendicularly to the path of the article as it passes under that blade. It also comprises means for advancing that article to and beyond that blade.

The improvement comprises three elements, in combination. The first is a plurality of sensing means for determining the extent of deviation of the leading edge of the article from parallelism with the cutting blade.

The second is electronic feedback means communicative with the sensing means. The electronic feedback means determine the extent of rotation of the cutting blade necessary so that the blade will be reoriented into parallelism with the leading edge of the article.

Finally, blade positioning means are provided, which are communicative with the electronic feedback means. The blade positioning means rotate the cutting blade to a position where that blade is parallel to the leading edge of the article.

Figure 1 is perspective view of an apparatus in accordance with the preferred embodiment of the invention;

Figure 2 is a top view of the invention of Figure 1, and showing an article being transported through the apparatus;

Figure 3 is a side perspective view of the apparatus of Figure 1, and showing the step motor for the cutting blade;

Figure 4 is a system diagram of a preferred embodiment of the invention, and particularly showing the electronic feedback means and a portion of the blade positioning means.

Referring now to the drawings, and particularly to Figure 1, the apparatus in accordance with the

invention is labeled with the reference numeral 12. This apparatus provides for parallel cutting of the laminated edge of a previously laminated article in a manner to be described.

The apparatus includes a cutting blade 14 oriented substantially perpendicularly to the path of the laminated article 16a (Figure 2) as it passes under that blade. As may be seen, the article 16a is one of many articles 16b, 16c, and so forth, that have been laminated together to form a single, continuous web 18 of the polymeric laminate sheet material.

Referring again to Figure 1, the apparatus also comprises means for advancing that article 16a and that web 18 to and beyond that blade 14. Here, that means includes a pair of drive rollers 20 and 22 upstream of the cutting blade 14, and an idler roller 24 downstream of that blade 14. The drive rollers 20 and 22 and the idler roller 24 are all indirectly driven by a step motor, as will be described later.

In the present embodiment, the step motor driving rollers 20, 22, and 24 is a type 34T2BEHD, model no. 2434, and is manufactured by Bodine Electric Company. This motor, without accompanying motor drives that are provided with this embodiment, is geared for 200 steps per revolution.

The improvement comprises three elements, in combination. The first is a plurality of sensing means for determining the extent of deviation of the leading edge of the article from parallelism with the cutting blade. Particularly, these sensing means comprise a pair of infrared light beams 26 and 28 and a pair of corresponding light detectors 30 and 32.

In the preferred embodiment, each of the infrared light beams 26 and 28 are secured within a frame 34, and are disposed on one side of the plane of the web 18. A line between the centers of those beams 26 and 28 is parallel to the cutting edge 36 of the cutting blade 14, when that blade is in a "zero" or "reference" position. Each of the sensors 30 and 32 are secured to another portion of the frame 34. The part of the frame to which the sensors 30 and 32 are secured is separated by the plane of the web 18 from the part of the frame to which the light beams 26 and 28 are secured.

As indicated above, light from these light beams 26 and 28 will be detected by sensors 30 and 32 when the transparent laminate border material 54 that connects the articles (e.g., 16a and 16b) is disposed directly between the beams and sensors. In contrast, when the opaque article 16a passes between the beam and the sensors, the light beam is interrupted, i.e., no light reaches the sensor.

When the leading edge 38 of article 16a is perfectly parallel with the cutting edge 36 of the blade 14 in the "zero" or "reference" position, the leading edge 38 will interrupt the beam of light from beam 26 to sensor 30 at precisely the same time as it interrupts the beam of light from beam 28 to sensor 32. However, in the event that the leading edge 38 of article 16a is somewhat offset from perfect parallelism with the cutting edge one of the light beams will be interrupted sooner than the other. It is this difference in the time of light beam interruption that triggers the mechanisms rotating the cutting blade 14.

The greater the difference in the time of light beam interruption, the greater the offset of the leading edge 38 from parallelism with the cutting edge 36 of the blade 14. The extent of this offset is measured by the step motor 40, which was described above.

Referring now to Figure 2, this Figure depicts an article 16a that is offset from perfect parallelism with the blade 14 in the "zero" position. The extent of offset depicted in this Figure is exaggerated for purposes of this description. As the drive rollers 20 and 22 move the web towards the blade 14, the beam of light provided by infrared light beam 28 to light detector 32 is interrupted by the leading edge 38 of article 16a. The light beam from infrared light beam 26 to light detector 30 is not interrupted, however, until the drive rollers 20 and 22 move the article 16a somewhat further ahead. As the step motor 40 revolves through one step, article 16a is moved forward 0.010" (ten-thousandths of an inch) in the present embodiment.

A signal from this step motor is sent to the second component of the system, the electronic feedback means, for each "step" moved by the motor 40 in the time interval between the interruption of these respective beams.

The second element of the present invention is the electronic feedback means communicative with the sensing means and the step motor. The electronic feedback means determine the extent of rotation of the cutting blade 14 necessary so that the blade is oriented parallel to the leading edge 38 of the article 16a prior to cutting the laminate material.

The electronic feedback means are shown in Figure 4 of the drawings. A 110-volt, alternating current unswitched power source 42 is provided to power controller 44. A transformer 43 provides stepped-down, direct-current power for step motor 40 and a second, smaller step motor 46. This smaller step motor 46, which will be fully described later, effects movement of the cutting blade 14. Motor 46 is also manufactured by Bodine, as model no. 2431.

As is known in the art, step motors require certain voltages and switching schemes in order to create the appropriate stepping. For this purpose, roller step motor 40 and blade step motor 46 are provided with a roller motor drive 48 and a blade motor drive 50, respectively. Roller motor drive 48 also provides gearing

effecting a 2:1 reduction, which effectively renders motor 40 a 400 step per revolution motor.

The roller motor drive 48 and the blade motor drive 50 both accept a "step" signal. The blade motor drive 50 also accepts a "direction" signal. The "step" signal from the controller signals each motor, and particularly the blade motor, to move a designated number of steps. The "direction" signal from the controller signals the movement of the blade motor, and ultimately the blade, in the desired clockwise or counterclockwise direction.

The display/keyboard 52 provides a means for user interface. It enables the user to turn the apparatus on and off, adjust its speed, control the length of the articles being cut, and establish the size of the laminate border, if any, surrounding the article.

The interruption and reception of light from infrared light beams (LED) 26 and 28 and their respective detectors (RCVR.) 30 and 32 is detected and determined by the controller 44. The detectors are phototransistors. As indicated above, these detectors 30 and 32: (1) detect the interruption of light from the infrared light beams 26 and 28 when an article (16a, 16b, or 16c) is disposed between the detectors and the light beams; (2) detect light from the infrared light beams 26 and 28 when transparent laminate border material 54 is disposed between the detectors and the light beams.

Typically, the apparatus 12 is used with articles, such as sheets, of various widths. The apparatus can best ensure accurate cutting by placing the light beams and their associated detectors as far away from each other as possible. For example, with a 8 1/2" wide sheet, the light beams and detectors are best placed about 7" apart. With a 14" wide sheet, however, the light beams and detectors are best placed about 12"-13" apart.

Accordingly, in an alternate embodiment of the invention, at least one of the light beams and one of the light detectors is movable. In this way, sheets of these and other varied widths can best be accommodated. For example, infrared light beam or 28 and its corresponding light detector or "eye" 32 may be movable into any one of three positions. The controller 44 may include a manually-operable "eye" position switch 56 for moving beam 28 and "eye" 32 to any one of these positions.

In yet another embodiment, the apparatus 12 would include several fixed light beams and their corresponding "eyes." Each beam/detector or beam/eye set would be along a line parallel to the blade 14 in its "zero" position. The controller 44 would determine the appropriate pair of beam/eye sets for a given article width. Particularly, components that are communicative with the controller 44 would sense the width of the article 16 passing through apparatus 12 and select the two light beam/eye sets most suitable for that width. As may be seen in both Figures 1 and 4, a blade home sensor 58 is provided. The blade home sensor 58 is adjacent the cutting blade 14 and determines its position. Particularly, the blade home sensor 58 in combination with the controller 44 determine the angular position of the blade at any given time. Referring now to Figure 4, the controller includes a bale switch 60. This switch 60 is coupled to a bale arm (not shown). The bale arm and switch regulate the relative speeds of the laminating apparatus (not shown) and the cutting apparatus 12 that it feeds.

During the cutting cycle, i.e., when the blade 14 is being raised or lowered, the web 18 is not being moved. Accordingly, drive rollers 20 and 22 are stationary during the cutting cycle. As may be seen in Figure 1, a pair of air-actuated cylinders 62 and 64 are provided for lowering and raising the blade 14 at the appropriate intervals.

A cylinder bottom switch 66 and a cylinder top switch 68 are provided to indicate to the controller 44 the positions of the cylinders. The cylinder bottom switch 66 provides a signal to the controller 44 the instant a cylinder 62 or 64 has reached the bottom of its travel. This instant corresponds to the blade 14 reaching its lowermost position. The switches may be located at any desirable position, such as on the cylinder.

Immediately upon receipt of this signal from the cylinder bottom switch 66, the controller 44 powers air cylinders 62 and 64 to move the blade upward into its normal, uppermost position. Upon attaining this uppermost position, cylinder top switch 68 sends its own signal to controller 44. Upon receipt of this signal, the controller 44 restarts the drive rollers 20 and 22.

The output signals of a microprocessor 70 (no. COP 402N, manufactured by National Semiconductor) control the motors and other components of the apparatus 12. The microprocessor 70 itself is controlled by a software program entered into an EPROM 72, or electronically programmable read-only memory. The software program which is entered into this EPROM is attached as an integral part of this specification, appearing immediately before the claims.

The controller 44 also includes a sensitivity switch 74. This switch 74 is adjustable, and regulates the amount of light that must be sensed by detectors 30 and 32 corresponding to the "light received" condition. This switch 74 accounts for articles 16 that may be very thin and of relatively low opacity. It also accounts for varying thicknesses and transparencies of the transparent laminate border material 54.

Finally, blade positioning means are provided as the third component of the present apparatus. The blade positioning means are communicative with the electronic feedback means. Blade positioning means rotate the cutting blade 14 to a position where that blade is parallel to the leading edge of the article.

The blade positioning means can best be viewed in Figure 3. Included are blade motor 46 and blade motor drive 50. As indicated above, blade motor 46 and its associated motor drive 50 provide 200 discrete steps per motor revolution. The output shaft of motor 46 is a ball screw 76 or threaded drive shaft connected at its end to a rotatable portion 78 of frame 34. This rotatable portion 78 pivots about a pivot point comprising, at the top, a brass bushing 80 held in place with a set screw 82 (Figure 1). At the bottom, the pivot point is defined shaft and thrust bearing assembly. Particularly, a 5/8" shaft 84 is reduced at its end to 3/8" in diameter, and this reduced end is rotatable in an Andrews W-3/8" ball and roller bearing 86.

In the present embodiment, as indicated above, one step of the motor 40 moves both rollers 20 and 22 and article 16a forward 0.010". It will be obvious to the skilled artisan that these figures will vary according to the diameter of the rollers used. It will also be obvious to the skilled artisan that the time difference for offset article 16a to break light beam 26 and light beam 28 will depend on the spacing of the light beams from each other.

It will also be understood to the skilled artisan that this apparatus 12 can be used for cutting the article 16a at either its leading edge 38 or its trailing edge 88.

The apparatus 12 does not assume that the leading 38 and trailing edges 88 are offset the same number of degrees. Accordingly, the apparatus 12 will calculate, in the manner described above, two numbers that are stored in the memory of the microprocessor. The first is the offset angle of the leading edge 38, and the second is the offset angle of the trailing edge 88. The computed angle is strictly a function of the number of steps that the motor moves forward between the time the first and second light beams are interrupted, and the distance between the two light beams.

These two angles can be translated into the required motion of the blade 14. In essence, the blade 14 must be turned by blade motor 46 enough to "cancel" the angle of edges 38 or 88 to the blade 14. The extent and direction of rotation of the threaded drive shaft 76 is determined by the pitch of its threads, the current angle of the blade 14, as read by blade home sensor 58, and the offset of the leading 38 or trailing edges 88 with the blade 14.

The apparatus 12 in accordance with this embodiment can easily handle the cuts on the leading and trailing edges of forty articles or more per minute. Thus, eighty adjustments of the angle of cutting blade 14 per minute can be easily handled.

Attached hereto is the software program necessary for incorporation with the EPROM 72 shown in Figure 4.

```
2500 A.D. COPS 400 CROSS ASSEMBLER  -  VERSION 3.01b
----------------------------------------------------

        INPUT  FILENAME :  BLADE.SRC
        OUTPUT FILENAME :  BLADE.OBJ


 1                      .TITLE ANGLING BLADE CONTROL PROGRAM— VERSION 1.0
 2                      ;*****************************************************************
 3                      ;* Program to control the infamous "Angling Blade"               *
 4                      ;*                                                               *
 5                      ;* Designed to work with the "Accu II New" Main Controller       *
 6                      ;*                                                               *
 7                      ;* Written October 24, 1988 for D&K Custom Machine Design Inc.   *
 8                      ;* by M. Flasza Cecomp Electronic Design, Inc.                   *
 9                      ;*                                                               *
10                      ;* All Rights Reserved                                           *
11                      ;*                                                               *
12                      ;*****************************************************************
13                      ;
14                             .LIST ON
15                             .CHIP   420
16  0000                       .ORG    0000H
17  0000  00                          CLRA            ;FIRST INST. MUST BE CLRA
18  0001  33 5F                       OGI     15      ;SET G PORT AS INPUT
19  0003  80                          JSRP    CLRAM   ;CLEAR ALL RAM ON POWER-UP
20  0004  33 64                       LEI     4       ;ENABLE L OUTPUTS
21  0006  68 A7                       JSR     SQBLD   ;SQUARE BLADE
22  0008  33 11                HOLD:  SKGBZ   1       ;WAIT FOR 1ST PULSE
23  000A  C8                          JP      HOLD
24  000B  44                          NOP             ;DELAY 16 uS
25  000C  44                          NOP
26  000D  33 28                       ININ            ;READ IN (eye) INPUTS
27  000F  12                          XABR            ;CLEAR A3, A2
28  0010  12                          XABR
29  0011  23 99                       XAD     1,9     ;SAVE INITIAL EYE STATUS
30  0013  33 11                WAIT:  SKGBZ   1       ;WAIT FOR STR TO RESET
31  0015  D7                          JP      START
32  0016  D3                          JP      WAIT
33  0017  33 11                START: SKGBZ   1       ;TEST STR, SKIP IF LOW
34  0019  D7                          JP      START
35  001A  44                   GO:    NOP             ;DELAY 16 uS
36  001B  44                          NOP
37  001C  33 28                       ININ            ;READ IN (eye) INPUTS
38  001E  12                          XABR            ;CLEAR A3, A2
39  001F  12                          XABR
40  0020  33 3C                       CAMQ            ;SERVICE EYE INDICATOR LITES
41  0022  18                          LBI     1,9     ;POINT TO "LAST EYE STATUS"
42  0023  21                          SKE             ;TEST FOR EYE CHANGE
43  0024  69 40                EYECH: JSR EYEDEC      ;EYE CHANGED—GO TO DECODE ROUTINE
44  0026  38                          LBI     3,9     ;POINT TO FLAG BOX 1
45  0027  81                          SKMBZ   0       ;SKIP IF RCC NOT ENABLED
46  0028  98                          JSRP    INCRCC  ;INCREMENT REAR CUT COUNTER
47  0029  38                          LBI     3,9     ;RE-POINT TO FLAG BOX 1
48  002A  83                          SKMBZ   2       ;SKIP IF FCC NOT ENABLED
```

ANGLING BLADE CONTROL PROGRAM-- VERSION 1.0

```
49  002B  89                JSRP    INCFCC  ;INCREMENT FRONT CUT COUNTER
50  002C  39        CREADY: LBI     3,10    ;POINT TO FLAG BOX 2
51  002D  01                SKMBZ   0       ;SKIP IF RCC NOT READY
52  002E  F4                JP      RCCR    ;REAR CUT COUNTER IS READY
53  002F  11        RCCNR:  SKMBZ   1       ;SKIP IF FCC NOT READY
54  0030  69 6F             JSR     MFC     ;MOVE TO FRONT CUT POSITION
55  0032  60 17             JMP     START   ;GO BACK TO START
56  0034  11        RCCR:   SKMBZ   1       ;SKIP IF FCC NOT READY
57  0035  FC                JP      FCCR
58  0036  44        FCCNR:  NOP
59  0037  44                NOP
60  0038  44                NOP             ;What goes here ??
61  0039  44                NOP
62  003A  60 17             JMP     START   ;GO BACK TO START
63  003C  69 C9     FCCR:   JSR     MRC     ;MOVE TO REAR CUT POSITION
64  003E  60 17             JMP     START   ;GO BACK TO START
65                      ;
66                      ;*** END OF MAIN PROGRAM ***
67                      ;
68                      .PAGE
```

ANGLING BLADE CONTROL PROGRAM-- VERSION 1.0

```
                        ; Place following subroutines on Page Two
                              .ORG    0080H
                              ;
                              ;SUBROUTINE CLRAM
                              ;Subroutine to clear all RAM on power-up
                              ;
0080  3E                CLRAM: LBI     3,15
0081  00                CLR:   CLRA
0082  07                       XDS
0083  81                       JP      CLR.
0084  12                       XABR
0085  5F                       AISC    15
0086  48                       RET
0087  12                       XABR
0088  81                       JP      CLR
                              ;
                              ;SUBROUTINES INCFCC, INCRCC
                              ;Subroutines to increment a two-byte binary RAM counter
                              ;
0089  2A                INCFCC: LBI     2,11    ;POINT TO LOW BYTE FCC
008A  05                        LD              ;BRING LOW BYTE TO A
008B  51                        AISC    1       ;INCREMENT, SKIP IF CARRY
008C  92                        JP      NOCARY  ;NO CARRY-- JUMP AHEAD
008D  04                        XIS             ;PUT 0 IN LSB, POINT TO MSB
008E  05                        LD              ;BRING MSB TO A
008F  51                        AISC    1       ;INCREMENT MSB
0090  92                        JP      NOCARY
0091  94                        JP      OVFL    ;COUNTER OVERFLOWED
0092  06                NOCARY: X               ;PUT INCR. BYTE BACK
0093  48                        RET             ;RETURN
0094  06                OVFL:   X               ;PUT 0 BACK IN MSB
0095  38                        LBI     3,9     ;POINT TO FLAG BOX 1
0096  42                        RMB     2       ;DISABLE FCC
0097  48                        RET             ;RETURN
0098  3A                INCRCC: LBI     3,11    ;POINT TO LOW BYTE RCC
0099  05                        LD
009A  51                        AISC    1
009B  A1                        JP      NCARY
009C  04                        XIS
009D  05                        LD
009E  51                        AISC    1
009F  A1                        JP      NCARY
00A0  A3                        JP      OOVFL
00A1  06                NCARY:  X
00A2  48                        RET
00A3  06                OOVFL:  X
00A4  38                        LBI     3,9
00A5  4C                        RMB     8       ;DISABLE RCC
00A6  48                        RET
                              ;
                              ;SUBROUTINE SQBLD
                              ;Subroutine to square blade by monitoring Blade Square
                              ;Sensor (BSS) and jogging blade accordingly. Also stores
                              ;nominal value in Blade Position Counter (RAM(0,9) and
                              ;(0,10)) when done.
                              ;
00A7  33 01             SQBLD:  SKGBZ   0       ;SKIP IF BSS=0 (blade too far CCW)
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                ANGLING BLADE CONTROL PROGRAM-- VERSION 1.0

 126  00A9  BE                    JP      MCCW    ;BSS=1 (blade too far CW)
 127  00AA  33 88                 LBI     0,8     ;PRELOAD B WITH "8"
 128  00AC  33 3E                 OBD             ;SET DIR BIT TO 1
 129  00AE  68 D6          LOOP:  JSR     DLY2MS  ;DELAY 2mS
 130  00B0  33 01                 SKGBZ   0       ;SKIP IF BSS=0
 131  00B2  D2                    JP      RSBPC   ;BLADE SQUARED:RESET POSITION COUNTER
 132  00B3  0B                    LBI     0,12    ;PRELOAD B WITH "12"
 133  00B4  33 3E                 OBD             ;TURN ON MOTOR PULSE,LEAVE DIR=1
 134  00B6  44                    NOP             ;DELAY 12uS
 135  00B7  44                    NOP
 136  00B8  44                    NOP
 137  00B9  33 88                 LBI     0,8     ;PRELOAD B WITH "8"
 138  00BB  33 3E                 OBD             ;TOTAL PUSE WIDTH=20uS
 139  00BD  AE                    JP      LOOP
 140  00BE  0F             MCCW:  LBI     0,8     ;PRELOAD B WITH "8"
 141  00BF  33 3E                 OBD             ;SET DIR BIT TO 0
 142  00C1  68 D6          LOOP1: JSR     DLY2MS  ;DELAY 2mS
 143  00C3  33 01                 SKGBZ   0       ;SKIP IF BSS=0
 144  00C5  C7                    JP      NEXT
 145  00C6  D2                    JP      RSBPC
 146  00C7  33 84          NEXT:  LBI     0,4     ;PRELOAD B WITH "4"
 147  00C9  33 3E                 OBD             ;TURN ON STROBE,LEAVE DIR=0
 148  00CB  44                    NOP
 149  00CC  44                    NOP             ;DELAY 12uS
 150  00CD  44                    NOP
 151  00CE  0F                    LBI     0,8     ;PRELOAD B WITH "8"
 152  00CF  33 3E                 OBD             ;TURN OFF STROBE
 153  00D1  C1                    JP      LOOP1
 154  00D2  08             RSBPC: LBI     0,9     ;POINT TO LOW BYTE BPC
 155  00D3  70                    STII    0       ;STORE 0 @ LSB
 156  00D4  70                    STII    0       ;STORE 0 @ MSB
 157  00D5  48                    RET
 158                       ;
 159                       ;SUBROUTINE DLY2MS
 160                       ;Subroutine to generate approx. 1mS delay
 161                       ;
 162  00D6  3F             DLY2MS: LBI    3,8     ;POINT TO TIMER COUNTER
 163  00D7  74                    STII    4       ;PRESET TIMER COUNTER
 164  00D8  00                    CLRA
 165  00D9  51             LOOPI: AISC    1       ;DELAY 2X4X16=128uS
 166  00DA  D9                    JP      LOOPI
 167  00DB  23 B8                 XAD     3,8     ;PUT 0 IN RAM, BRING TC TO A
 168  00DD  51                    AISC    1       ;INCREMENT TC
 169  00DE  E8                    JP      NEXTI
 170  00DF  48                    RET
 171  00E0  23 B0          NEXTI: XAD     3,8     ;PUT INCR. TC BACK IN RAM
 172  00E2  D9                    JP      LOOPI
 173                       .PAGE
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ANGLING BLADE CONTROL PROGRAM-- VERSION 1.0

```
174                          ;SUBROUTINE EYEDEC
175                          ;Decodes all 16 possible eye change patterns and jumps
176                          ;to necessary decode routine. On entry, A has "Latest
177                          ;Eye Status" in A1 and A0, B in A2 and A3. B points to
178                          ;"Last Eye Status". Subroutine then sets or resets necessary
179                          ;Control Flags in two RAM flag boxes.
180                          ;
181                          ;First part of subroutine is address lookup table for JID
182                          ;
183  0100                    .ORG   0100H
184  0100  6D                .BYTE  6DH           ;ADDRESS OF CASE 0 (No Change)
185  0101  4E                .BYTE  4EH           ;ADDRESS OF CASE 4
186  0102  4E                .BYTE  4EH           ;ADDRESS OF CASE 8 (Same as Case 4)
187  0103  60                .BYTE  60H           ;ADDRESS OF CASE 12
188  0110                    .ORG   0110H
189  0110  41                .BYTE  41H           ;ADDRESS OF CASE 1
190  0111  6D                .BYTE  6DH           ;ADDRESS OF CASE 5 (No Change)
191  0112  5C                .BYTE  5CH           ;ADDRESS OF CASE 9
192  0113  65                .BYTE  65H           ;ADDRESS OF CASE 13
193  0120                    .ORG   0120H
194  0120  45                .BYTE  45H           ;ADDRESS OF CASE 2
195  0121  53                .BYTE  53H           ;ADDRESS OF CASE 6
196  0122  6D                .BYTE  6DH           ;ADDRESS OF CASE 10 (No Change)
197  0123  69                .BYTE  69H           ;ADDRESS OF CASE 14
198  0130                    .ORG   0130H
199  0130  49                .BYTE  49H           ;ADDRESS OF CASE 3
200  0131  57                .BYTE  57H           ;ADDRESS OF CASE 7
201  0132  57                .BYTE  57H           ;ADDRESS OF CASE 11 (Same as Case 7)
202  0133  6D                .BYTE  6DH           ;ADDRESS OF CASE 15 (No Change)
203  0140                    .ORG   0140H
204  0140  FF                EYEDEC: JID          ;JUMP INDIRECT TO DECODE ROUTINE
205  0141  38                CASE1:  LBI    3,9   ;POINT TO FLAG 1
206  0142  46                        SMB    7     ;ENABLE FCC
207  0143  43                        RMB    3     ;ANGLE IS -. RESET DIR BIT
208  0144  EC                        JP     COM
209  0145  38                CASE2:  LBI    3,9   ;POINT TO FLAG 1
210  0146  46                        SMB    2     ;ENABLE FCC
211  0147  4B                        SMB    3     ;ANGLE IS +. SET DIR BIT
212  0148  EC                        JP     COM
213  0149  39                CASE3:  LBI    3,10  ;POINT TO FLAG 2
214  014A  47                        SMB    1     ;SET FCC READY FLAG
215  014B  38                        LBI    3,9   ;POINT TO FLAG 1
216  014C  42                        RMB    2     ;DISABLE FCC
217  014D  EC                        JP     COM
218  014E  39                CASE4:  LBI    3,10  ;POINT TO FLAG 2
219  014F  4D                        SMB    0     ;SET RCC READY FLAG
220  0150  38                        LBI    3,9   ;POINT TO FLAG 1
221  0151  4C                        RMB    0     ;DISABLE RCC
222  0152  EC                        JP     COM
223  0153  38                CASE6:  LBI    3,9   ;POINT TO FLAG 1
224  0154  46                        SMB    2     ;ENABLE FCC
225  0155  4B                        SMB    3     ;SET FC (+) FLAG
226  0156  CE                        JP     CASE4
227  0157  39                CASE7:  LBI    3,10  ;POINT TO FLAG 2
228  0158  47                        SMB    1     ;SET FCC READY FLAG
229  0159  38                        LBI    3,9   ;POINT TO FLAG 1
230  015A  42                        RMB    2     ;DISABLE FCC
```

ANGLING BLADE CONTROL PROGRAM-- VERSION 1.0

```
231  015B  EC                    JP      COM
232  015C  38              CASE9: LBI     3,9
233  015D  46                     SMB     2       ;ENABLE FCC
234  015E  43                     RMB     3       ;ANGLE IS (-), RESET FLAG
235  015F  CE                     JP      CASE4
236  0160  39              CASE12: LBI    3,10
237  0161  4D                     SMB     0       ;SET RCC READY FLAG
238  0162  38                     LBI     3,9
239  0163  4C                     RMB     0       ;DISABLE RCC
240  0164  EC                     JP      COM
241  0165  38              CASE13: LBI    3,9
242  0166  4D                     SMB     0       ;ENABLE RCC
243  0167  47                     SMB     1       ;ANGLE IS (+), SET DIR BIT
244  0168  EC                     JP      COM
245  0169  38              CASE14: LBI    3,9
246  016A  4D                     SMB     0
247  016B  45                     RMB     1       ;ANGLE IS (-)
248  016C  23 99            COM:  XAD     1,9     ;SAVE LATEST TO "LAST" EYE STATUS
249  016E  48               NC:   RET             ;PLAIN RETURN FOR NO EYE CHANGE
250                         .PAGE
```

ANGLING BLADE CONTROL PROGRAM-- VERSION 1.2

```
251                         ;SUBROUTINES MFC, MRC
252                         ;Subroutines to move blade, when called, into position for
253                         ;Front and Rear Cuts.
254                         ;
255  816F  68 A7       MFC:  JSR   SQBLD   ;SQUARE BLADE FIRSTT
256  8171  6A 13             JSR   FUDGE   ;Front Cut Fudge Factor
257  8173  08          TEST: CLRA          ;CLEAR A FOR COUNTER TEST
258  8174  2A                LBI   2,11    ;POINT TO FCC LSB
259  8175  21                SKE           ;SKIP IF ZERO
260  8176  61 89            JMP   NZ      ;LSB NOT ZERO
261  8178  2B                LBI   2,12    ;POINT TO FCC MSB
262  8179  21                SKE           ;SKIP IF MSB IS ZERO
263  817A  61 89            JMP   NZ      ;MSB IS NOT ZERO
264  817C  39          ZERO: LBI   3,10    ;FCC IS ZERO
265  817D  45                RMB   1       ;RESET FCC READY FLAG
266  817E  33 81             LBI   8,1     ;PRELOAD B WITH "1"
267  8180  33 3E             OBD           ;SET BLADE READY SIGNAL
268  8182  33 13       WTE:  SKGBZ 3       ;TEST EXIT INPUT
269  8184  C2                JP    WTE     ;WAIT FOR EXIT SIGNAL TO GO LOW
270  8185  8F          DUN:  LBI   8,8     ;PRELOAD B
271  8186  33 3E             OBD           ;RESET BLADE READY SIGNAL
272  8188  48                RET
273  8189  2A          NZ:   LBI   2,11    ;DECREMENT FCC
274  818A  69 BA             JSR   DEC
275        00 00        NU:   EQUAL 0
276        00 03        NT:   EQUAL 3
277                     ;This program uses a macrostep count of 47dec (30H)
278                     ;i.e.,angular resolution of blade motor is 48 times as great
279                     ;as angular resolution of roller step/eye spacing
280                     ;
281  818C  28          MACCRO: LBI   2,9   ;PRELOAD M
282  818D  70                STII  NU
283  818E  73                STII  NT
284  818F  68 D6       MLOOP:  JSR   DLY2MS ;DELAY 2mS
285  8191  38                 LBI   3,9    ;POINT TO FLAG 1
286  8192  13                 SKMBZ 3      ;TEST DIR FLAG
287  8193  E1                 JP    STEPCW ;BLADE MUST BE MOVED CW
288  8194  8F          STEPCCW:LBI   8,8    ;RESET DIR BIT FOR CCW
289  8195  33 3E              OBD          ;SEND TO OUTPUT
290  8197  33 84              LBI   8,4    :PRELOAD B
291  8199  33 3E              OBD          ;TURN ON STEP PULSE,LEAVE DIR=CCW
292  819B  69 C4              JSR   DLY64  ;DELAY 64uS
293  819D  8F                 LBI   8,8    ;PRELOAD B
294  819E  33 3E              OBD          ;TURN OFF STEP PULSE
295  81A0  EE                 JP    DECMC  ;DECREMENT MACROSTEP COUNTER
296  81A1  33 88       STEPCW: LBI   8,8    ;BLADE MUST MOVE CW
297  81A3  33 3E               OBD          ;SET DIR OUTPUT TO 1 (CW)
298  81A5  8B                  LBI   8,12   ;PRELOAD B
299  81A6  33 3E               OBD          ;TURN ON STEP PULSE
300  81A8  69 C4               JSR   DLY64  ;DELAY 64uS
301  81AA  33 88               LBI   8,8    ;PRELOAD B
302  81AC  33 3E               OBD          ;TURN OFF STEP PULSE
303  81AE  28           DECMC: LBI   2,9    ;POINT TO MACROSTEP COUNTER
304  81AF  69 BA               JSR   DEC    ;DECREMENT
305  81B1  08           TESTMC: CLRA
306  81B2  28                  LBI   2,9    ;POINT TO MC LSB
307  81B3  21                  SKE          ;TEST, SKIP IF LSB=0
```

ANGLING BLADE CONTROL PROGRAM-- VERSION 1.8

```
308  01B4  CF          JP      MLOOP   ;NOT ZERO, GO BACK
309  01B5  29          LBI     2,10    ;POINT TO MC MSB
310  01B6  21          SKE             ;TEST
311  01B7  CF          JP      MLOOP   ;NOT ZERO, GO BACK
312  01B8  61 73       JMP     TEST    ;ZERO,MACROSTEPS DONE
313                  ;SUBROUTINE DEC
314                  ;Subroutine to decrement a two-byte binary RAM Counter
315                  ;On entry, B must point to counter LSB
316                  ;
317  01BA  32         DEC:    RC
318  01BB  00                 CLRA
319  01BC  10                 CASC
320  01BD  44                 NOP
321  01BE  84                 XIS
322  01BF  00                 CLRA
323  01C0  10                 CASC
324  01C1  44                 NOP
325  01C2  86                 X
326  01C3  48                 RET
327                  ;SUBROUTINE DLY64
328                  ;Subroutine to generate 64uS delay
329                  ;
330  01C4  00         DLY64:  CLRA
331  01C5  52         OCRAP:  AISC    2
332  01C6  61 C5              JMP     OCRAP
333  01C8  48                 RET
334                  .PAGE
```

ANGLING BLADE CONTROL PROGRAM-- VERSION 1.0

```
335  01C9  68 A7          MRC:   JSR     SQBLD   ;SQUARE BLADE FIRST
336  01CB  00             TEST2: CLRA
337  01CC  3A                    LBI     3,11
338  01CD  21                    SKE
339  01CE  DF                    JP      NZ2
340  01CF  38                    LBI     3,12
341  01D0  21                    SKE
342  01D1  DF                    JP      NZ2
343  01D2  39             ZERO2: LBI     3,10
344  01D3  4C                    RMB     0
345  01D4  33 81                 LBI     0,1
346  01D6  33 3E                 OBD
347  01D8  33 13          WTE2:  SKGBZ   3
348  01DA  D8                    JP      WTE2
349  01DB  0F             DUN2:  LBI     0,0
350  01DC  33 3E                 OBD
351  01DE  48                    RET
352  01DF  3A             NZ2:   LBI     3,11
353  01E0  69 BA                 JSR     DEC
354  01E2  28             MACCR02:LBI    2,9
355  01E3  70                    STII    NU
356  01E4  73                    STII    NT
357  01E5  68 D6          MLOOP2: JSR    DLY2MS
358  01E7  38                    LBI     3,9
359  01E8  11                    SKMBZ   1
360  01E9  F8                    JP      STEPCW2
361  01EA  0F             STPCCW2:LBI    0,0
362  01EB  33 3E                 OBD
363  01ED  33 04                 LBI     0,4
364  01EF  33 3E                 OBD
365  01F1  69 C4                 JSR     DLY64
366  01F3  0F                    LBI     0,0
367  01F4  33 3E                 OBD
368  01F6  62 05                 JMP     DECMC2
369  01F8  33 08          STEPCW2:LBI    0,8
370  01FA  33 3E                 OBD
371  01FC  0B                    LBI     0,12
372  01FD  33 3E                 OBD
373  01FF  69 C4                 JSR     DLY64
374  0201  33 08                 LBI     0,8
375  0203  33 3E                 OBD
376  0205  28             DECMC2: LBI    2,9
377  0206  69 BA                 JSR     DEC
378  0208  00             TESTMC2:CLRA
379  0209  28                    LBI     2,9
380  020A  21                    SKE
381  020B  61 E5                 JMP     MLOOP2
382  020D  29                    LBI     2,10
383  020E  21                    SKE
384  020F  61 E5                 JMP     MLOOP2
385  0211  61 CB                 JMP     TEST2
386                       ;      SUBROUTINE FUDGE
387                       ;      Subroutine to cheat on front cut by "re-squaring"
388                       ;      or "offsetting" blade by fixed amount (basically
389                       ;      "trimming" Front Cut only
390  0213  8D             FUDGE: LBI     8,14    ;POINT TO FUDGE CTR
391        00 00                FULSB:  EQUAL   0
```

ANGLING BLADE CONTROL PROGRAM-- VERSION 1.8

```
392                00 06          FUMSB:  EQUAL   6       ;PRESET FUDGE CTR TO 96dec
393   0214   70                    STII    FULSB
394   0215   76                    STII    FUMSB           ;STORE IN RAM
395   0216   33 08                 LBI     8,8     ;PRELOAD B
396   0218   33 3E                 OBD             ;SET DIR=CW
397   021A   68 D6          FULOOP: JSR     DLY2MS  ;DELAY 2mS
398   021C   0B                    LBI     8,12    ;PRELOAD B
399   021D   33 3E                 OBD             ;TURN ON STEP, LEAVE DIR=CW
400   021F   44                    NOP
401   0220   44                    NOP
402   0221   44                    NOP             ;DELAY 16uS
403   0222   33 08                 LBI     8,8     ;PRELOAD B
404   0224   33 3E                 OBD             ;TURN OFF STEP
405   0226   0D                    LBI     8,14    ;POINT TO FUDGE CTR
406   0227   69 BA                 JSR     DEC     ;DECREMENT FUDGE CTR
407   0229   0D            FUCTEST:LBI     8,14    ;POINT TO FUDGE CTR LSB
408   022A   08                    CLRA
409   022B   21                    SKE
410   022C   DA                    JP      FULOOP
411   022D   0E                    LBI     8,15
412   022E   21                    SKE
413   022F   DA                    JP      FULOOP
414   0230   48                    RET
415   0231                 .END
```

```
2500 A.D. COPS 400 CROSS ASSEMBLER  -  VERSION 3.01b
-----------------------------------------------------

                INPUT  FILENAME :  ACU2NU.SRC
                OUTPUT FILENAME :  ACU2NU.OBJ


   1                    .TITLE ACCUMATIC II-NEW CONTROL PROGRAM--  VERSION 2.5
   2                    ;*********************************************************
   3                    ;*                                                       *
   4                    ;*  Control Program for Accumatic ii with Custom Keybd.  *
   5                    ;*  and Display, and prov. to interface w/BLADE CONTROL  *
   6                    ;*  Custom Written for D&K Custom Machine Design Inc.    *
   7                    ;*  Written by M. Flasza Cecomp Electronic Design Inc.   *
   8                    ;*  August 26, 1988 All Rights Reserved-                 *
   9                    ;*                                                       *
  10                    ;*                                                       *
  11                    ;*********************************************************
  12                    ;
  13                            .LIST ON
  14                            .CHIP 420
  15  0000              .ORG    0000H
  16  0000  00          CLRA
  17  0001  33 5F               OGI     15      ;Set G Port as input
  18  0003  69 EA               JSR     CLRAM   ;Clear all RAM on power-up
  19  0005  33 60               LEI     0       ;Set L Port as input
  20                                            ;Set SIO as Shift reg.
  21                                            ;Set SO as Shift reg. Out
  22          00 00     FCDU:   EQUAL   0       ;Front Cut Default = 10
  23          00 01     FCDT:   EQUAL   1
  24          00 00     RCDU:   EQUAL   0       ;Rear Cut Default = 10
  25          00 01     RCDT:   EQUAL   1
  26          00 02     SPDU:   EQUAL   2       ;Speed Default Value=32
  27          00 03     SPDT:   EQUAL   3
  28          00 00     SPBU:   EQUAL   0       ;Binary equiv. of SPEED setting for
  29          00 02     SPBT:   EQUAL   2       ;use as binary "Shadow Counter"
  30          00 0A     BLNK:   EQUAL   AH      ;This value blanks display digit
  31  0007  33 A5               LBI     2,5
  32  0009  70                  STII    FCDU    ;Store Front Cut Default values
  33  000A  71                  STII    FCDT    ;@ RAM(2,5),(2,6)
  34  000B  7A                  STII    BLNK
  35  000C  7A                  STII    BLNK
  36  000D  33 B5               LBI     3,5
  37  000F  70                  STII    RCDU    ;Store Rear Cut Default values
  38  0010  71                  STII    RCDT    ;@ RAM (3,5),(3,6)
  39  0011  7A                  STII    BLNK
  40  0012  7A                  STII    BLNK
  41  0013  33 93               LBI     1,3
  42  0015  78                  STII    SPBU
  43  0016  72                  STII    SPBT
  44  0017  72                  STII    SPDU    ;Store Speed Default values
  45  0018  73                  STII    SPDT    ;@ RAM (1,5),(1,6)
  46  0019  7A                  STII    BLNK    ;Store "blank" values to make
  47  001A  7A                  STII    BLNK    ;Speed, Front Cut, and Rear Cut
  48  001B  69 3C               JSR     MATH    ;Calculate RCO+RC,FCO-FC
```

ACCUMATIC II-NEW CONTROL PROGRAM-- VERSION 2.5

```
49  001D  69 C8          JSR     PWRCHK  ;Jump to check for power-on
50  001F  33 01  START:  SKGBZ   0       ;Check if power is on
51  0021  68 C8          JSR     PWRCHK  ;Power is off
52  0023  1E     GOON:   LBI     1,15    ;Point to Outputs Work Area
53  0024  4D             SMB     0       ;Set bit to turn on strobe
54  0025  05             LD              ;Bring to A
55  0026  58             CAB             ;Copy to Bd
56  0027  33 3E          OBD             ;Turn on Strobe;EFSS if flag is set
57  0029  2F             LBI     2,8     ;Point to "Latest Eye Status" box
58  002A  06             X               ;Save Outputs data & RAM(2,8)
59  002B  4C             RMB     0       ;Reset strobe bit in RAM
60  002C  33 2B          ININ            ;Read I inputs (eye data) to A
61  002E  06             X               ;Store I data to RAM, restore Output
62                                       ;data to A
63  002F  58             CAB             ;Send new Outputs data to B
64  0030  33 3E          OBD             ;Turn off Strobe
65  0032  41     CHKTIM: SKT             ;Test Time Base Counter
66  0033  FD             JP      NOKEY   ;Not time to svc. kbd/disp yet
67  0034  3E             LBI     3,15    ;Service keybd or disp every 4mS
68  0035  13             SKMBZ   3       ;Flag Box bit 3=0 means display
69  0036  FB             JP      DNUPD   ;doesn't need service--do keybd
70  0037  6B D5          JSR     HLTCHK  ;Poll for Halt flags
71  0039  6A 4B          JSR     KBDSVC  ;instead--Bit 3=1 means display
72                                       ;needs service--don't do keybd
73  003B  69 7B  DNUPD:  JSR     DISUPD  ;Update Display
74  003D  1F     NOKEY:  LBI     1,8     ;Point to "Last Eye Status" box
75  003E  01             SKMBZ   0       ;Test Last Eye Status, skip if 0
76  003F  C4             JP      LIS1    ;Last Eye Status was 1
77  0040  2F     LIS0:   LBI     2,8     ;Last Eye Status was 0
78                                       ;Point to Latest Eye Status box
79  0041  01             SKMBZ   0       ;If Latest Eye Status was 1,
80  0042  C7             JP      YESICH  ;Eye changed
81  0043  CA             JP      NOICH   ;If Latest Eye Status was 0,
82                                       ;eye did not change
83  0044  2F     LIS1:   LBI     2,8     ;Last Eye Status was 1
84  0045  01             SKMBZ   0       ;If latest eye status was 1,
85  0046  CA             JP      NOICH   ;eye did not change
86  0047  35     YESICH: LD      3       ;Load latest eye status to A
87                                       ;Point to RAM(1,8)
88  0048  06             X               ;Save Latest Eye Status to
89                                       ;Last Eye Status
90  0049  D1             JP      SETFLAG ;Go ahead to Set Flags segment
91  004A  3E     NOICH:  LBI     3,15    ;No eye change--Point to Flag box
92  004B  01             SKMBZ   0       ;If bit 0=1,Front Cut Flag set
93  004C  E4             JP      CTTEST  ;Test Counter if FCF is set
94  004D  11             SKMBZ   1       ;If bit1=1, Rear Cut Flag set
95  004E  E4             JP      CTTEST  ;Test Counter if RCF is set
96  004F  68 9E  NOFLAG: JMP     TTEST   ;No flags up,go to wait for timer
97  0051  01     SETFLAG: SKMBZ  0       ;Test Latest Eye Status bit
98                                       ;If latest Eye Status=0,skip FCF set
99  0052  DC             JP      SETFCF
100 0053  33 B6  SETRCF: LBI     3,6     ;Point to Rear Cut Tens digit
101 0055  05             LD              ;Bring to A
102 0056  5A             AISC    10      ;Skip RCF set if RC Tens greater than 5
103 0057  D9             JP      RCON    ;Rear Cut is On
104 0058  E4             JP      CTTEST  ;RC is off, skip ahead
105 0059  3E     RCON:   LBI     3,15    ;Point to Flag box
```

ACCUMATIC II-NEW CONTROL PROGRAM-- VERSION 2.5

```
106  005A  47                SMB   1       ;Set rear Cut Flag
107  005B  E4                JP    CTTEST  ;RCF is set, go ahead
108  005C  33 A6   SETFCF:    LBI   2,6     ;Point to Front Cut Tens
109  005E  05                LD            ;Bring to A
110  005F  5A                AISC  10      ;Skip FCF set if FC Tens greater than 5
111  0060  E2                JP    FCON    ;Front Cut is On
112  0061  E4                JP    CTTEST  ;FC is off, go ahead
113  0062  3E      FCON:     LBI   3,15    ;Point to flag box
114  0063  40                SMB   0       ;Set Front Cut Flag
115  0064  1B      CTTEST:   LBI   1,12    ;Point to RCC units
116  0065  35                LD    3       ;Bring to A,point to RAM(2,12)
117  0066  21                SKE           ;Test if RCC units=RCO+RC units
118  0067  FD                JP    NORCM   ;Jump ahead if no match
119  0068  1C                LBI   1,13    ;Point to RCC tens
120  0069  35                LD    3       ;Bring to A,point to RAM(2,13)
121  006A  21                SKE           ;Test if RCC tens=RCO+RC tens
122  006B  FD                JP    NORCM   ;Jump ahead if no match
123  006C  1D                LBI   1,14    ;point to RCC huns.
124  006D  35                LD    3       ;Bring to A,point to RAM(2,14)
125  006E  21                SKE           ;Test if RCC huns.=RCO+RC huns.
126  006F  FD                JP    NORCM   ;Jump ahead if no match
127  0070  3E      RCM:      LBI   3,15    ;Match, point to flag box
128  0071  45                RMB   1       ;Reset Rear Cut Flag
129  0072  1B                LBI   1,12    ;Clear Rear Cut Counter
130  0073  00                CLRA
131  0074  04                XIS
132  0075  00                CLRA
133  0076  04                XIS
134  0077  00                CLRA
135  0078  04                XIS
136  0079  69 3C             JSR   MATH    ;Do FC/RC Arithmetic
137  007B  68 44             JSR   RCUT    ;Rear Cut Sequence
138  007D  18      NORCM:    LBI   1,9     ;Test for Front Cut match
139  007E  35                LD    3       ;Bring FC Units to A,point to RAM(2,9)
140  007F  21                SKE           ;Test if FC Units=FCO-FC units
141  0080  96                JP    INCCT   ;Jump ahaead if no match
142  0081  19                LBI   1,10    ;Point to FC tens
143  0082  35                LD    3       ;Bring to A,point to RAM(2,10)
144  0083  21                SKE           ;Test if FC tens=FCO-FC tens
145  0084  96                JP    INCCT   ;Jump ahead if no match
146  0085  1A                LBI   1,11    ;Point to FC huns.
147  0086  35                LD    3       ;Bring to A,point to FCO-FC huns.
148  0087  21                SKE           ;Test if FC huns.=FCO-FC huns.
149  0088  96                JP    INCCT   ;Jump ahead if no match
150  0089  3E      FCM:      LBI   3,15    ;Match;poit to flag box
151  008A  4C                RMB   0       ;Reset Front Cut Flag
152  008B  18                LBI   1,9     ;Clear Front Cut Counter
153  008C  00                CLRA
154  008D  04                XIS
155  008E  00                CLRA
156  008F  04                XIS
157  0090  00                CLRA
158  0091  04                XIS
159  0092  69 3C             JSR   MATH    ;Do FC/RC Arithmetic
160  0094  6B 3F             JSR   FCUT    ;Front Cut Sequence
161  0096  3E      INCCT:    LBI   3,15    ;Point to flag box
162  0097  81                SKMBZ 0       ;Skip if FCF not set
```

ACCUMATIC II-NEW CONTROL PROGRAM-- VERSION 2.5

```
163  0099  69 83          JSR     INCFCC  ;Increment Front Cut Counter
164  009A  3E             TESTRCF: LBI    3,15    ;Point to flag box
165  009B  11             SKMBZ   1       ;Skip if RCF not set
166  009C  69 84          JSR     INCRCC  ;Increment Rear Cut Counter
167  009E  69 04          TTEST:  JSR     TIMER   ;Speed Control Subroutine
168  00A0  60 1F          JMP     START   ;Go back to start and repeat
169                       ;
170                       ;***END OF MAIN PROGRAM***
171                       ;
172  00A2  33 82          EXIT:   LBI     0,2     ;Preload B
173  00A4  33 3E                  OBD             ;Turn on EXIT Pulse
174  00A6  00                     CLRA            ;Delay approx. 144uS
175  00A7  51             LUPE:   AISC    1
176  00A8  A7                     JP      LUPE
177  00A9  8F                     LBI     0,8     ;Preload B for turn-off
178  00AA  33 3E                  OBD             ;Turn off Exit Pulse
179  00AC  48                     RET
180                               .PAGE
```

ACCUMATIC II-NEW CONTROL PROGRAM-- VERSION 2.5

```
352  8165  38                LBI    3,9
353  8166  86                X
354  8167  22          BCDSUB: SC
355  8168  15          SUB:    LD     1
356  8169  18                  CASC
357  816A  4A                  ADT
358  816B  14                  XIS    1
359  816C  4E                  CBA
360  816D  54                  AISC   4
361  816E  E8                  JP     SUB
362  816F  48                  RET
363                     ;
364                     ;SUBROUTINE DISUPD
365                     ;Subroutine to update display by sending data out
366                     ;the serial port to MM5450N Display Driver
367                     ;
368  8170  3E          DISUPD: LBI    3,15    ;Point to Flag Box
369  8171  43                  RMB    3       ;Reset 'Disp. Needs Svc.' Flag
370  8172  3F                  LBI    3,8     ;Point to Mode Box
371  8173  85                  LD             ;Bring to A
372  8174  33 88               LBI    8,8     ;point to 'Units' digit column
373  8176  12                  XABR           ;Point to actual digit to send
374  8177  85          DIS:    LD             ;Bring Thous digit to A
375  8178  87                  XDS            ;Bring Thous to A, point to huns
376  8179  23 BF               XAD    8,15    ;Put Thous in Disp Work Area (DWA)
377  817B  85                  LD             ;Bring Huns to A
378  817C  87                  XDS            ;Bring huns to A, point to tens
379  817D  23 8E               XAD    8,14    ;Put Huns in DWA
380  817F  85                  LD             ;Bring Tens to A
381  8180  87                  XDS            ;Bring Tens to A, point to units
382  8181  23 8D               XAD    8,13    ;Put Tens in DWA
383  8183  85                  LD             ;Bring Units to A
384  8184  8B                  LBI    8,12    ;Point to units of DWA
385  8185  86                  X              ;Put Units in DWA,B points to RAM(8,12)
386  8186  88          PACK1:  CLRA
387  8187  5C                  AISC   12      ;Flip to page 3 for lookup
388  8188  BF                  LQID           ;Segment data to Q
389  8189  33 2C               CQMA           ;Q7-4 to RAM(8,12), Q3-8 to A
390  818B  22                  SC             ;Set carry for sync
391  818C  4F                  XAS            ;Exch. A with SIO and start data flow
392  818D  44                  NOP            ;Start bit is embedded in table data
393  818E  44                  NOP            ;Wait 4 cycles then bring next 4 bits
394  818F  85                  LD             ;to A
395  8190  4F                  XAS            ;Exchange for next 4 bits
396  8191  44                  NOP            ;Wait 4 more cycles
397  8192  44                  NOP
398  8193  32                  RC             ;Reset carry to stop sync
399  8194  4F                  XAS            ;Stop sync--First 8 bits sent
400  8195  8C                  LBI    8,13    ;Point to tens digit
401  8196  88          THRPAI: CLRA           ;This loop sends 7 bits three times
402  8197  5D                  AISC   13      ;Flip to page 3 for lookup
403  8198  BF                  LQID           ;Segment data to Q
404  8199  33 2C               CQMA
405  819B  22                  SC
406  819C  4F                  XAS
407  819D  44                  NOP
408  819E  44                  NOP            ;The three 7-bit packets represent the
```

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```
409  819F  85                    LD          ;Tens,Hundreds,and Thousands digit
410  81A0  4F                    XAS         ;in that order.
411  81A1  44                    NOP         ;Wait only three cycles this time
412  81A2  32                    RC          ;so that seven bits only are sent
413  81A3  4F                    XAS         ;After this group,21+8=29bits have been sent
414  81A4  84                    XIS         ;Skip after Thous. have been sent,
415  81A5  D6                    JP    THRPAX;otherwise go back
416  81A6  3F            LASPAX: LBI   3,0   ;To send last 7 bits, point to Mode box
417  81A7  80                    CLRA        ;and get data for Mode LED's
418  81A8  5E                    AISC  14    ;Flip to page 3 for lookup
419  81A9  BF                    LQID        ;LED data to Q
420  81AA  0F                    LBI   0,0   ;Point to scratchpad area
421  81AB  33 2C                 COMA        ;Q7-4 to RAM(0,0) Q3-0 to A
422  81AD  22                    SC
423  81AE  4F                    XAS         ;Last 7 bits sent represent the six
424  81AF  44                    NOP         ;Mode LED's plus the 36th bit,
425  81B0  44                    NOP         ;which is a dummy bit for MM5450N
426  81B1  85                    LD
427  81B2  4F                    XAS         ;Laspax sends 7 bits so that Disupd
428  81B3  44                    NOP         ;always sends a stream of 36 total bits
429  81B4  32                    RC
430  81B5  4F                    XAS         ;Stop sync, 36th bit sent
431  81B6  48                    RET         ;Done
432                              .PAGE
```

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```
433
434
435
436  01C8
437  01C8  EF          ;Page 7 has Lookup data for the various segments of DISUPD
438  01C1  0B          ;Subroutine. Table starts on page 7 first byte.
439  01C2  DE          ;
440  01C3  9F                .ORG    01C8H
441  01C4  3B                .BYTE   EFH
442  01C5  BD                .BYTE   0BH
443  01C6  FD                .BYTE   DEH
444  01C7  0F                .BYTE   9FH
445  01C8  FF                .BYTE   3BH
446  01C9  BF                .BYTE   BDH
447  01CA  08                .BYTE   FDH
448  01CB  7C                .BYTE   0FH
449  01CC  18                .BYTE   FFH
450                          .BYTE   BFH
451  01D0                    .BYTE   08H
452  01D0  CF                .BYTE   7CH
453  01D1  06                .BYTE   18H
454  01D2  AD           ;Data for THRPAX segment
455  01D3  2F                .ORG    01D0H
456  01D4  66                .BYTE   CFH
457  01D5  6B                .BYTE   06H
458  01D6  EB                .BYTE   ADH
459  01D7  0E                .BYTE   2FH
460  01D8  EF                .BYTE   66H
461  01D9  6F                .BYTE   6BH
462  01DA  00                .BYTE   EBH
463  01DB  EB                .BYTE   0EH
464  01DC  20                .BYTE   EFH
465                          .BYTE   6FH
466  01E0                    .BYTE   00H
467  01E0  88                .BYTE   EBH
468  01E1  84                .BYTE   20H
469  01E2  82           ;Data for LASPAX segment
470  01E3  81                .ORG    01E0H
471  01E4  48                .BYTE   88H
472  01E5  44                .BYTE   84H
473  01E6  42                .BYTE   82H
474  01E7  41                .BYTE   81H
475  01E8  00                .BYTE   48H
476                          .BYTE   44H
                             .BYTE   42H
                             .BYTE   41H
                             .BYTE   00H
                             .PAGE
```

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```
181                                 ;Place the following Subroutines on Page 3
182                                 ;
183                                 ;SUBROUTINE PWRCHK
184                                 ;Polls and processes Machine Power-Off Input
185                                 ;
186  00C0                                .ORG    00C0H
187  00C0  69 FB                PWRCHK: JSR     DISBNK  ;Turn off display
188  00C2  33 01                LOOP:   SKGBI   0       ;If G0=0,power is on
189  00C4  C2                            JP      LOOP    ;Wait for power-on
190  00C5  3F                   PON:     LBI     3,0     ;Power is ON; point to Mode box
191  00C6  70                            STII    0       ;Put in Count/Halt mode
192  00C7  33 01                         LBI     0,1     ;Preload B
193  00C9  33 3E                         OBD             ;Turn on Strobe
194  00CB  44                            NOP
195  00CC  1F                            LBI     1,0     ;Point to Last Eye Status
196  00CD  33 28                         ININ            ;Eye inputs to A
197  00CF  06                            X               ;Put into RAM
198  00D0  33 3E                         OBD             ;Turn off Strobe
199  00D2  69 F3                         JSR     CLRCNT  ;Reset Sheet Counter
200  00D4  69 70                         JSR     DISUPD  ;Update display
201                                 ;
202                                 ;SUBROUTINE HALT
203                                 ;This routine goes to work when machine is halted by
204                                 ;either the Keyboard or Bale input
205                                 ;
206  00D6  33 01                HALT:   SKGBI   0       ;Test Power input
207  00D8  C0                            JP      PWRCHK  ;Power is Off
208  00D9  41                            SKT             ;Test timer
209  00DA  E2                            JP      NKEY    ;Not timed out
210  00DB  3E                            LBI     3,15    ;Point to Flag Box
211  00DC  13                            SKMBI   3       ;Does display need service ?
212  00DD  E8                            JP      DISNUP  ;Display needs updating
213  00DE  6A 48                         JSR     KBDSVC  ;Service keyboard instead
214  00E0  69 70                DISNUP: JSR     DISUPD  ;Update display
215  00E2  3F                   NKEY:   LBI     3,0     ;Point to Mode box
216  00E3  03                            SKMBZ   2       ;Test Run/Stop bit 0=Stop 1=Run
217  00E4  E6                            JP      NEXT1   ;No skip means RUN
218  00E5  D6                            JP      HALT    ;Machine Halt
219  00E6  33 03                NEXT1:  SKGBZ   2       ;Test Bale Input 0=Halt 1=Run
220  00E8  EA                            JP      NEXT2   ;No skip means Run
221  00E9  D6                            JP      HALT    ;Loop until bale halt is off
222  00EA  69 3C                NEXT2:  JSR     MATH    ;Do FC/RC Arithmetic
223  00EC  48                            RET
224                                 ;
225                                 ;SUBROUTINE SPDUP
226                                 ;SPDUP first increments the Binary Speed "Shadow" Counter
227                                 ;Then goes ahead to increment the BCD (display) counter
228                                 ;
229  00ED  23 13                SPDUP:  LDD     1,3
230  00EF  51                            AISC    1
231  00F0  F9                            JP      NOCARY
232  00F1  23 93                         XAD     1,3
233  00F3  23 94                         XAD     1,4
234  00F5  51                            AISC    1
235  00F6  23 94                         XAD     1,4
236  00F8  F8                            JP      INCSPD
237  00F9  23 93                NOCARY: XAD     1,3
```

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```
238                                 ;
239                                 ;SUBROUTINE INC
240                                 ;Subroutine to increment various RAM counters
241                                 ;
242  00FB  33 95                    INCSPD: LBI     1,5     ;Entry Pt. to incr. Speed setting
243  00FD  33 A5                    INCFC:  LBI     2,5     ;Entry pt. to incr. Front Cut
244  00FF  33 B5                    INCRC:  LBI     3,5     ;Entry pt. to incr. Rear Cut
245  0101  22                               SC
246  0102  D4                               JP      ADD2    ;Add 2 BCD digits
247  0103  18                       INCFCC: LBI     1,9
248  0104  18                       INCRCC: LBI     1,12
249  0105  22                               SC
250  0106  CF                               JP      ADD3
251  0107  33 85                    INCSC:  LBI     0,5     ;Entry pt. to incr. Sheet Counter
252  0109  22                               SC
253  010A  00                               CLRA
254  010B  56                               AISC    6
255  010C  30                               ASC
256  010D  4A                               ADT
257  010E  04                               IIS
258  010F  00                       ADD3:   CLRA
259  0110  56                               AISC    6
260  0111  30                               ASC
261  0112  4A                               ADT
262  0113  04                               IIS
263  0114  00                       ADD2:   CLRA
264  0115  56                               AISC    6
265  0116  30                               ASC
266  0117  4A                               ADT
267  0118  04                               IIS
268  0119  00                               CLRA
269  011A  30                               ASC
270  011B  06                               X
271  011C  48                               RET
272                                 ;
273                                 ;SUBROUTINE SPDDN
274                                 ;Subroutine to decrement to Speed Binary "Shadow" Counter
275                                 ;Then jump ahead to decrement the BCD (display) counter
276                                 ;
277  011D  23 13                    SPDDN:  LDD     1,3
278  011F  5F                               AISC    15
279  0120  E4                               JP      MORE
280  0121  23 93                            IAD     1,3
281  0123  EC                               JP      DECSPD
282  0124  23 93                    MORE:   IAD     1,3
283  0126  23 94                            IAD     1,4
284  0128  5F                               AISC    15
285  0129  44                               NOP
286  012A  23 94                            IAD     1,4
287                                 ;
288                                 ;SUBROUTINE DEC
289                                 ;Subroutine to decrement a BCD RAM Counter
290                                 ;
291  012C  33 95                    DECSPD: LBI     1,5     ;Entry pt. to decr. Speed setting
292  012E  33 A5                    DECFC:  LBI     2,5     ;Entry pt. to decr. Front Cut
293  0130  33 B5                    DECRC:  LBI     3,5     ;Entry pt. to decr. Rear Cut
294  0132  32                               RC
```

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```
295  0133  00                    CLRA
296  0134  10                    CASC
297  0135  4A                    ADT
298  0136  04                    XIS
299  0137  00                    CLRA
300  0138  10                    CASC
301  0139  44                    NOP
302  013A  06                    X
303  013B  48                    RET
304                          ;
305                          ;SUBROUTINE MATH
306                          ;Subroutine to calculate Rear Cut Offset + Rear Cut
307                          ;Front Cut Offset - Front Cut from current RAM values
308                          ;
309  013C  3B                MATH:  LBI    3,12
310        00 01                    RCOU:  EQUAL  1
311        00 09                    RCOT:  EQUAL  9
312        00 02                    RCOH:  EQUAL  2
313  013D  71                    STII   RCOU
314  013E  79                    STII   RCOT
315  013F  72                    STII   RCOH
316  0140  2D                    LBI    2,14
317  0141  00                    CLRA
318  0142  06                    X
319  0143  33 B6                 LBI    3,6
320  0145  05                    LD
321  0146  2C                    LBI    2,13
322  0147  06                    X
323  0148  33 B5                 LBI    3,5
324  014A  05                    LD
325  014B  2B                    LBI    2,12
326  014C  16                    X      1
327  014D  32                BCDADD: RC
328  014E  15                ADDL:  LD     1
329  014F  56                       AISC   6
330  0150  30                       ASC
331  0151  4A                       ADT
332  0152  14                       XIS    1
333  0153  4E                       CBA
334  0154  51                       AISC   1
335  0155  CE                       JP     ADDL
336  0156  28                       LBI    2,9
337        00 01                    FCOU:  EQUAL  1
338        00 09                    FCOT:  EQUAL  9
339        00 02                    FCOH:  EQUAL  2
340  0157  71                    STII   FCOU
341  0158  79                    STII   FCOT
342  0159  72                    STII   FCOH
343  015A  3A                    LBI    3,11
344  015B  00                    CLRA
345  015C  06                    X
346  015D  33 A6                 LBI    2,6
347  015F  05                    LD
348  0160  39                    LBI    3,10
349  0161  06                    X
350  0162  33 A5                 LBI    2,5
351  0164  05                    LD
```

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```
477                                 ;SUBROUTINE CLRAM
478                                 ;Subroutine to clear all RAM on power-up
479                                 ;
488  01EA                                .ORG    01EAH
481  01EA  3E                    CLRAM:  LBI     3,15
482  01EB  00                    CLR:    CLRA
483  01EC  07                            XDS
484  01ED  EB                            JP      CLR
485  01EE  12                            XABR
486  01EF  5F                            AISC    15
487  01F0  48                            RET
488  01F1  12                            XABR
489  01F2  EB                            JP      CLR
490                                 ;
491                                 ;SUBROUTINE CLRCNT
492                                 ;Subroutine to clear a 4-digit RAM Counter(Sheet Counter)
493                                 ;@ RAM(0,5) thru (0,8)
494                                 ;
495  01F3  33 05                 CLRCNT: LBI     0,5
496  01F5  00                    CLRC:   CLRA
497  01F6  04                            XIS
498  01F7  4E                            CBA
499  01F8  57                            AISC    7
500  01F9  F5                            JP      CLRC
501  01FA  48                            RET
502                                 ;
503                                 ;SUBROUTINE     DISBNK
504                                 ;This subroutine outputs all zeros via serial port
505                                 ;to blank the display
506                                 ;
507  01FB  00                    DISBNK: CLRA
508  01FC  58                            AISC    8
509  01FD  22                            SC
510  01FE  4F                            XAS
511  01FF  00                            CLRA
512  0200  51                    LOOPD:  AISC    1
513  0201  C0                            JP      LOOPD
514  0202  44                            NOP
515  0203  32                            RC
516  0204  4F                            XAS
517  0205  48                            RET
518                                 .PAGE
```

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```
519
520
521
522
523
524  0207
525  0207  7E
526  0208  FF
527  0209  FF
528  020A  FF
529  020B  7E
530  020C  FF
531  020D  5E
532  020E  58
533  0217
534  0217  6E
535  0218  FF
536  0219  FF
537  021A  FF
538  021B  7A
539  021C  FF
540  021D  5E
541  021E  58
542  0227
543  0227  6B
544  0228  FF
545  0229  FF
546  022A  FF
547  022B  74
548  022C  FF
549  022D  5E
550  022E  58
551  0237
552  0237  71
553  0238  FF
554  0239  FF
555  023A  FF
556  023B  77
557  023C  FF
558  023D  5E
559  023E  58
560
```

```
;SUBROUTINE KBDSVC
;Subroutine to decode and process the keyboard
;
;Place this code on Page 8
;Page 8 contains "JID" table data for keyboard decode
        .ORG    0207H
        .BYTE   7EH     ;Address of SKIP
        .BYTE   FFH     ;Dummy
        .BYTE   FFH     ;Dummy
        .BYTE   FFH     ;Dummy
        .BYTE   7EH     ;Address of SKIP
        .BYTE   FFH     ;Dummy
        .BYTE   5EH     ;Address of MODEKEY
        .BYTE   58H     ;Address of RSKEY
        .ORG    0217H
        .BYTE   6EH     ;Address of UPSPD
        .BYTE   FFH
        .BYTE   FFH
        .BYTE   FFH
        .BYTE   7AH     ;Address of DWNSPD
        .BYTE   FFH
        .BYTE   5EH     ;Address of MODEKEY
        .BYTE   58H     ;Address of RSKEY
        .ORG    0227H
        .BYTE   6BH     ;Address of UPFC
        .BYTE   FFH
        .BYTE   FFH
        .BYTE   FFH
        .BYTE   74H     ;Address of DWNFC
        .BYTE   FFH
        .BYTE   5EH     ;Address of MODEKEY
        .BYTE   58H     ;Address of RSKEY
        .ORG    0237H
        .BYTE   71H     ;Address of UPRC
        .BYTE   FFH
        .BYTE   FFH
        .BYTE   FFH
        .BYTE   77H     ;Address of DWNRC
        .BYTE   FFH
        .BYTE   5EH     ;Address of MODEKEY
        .BYTE   58H     ;Address of RSKEY
        .PAGE
```

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```
561                                 ;Place following code on Page 9
562                                 ;This is the actual KBDSVC Subroutine
563                                 ;
564  8248                                .ORG   8248H
565  8248  0F                    KBDSVC: LBI    0,0     ;Point to scratchpad area
566  8249  33 2E                       INL             ;L7-4 to RAM(0,0) L3-0 to A
567  824B  51                           AISC   1       ;Skip if no keys down
568  824C  C8                           JP     KEYDWN
569  824D  2E                    RSKBC:  LBI    2,15    ;Reset KBC
570  824E  06                           X
571  824F  49                           RETSK
572  8250  2E                    KEYDWN: LBI    2,15    ;Skip if Kbd is NOT disabled
573  8251  13                           SKMBZ  3
574  8252  49                           RETSK
575  8253  05                    KBND:   LD             ;Bring KBC to A
576  8254  51                           AISC   1       ;Increment
577  8255  06                           X              ;Return to RAM
578  8256  03                           SKMBZ  2       ;Skip if NOT ready
579  8257  D1                           JP     SETKBD  ;Set keyboard disable
580  8258  49                           RETSK
581  8259  4B                    SETKBD: SMB    3       ;
582  825A  3F                    KEYDEC: LBI    3,8     ;Point to Mode box
583  825B  05                           LD             ;Bring to A
584  825C  12                           XABR           ;Put lower two bits of Mode box
585  825D  12                           XABR           ;in A, 0 to A3 and A2
586  825E  0F                           LBI    0,0     ;Point to stored switch inputs
587  825F  FF                           JID            ;Jump indirect (via table) to routine
588                                                    ;to process the active keyswitch
589  8260  3F                    RSKEY:  LBI    3,8     ;Run/Stop key depressed-Point to Mode box
590  8261  00                           CLRA
591  8262  54                           AISC   4       ;Make mask '0100'
592  8263  02                           XOR            ;Toggle Run/Stop bit
593  8264  06                           X              ;Put back in RAM
594  8265  FC                           JP     SDNSF   ;Jump to set 'Disp needs Svc' flag
595  8266  3F                    MODEKEY: LBI   3,8     ;Mode key is pressed-Point to Mode box
596  8267  00                           CLRA           ;Increment Mode value
597  8268  51                           AISC   1
598  8269  31                           ADD
599  826A  03                           SKMBZ  2       ;Test bit 2 (Run/Stop),skip if zero
600  826B  E7                           JP     SET     ;Make sure bit 2 is set (don't change)
601  826C  06                           X              ;Put incr. mode counter back in RAM
602  826D  42                           RMB    2       ;Reset bit 2 if nec.
603  826E  FC                           JP     SDNSF   ;Jump to set 'Disp needs Svc' Flag
604  826F  06                    SET:    X
605  8270  46                           SMB    2       ;Set bit 2 if nec.
606  8271  43                           RMB    3       ;Be sure bit 3 wasn't incremented
607  8272  FC                           JP     SDNSF   ;Jump to set 'Disp needs Svc' flag
608  8273  68 FD                UPFC:   JSR    INCFC   ;UP pushed in Front Cut mode
609  8275  FC                           JP     SDNSF
610  8276  68 ED                UPSPD:  JSR    SPDUP   ;UP pushed in Speed Mode
611  8278  FC                           JP     SDNSF
612  8279  68 FF                UPRC:   JSR    INCRC   ;UP pushed in Rear Cut mode
613  827B  FC                           JP     SDNSF
614  827C  69 2E                DWNFC:  JSR    DECFC   ;DOWN pushed in Front Cut mode
615  827E  FC                           JP     SDNSF
616  827F  69 38                DWNRC:  JSR    DECRC   ;DOWN pushed in Rear Cut mode
617  8281  FC                           JP     SDNSF
```

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```
618  027A  69 1D          DWNSPD: JSR     SPDDN
619  027C  3E              SDNSF:  LBI     3,15    ;Point to Flag box
620  027D  48                      SMB     3       ;Set "Display Needs Service" flag
621  027E  49              SKIP:   RETSK           ;This table entry point lets progra
622                                                 ;ignore Up/Down keys in Counter mode
623  02FF                          .ORG 02FFH
624  02FF  49                      RETSK           ;Throw back multiple key depressions
625                                                 ;accessed by wayward table jumps
626                           .PAGE
```

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```
627                          ;SUBROUTINE TIMER
628                          ;Subroutine to generate a variable delay depending on SPEED setting
629                          ;Uses Speed Binary "Shadow" Counter to generate delays from 20uS
630                          ;to 7mS for Speed settings of 63 to 00 in RAM
631                          ;
632  0300  08                        .BYTE   08H     ;Address of DLY1
633  0301  0E                        .BYTE   0EH     ;Address of DLY2
634  0302  14                        .BYTE   14H     ;Address of DLY3
635  0303  1A                        .BYTE   1AH     ;Address of DLY4
636  0304  00                TIMER:  CLRA
637  0305  33 94                     LBI     1,4
638  0307  FF                        JID
639  0308  23 13             DLY1:   LDD     1,3
640  030A  33 13             NUTS2U: SKGBZ   3
641  030C  CA                        JP      NUTS2U
642  030D  E0                        JP      DLYA
643  030E  23 13             DLY2:   LDD     1,3
644  0310  33 13             NUTS2U2:SKGBZ   3
645  0312  D0                        JP      NUTS2U2
646  0313  EA                        JP      DLYB
647  0314  23 13             DLY3:   LDD     1,3
648  0316  33 13             NUTS2U3:SKGBZ   3
649  0318  D6                        JP      NUTS2U3
650  0319  F2                        JP      DLYC
651  031A  23 13             DLY4:   LDD     1,3
652  031C  33 13             NUTS2U4:SKGBZ   3
653  031E  DC                        JP      NUTS2U4
654  031F  FA                        JP      DLYD
655  0320  23 89             DLYA:   IAD     8,9
656  0322  44                DLYALP: NOP
657  0323  44                        NOP
658  0324  51                        AISC    1
659  0325  E2                        JP      DLYALP
660  0326  23 89                     IAD     8,9
661  0328  51                        AISC    1
662  0329  E8                        JP      DLYA
663  032A  23 89             DLYB:   IAD     8,9
664  032C  51                DLYBLP: AISC    1
665  032D  EC                        JP      DLYBLP
666  032E  23 89                     IAD     8,9
667  0330  51                        AISC    1
668  0331  EA                        JP      DLYB
669  0332  44                DLYC:   NOP
670  0333  44                        NOP
671  0334  44                        NOP
672  0335  44                        NOP
673  0336  44                        NOP
674  0337  44                        NOP
675  0338  51                        AISC    1
676  0339  F2                        JP      DLYC
677  033A  44                DLYD:   NOP
678  033B  44                        NOP
679  033C  51                        AISC    1
680  033D  FA                        JP      DLYD
681  033E  48                        RET
682                                  .PAGE
```

ACCUMATIC II-NEW CONTROL PROGRAM-- VERSION 2.5

```
683                                 ;SUBROUTINES FCUT, RCUT
684                                 ;Subroutines to control the Cut sequence when called
685                                 ;by the Main Program
686                                 ;
687  833F  33 86                    FCUT:   LBI     3,6     ;Point to RC tens digit
688  8341  85                              LD              ;Bring to A
689  8342  5A                              AISC    10      ;Skip if RC greater than 59
690  8343  C6                              JP      CUT     ;No skip means RC on--don't incr. counter
691  8344  69 07                 RCUT:   JSR     INCSC   ;Increment Sheet Counter
692  8346  33 11                 CUT:    SKGBZ   1       ;Check for Blade Ready signal
693  8348  CA                              JP      CUTNOW  ;Blade is ready
694  8349  C6                              JP      CUT     ;Wait for blade ready (loop)
695  834A  3E                    CUTNOW: LBI     3,15
696  834B  42                            RMB     2       ;Clear Top Sw. Present Flag
697  834C  33 81                         LBI     8,1     ;Clear TSCC, BSCC
698  834E  70                            STII    8
699  834F  70                            STII    8
700  8350  89                            LBI     8,10    ;Clear Timer Counter
701  8351  70                            STII    8
702  8352  70                            STII    8
703  8353  33 88                         LBI     8,8     ;Load 8 to turn on Shear, EFSS
704  8355  33 3E                         OBD             ;Turn on Shear
705  8357  8F                    LOOP5:  LBI     8,8     ;Point to scratchpad area
706  8358  33 20                         ININ            ;Read inputs (Top sw=IN2 Bot sw=IN3)
707  835A  86                            X               ;Put in RAM(8,8)
708  835B  83                            SKMBZ   2       ;Skip if I2 was 8 (Top sw open)
709  835C  E1                            JP      INCTSC  ;No skip=Top Sw closed
710  835D  33 82                 CLRTSC: LBI     8,2     ;Clear TSCC
711  835F  70                            STII    8
712  8360  E9                            JP      POLLBS  ;Jump ahead to poll Bot. Sw.
713  8361  23 82                 INCTSC: XAD     8,2     ;Bring TSCC to A
714  8363  51                            AISC    1       ;Increment, skip if full
715  8364  E7                            JP      CCNF    ;Counter not full
716  8365  3E                            LBI     3,15    ;Counter full;set Top Sw present flag
717  8366  46                            SMB     2
718  8367  23 82                 CCNF:   XAD     8,2     ;Put incr. TSCC back in RAM
719  8369  8F                    POLLBS: LBI     8,8     ;Point to scratchpad area
720  836A  13                            SKMBZ   3       ;Skip if I3 was 8 (Bot sw open)
721  836B  F8                            JP      INCBSC  ;I3 was 1 (Bot sw closed)-incr. BSCC
722  836C  33 81                 CLRBSC: LBI     8,1     ;Clear BSCC
723  836E  70                            STII    8
724  836F  F8                            JP      TESTIM  ;Go ahead to test timer
725  8370  23 81                 INCBSC: XAD     8,1     ;Bring BSCC to A
726  8372  51                            AISC    1       ;Increment BSCC
727  8373  F6                            JP      NUTS    ;BSCC not full
728  8374  63 8E                         JMP     ENDCUT  ;BSCC full--Downstroke done
729  8376  23 81                 NUTS:   XAD     8,1     ;Put incr. BSCC back in RAM
730  8378  41                   TESTIM: SKT             ;Test timer
731  8379  07                            JP      LOOP5   ;Timer not set, go back
732  837A  23 8A                INCTC:  XAD     8,10    ;Increment Timer Counter
733  837C  51                            AISC    1
734  837D  63 86                         JMP     AHEAD1
735  837F  23 8A                         XAD     8,10
736  8381  23 8B                         XAD     8,11
737  8383  54                            AISC    4
738  8384  CA                            JP      DUMMY
739  8385  CE                            JP      ENDCUT
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ACCUMATIC II-NEW CONTROL PROGRAM-- VERSION 2.5

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748  0386  23 8A          AHEAD1: IAD    0,10
741  0388  63 57                  JMP    LOOP5
742  038A  23 8B          DUMMY:  IAD    0,11
743  038C  63 57                  JMP    LOOP5
744  038E  0F             ENDCUT: LBI    0,0     ;Load 0 to turn off Shear, EFSS on
745  038F  33 3E                  OBD             ;Turn off shear
746  0391  3E             TSTTSF: LBI    3,15    ;Test Top Sw present Flag
747  0392  03                    SKMBZ  2       ;Skip if Top Sw is not present
748  0393  D7                    JP     TSP     ;Top Sw is present
749  0394  6B B8                 JSR    DLY512  ;Top Sw missing--delay 512mS
750  0396  E9                    JP     FINIS   ;Almost done
751  0397  6B B5          TSP:    JSR    DLY128  ;Top Sw is present--delay 128mS
752  0399  33 02          CCC:    LBI    0,2     ;Clear TSCC
753  039B  70                    STII   0
754  039C  0F             LOOP6:  LBI    0,0     ;point to scratchpad area
755  039D  33 28                  ININ           ;Read IN inputs
756  039F  06                    X              ;Put into RAM
757  03A0  13                    SKMBZ  3       ;Skip if Top Sw open
758  03A1  E3                    JP     NERD    ;Top Sw is closed
759  03A2  D9                    JP     CCC     ;Clear Top Sw counter
760  03A3  23 02          NERD:   IAD    0,2     ;Bring TSCC to A
761  03A5  51                    AISC   1       ;Increment TSCC, skip if full
762  03A6  EF                    JP     GOOF    ;TSCC not full
763  03A7  6B B2                 JSR    DLY64   ;TSCC full--Delay 64mS
764  03A9  69 70          FINIS:  JSR    DISUPD  ;Update display before returning
765  03AB  68 A2                 JSR    SEXIT   ;Send Exit Pulse for Blade Controller
766  03AD  48                    RET
767  03AE  44                    NOP
768  03AF  23 02          GOOF:   IAD    0,2     ;Put incr. TSCC back in RAM
769  03B1  DC                    JP     LOOP6
770  03B2  00             DLY64:  CLRA           ;Preset A to 15
771  03B3  5F                    AISC   15
772  03B4  FD                    JP     DLY
773  03B5  00             DLY128: CLRA           ;Preset A to 14
774  03B6  5E                    AISC   14
775  03B7  FD                    JP     DLY
776  03B8  00             DLY256: CLRA           ;Preset A to 12
777  03B9  5C                    AISC   12
778  03BA  FD                    JP     DLY
779  03BB  00             DLY512: CLRA           ;Preset A to 8
780  03BC  58                    AISC   8
781  03BD  09             DLY:    LBI    0,10    ;Point to low byte Timer Counter
782  03BE  70                    STII   0       ;Clear RAM(0,10),point to (0,11)
783  03BF  06                    X              ;Store A preset in RAM(0,11)
784  03C0  41             LOOP3:  SKT            ;Test Time base counter
785  03C1  C0                    JP     LOOP3
786  03C2  23 8A                 IAD    0,10    ;Bring RAM(0,10) to A
787  03C4  51                    AISC   1       ;Incr. A
788  03C5  CD                    JP     LOOP4
789  03C6  23 8A                 IAD    0,10    ;Put 0 back in RAM
790  03C8  23 8B                 IAD    0,11    ;Retrieve high order byte
791  03CA  51                    AISC   1       ;Incr. High order byte,skip if full
792  03CB  D1                    JP     DUMMY1
793  03CC  48                    RET
794  03CD  23 8A          LOOP4:  IAD    0,10
795  03CF  63 C0                  JMP    LOOP3
796  03D1  23 8B          DUMMY1: IAD    0,11
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ACCUMATIC II-NEW CONTROL PROGRAM-- VERSION 2.5

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 797  03D3  63 C8                    JMP     LOOP3
 798                                 .PAGE
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ACCUMATIC II-NEW CONTROL PROGRAM-- VERSION 2.5

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 799                    ;SUBROUTINE HLTCHK
 800                    ;Subroutine to poll Bale Halt, Machine Halt and Front/Rear Cut
 801                    ;Flags to see if EFSS is required, or if Halt is needed, to
 802                    ;give EFSS enough time to slow machine before halting
 803                    ;
 804  03D5  33 03       HLTCHK: SKGBZ   2       ;Poll Bale Halt input
 805  03D7  D9                  JP      NBHLT   ;No Bale Halt needed
 806  03D8  E9                  JP      INCHC   ;Bale Halt called-- incr. counter
 807  03D9  3F          NBHLT:  LBI     3,0     ;Point to Mode box
 808  03DA  83                  SKMBZ   2       ;Test for Machine halt
 809  03DB  DD                  JP      NOHLT   ;No Machine halt
 810  03DC  E9                  JP      INCHC   ;Machine halt-- incr. counter
 811  03DD  3E          NOHLT:  LBI     3,15    ;No Halt called, check FC/RC Flags
 812  03DE  81                  SKMBZ   0       ;Skip if FCF not set
 813  03DF  F7                  JP      SETEFSS ;FCF is set-- set EFSS
 814  03E0  11                  SKMBZ   1       ;Skip if RCF not set
 815  03E1  F7                  JP      SETEFSS ;RCF is set-- set EFSS
 816  03E2  1E          RSEFSS: LBI     1,15    ;Reset EFSS flag
 817  03E3  46                  SMB     2
 818  03E4  33 03       RSHC:   LBI     0,3     ;Point to Halt Counter
 819  03E6  70                  STII    0       ;Clear Halt Counter
 820  03E7  70                  STII    0
 821  03E8  48                  RET
 822  03E9  23 03       INCHC:  XAD     0,3     ;Bring Halt Counter to A
 823  03EB  51                  AISC    1       ;Increment
 824  03EC  F5                  JP      LOOP7   ;No carry to 0,4
 825  03ED  23 03               XAD     0,3     ;Return to RAM, restore A
 826  03EF  23 04               XAD     0,4     ;Bring HC MSB to A
 827  03F1  51                  AISC    1       ;Incr. MSB
 828  03F2  23 04               XAD     0,4     ;Store MSB, restore A
 829  03F4  F7                  JP      SETEFSS ;Go on
 830  03F5  23 03       LOOP7:  XAD     0,3     ;Put back LSB
 831  03F7  1E          SETEFSS:LBI     1,15    ;Point to Output Work area
 832  03F8  42                  RMB     2       ;Set EFSS flag
 833  03F9  33 04       RTH:    LBI     0,4     ;Point to Halt Ctr. MSB
 834  03FB  83                  SKMBZ   2       ;Delay 64 counts or 256mS
 835  03FC  60 D6               JMP     HALT    ;Go to HALT routine
 836  03FE  48                  RET
 837  03FF              .END
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Claims

1. An apparatus for parallel cutting of the laminated edge of a previously laminated article, wherein said apparatus includes a cutting blade oriented substantially perpendicularly to the path of said article as it passes thereunder, and further comprising means for advancing said article, the improvement comprising:

(a) a plurality of sensing means for determining the extent of deviation of the leading edge of said article from parallelism with said cutting blade;

(b) electronic feedback means communicative with said sensing means and for determining the extent of rotation of said cutting blade necessary so that said blade is oriented parallel to said leading edge of said article; and

(c) blade positioning means communicative with said electronic feedback means for rotating said cutting blade, to a position wherein said cutting blade is parallel to said leading edge of said article wherein said blade positioning means rotates said cutting blade about a pivot point and wherein said cutting blade is not laterally movable.

2. The apparatus of Claim 1, wherein said sensing means comprises a pair of infrared light beams and a pair of corresponding light detectors.

3. The apparatus of Claim 1, wherein said blade positioning means comprises a step motor having an output shaft mechanically linked to said blade to effect rotation of said blade about said pivot point.

4. The apparatus of Claim 2, wherein at least one of said light beams and its corresponding light detector is movable.

5. The apparatus of Claim 1, further comprising a controller and a plurality of beam and detector sets, and wherein said controller senses the width of said article passing through said apparatus, and selects the two light beam and detector sets most suitable for the width of said article.

6. An apparatus for parallel cutting of the laminated edge of a previously laminated article, wherein said apparatus includes a cutting blade oriented substantially perpendicularly to the path of said article as it passes thereunder, and further comprising means for advancing said article, the improvement comprising:

(a) a plurality of sensing means for determining the extent of deviation of the leading edge of said article from parallelism with said cutting blade, said sensing means comprising a pair of infrared light beams and a pair of corresponding light detectors;

(b) electronic feedback means communicative with said sensing means and for determining the extent of rotation of said cutting blade necessary so that said blade is oriented parallel to said leading edge of said article; and

(c) blade positioning means communicative with said electronic feedback means for rotating said cutting blade, and to a position wherein said cutting blade is parallel to said leading edge of said article, wherein said blade positioning means comprises a step motor having an output shaft mechanically linked to said blade to effect rotation of said blade about a pivot point, and wherein said blade positioning means rotates said cutting blade about said pivot point and wherein said cutting blade is not laterally movable.

7. The apparatus of Claim 6, wherein at least one of said light beams and its corresponding light detector is movable.

8. The apparatus of Claim 6, further comprising a controller and a plurality of beam/detector sets, and wherein said controller senses the width of said article passing through said apparatus, and selects the two light beam/detector sets most suitable for the width of said article.

FIG-1

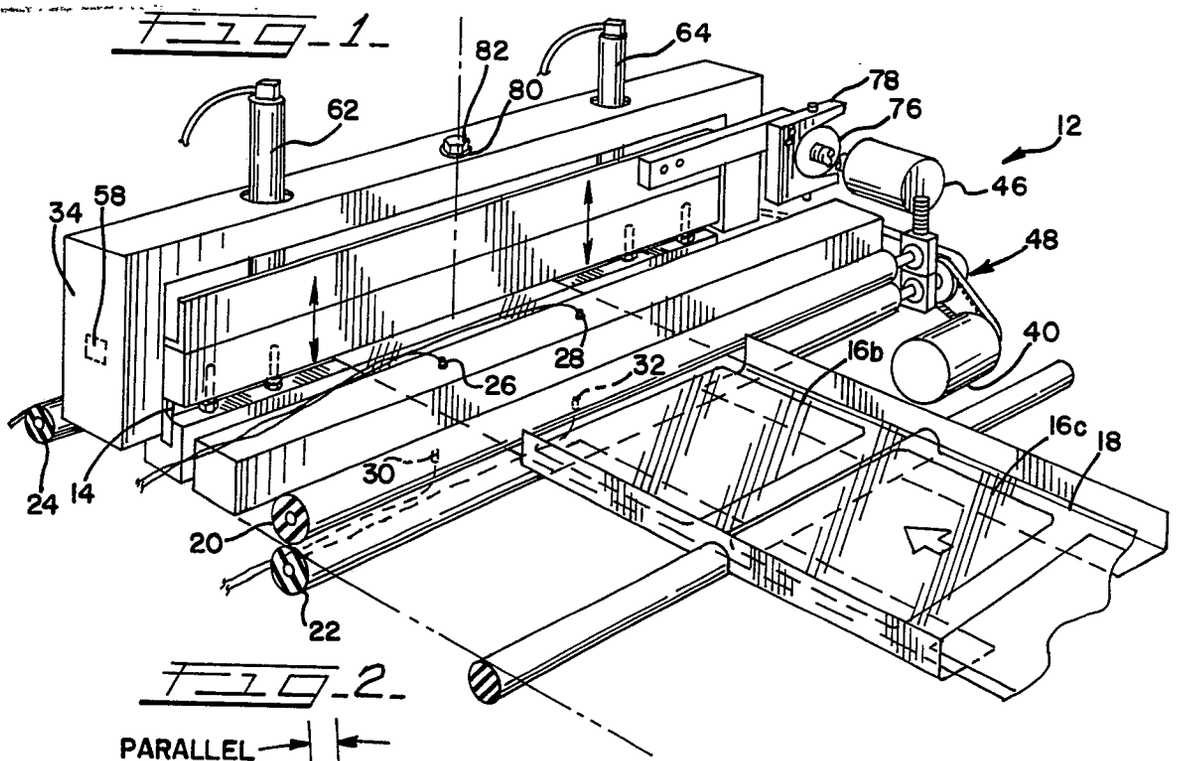


FIG-2

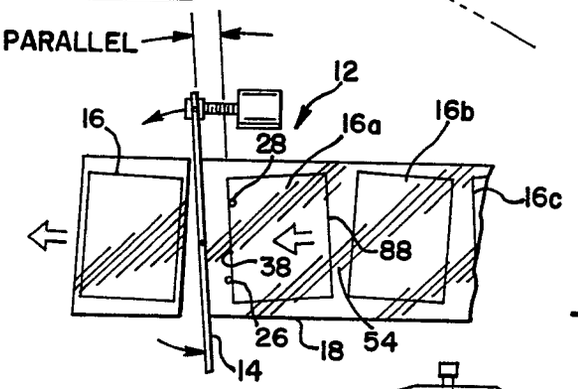
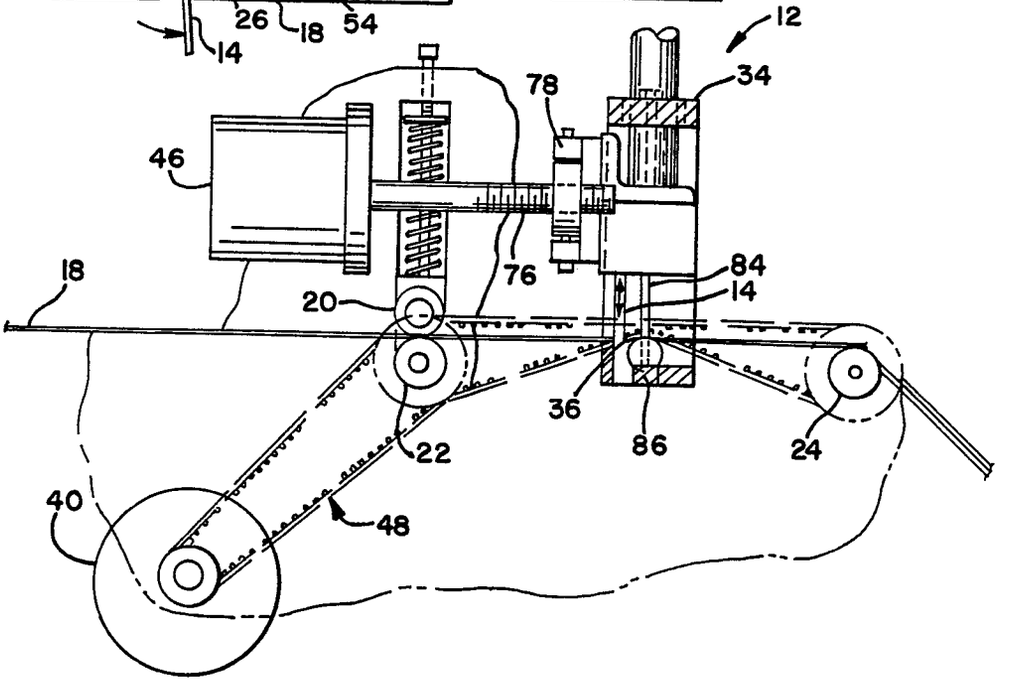


FIG-3



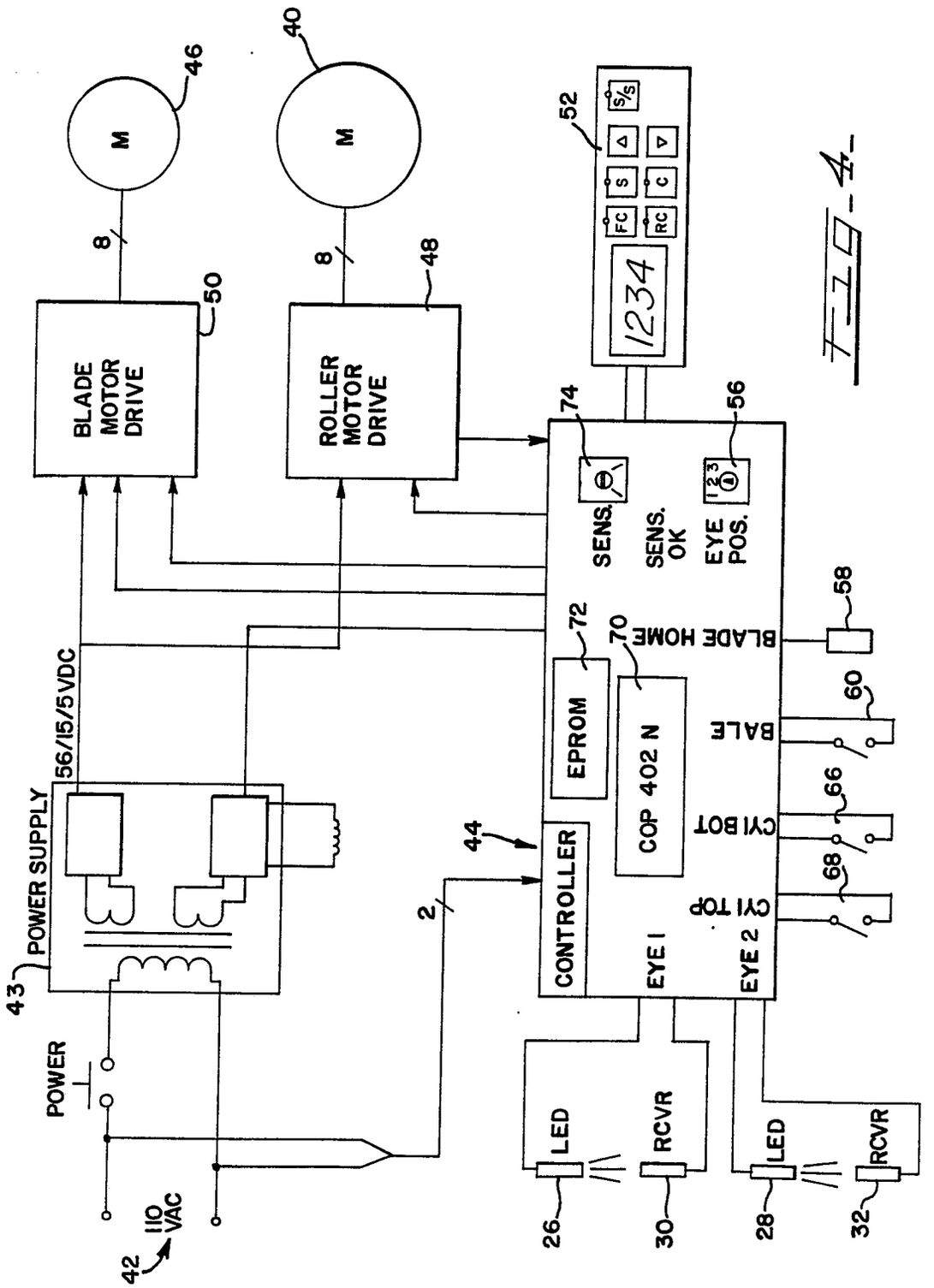

40
46
M
M
8
8
50
48
52
BLADE MOTOR DRIVE
ROLLER MOTOR DRIVE
S/S
FC
S
C
RC
1234
74
56
SENS.
SENS. OK
EYE POS.
58
BLADE HOME
72
70
EPROM
COP 402 N
60
BALE
66
CYI BOT
68
CYI TOP
56/15/5VDC
POWER SUPPLY
44
2
CONTROLLER
EYE 1
EYE 2
43
POWER
110 VAC
42
LED
RCVR
LED
RCVR
26
30
28
32

FIG-4

European Patent Office

EUROPEAN SEARCH REPORT

Application number

DOCUMENTS CONSIDERED TO BE RELEVANT

EP 89311200.3

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int Cl 5)
A	EP - A1 - 0 251 802 (HAMAMATSU) * Totality * --	1,6	B 26 D 5/06
A	US - A - 4 555 967 (JUMEL) * Totality * ----	1,6	

TECHNICAL FIELDS SEARCHED (Int. Cl 5)

B 26 D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
VIENNA	15-02-1990	TRATTNER

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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