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(54) **Improved envelope processing machine having visual processing verification means.**

(57) There is disclosed a new and improved envelope processing machine. The machine includes a processing station (54) arranged to present each envelope in an opened condition to an operator in one-by-one relation to facilitate the removal of contents from or the insertion of materials into the envelopes by the operator. A detecting means (70) downstream from the processing station (54) acts upon the envelopes one at a time for sensing a predetermined event corresponding to the suspected absence of complete removal of the contents from or complete insertion of materials into the envelopes. An illumination means (80) actuable in response to the detecting means sensing the predetermined event is arranged to direct light through the envelopes to afford visual verification of the predetermined event by the operator.

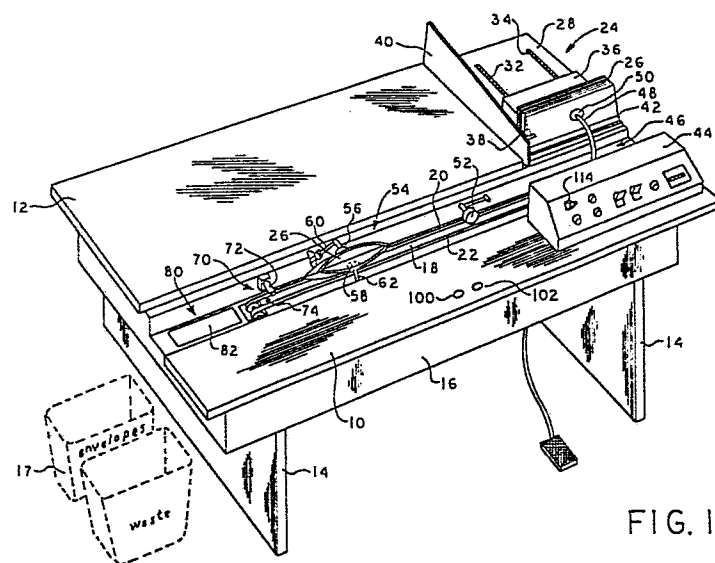


FIG. 1

5 IMPROVED ENVELOPE PROCESSING MACHINE
 HAVING VISUAL PROCESSING VERIFICATION MEANS

Background of the Invention

10 The present invention relates to a new and improved
 envelope processing machine, and more particularly to a
 processing machine which facilitates the manual removal of
 contents from or the manual insertion of materials into
 the envelopes by an operator and which includes visual
 verification means to afford visual verification by the
15 operator of suspected incomplete envelope processing.

 Envelope processing machines are known in the prior art
 wherein envelopes are removed from a supply hopper, trans-
 mitted to a cutting station where one edge of the envelope
20 is cut open, and then transmitted to a removal station
 wherein the envelope is opened and the contents are mech-
 anically extracted. One such machine is described, for
 example, in West, U. S. Patent No. 3,384,252. The present
 invention provides for the manual removal or insertion of
25 the contents of an envelope at the processing station,
 thus avoiding the complexity and problems incident to the
 operation of mechanical processing means.

30 Envelope processing machines were also known in the prior
 art wherein envelopes are removed from a supply hopper,
 severed along one edge at a cutting station, and trans-
 mitted to a station whereat the envelope is opened and
 held open for manual removal of the contents. Such a
 machine is fully described and claimed in U.S. applica-
35 tion Serial No. 801,454 filed May 31, 1977, now Patent
 No. 4,159,611, which is assigned to the assignee of the
 present invention. The machine there described includes
 a plurality of reciprocating arms with each arm termin-
 ating with a suction cup coupled to a source of negative

air pressure. One such arm is located at the envelope
5 hopper where the suction cup engages the envelopes one at
a time and pulls the envelopes to a conveyor. The suction
cup is able to grip the envelopes due to the air suction
at the suction cups. Similarly, a pair of such arms are
located at the processing station with each arm having a
10 suction cup arranged to engage respective opposite side
panels of the envelopes for gripping and separating the
side panels to dispose the envelopes in an open condition
to an operator. Again, the suction at the suction cups
facilitates the gripping of the envelope side panels.

15 In addition to the foregoing, the above mentioned envelope
processing machine includes a candler device located at
the end of the conveyor which includes a light source
and a light sensitive element which are spaced apart for
20 receiving the envelopes therebetween as the envelopes
exit the processing station. The light sensitive element
senses the intensity of the light from the light source
which passes through the envelope. When the light intensi-
ty received by the light sensitive element is below a
25 predetermined intensity, incomplete removal of the contents
from the envelope is suspected and responsive to such
detection, operation of the machine is halted and a small
alert light is lit to notify the operator of the suspected
incomplete removal of the contents. To insure that all of
30 the contents are removed from each envelope before the
envelopes are discarded, the candler device is set so
as to function conservatively. In other words, the candler
device is set so that it will cause machine operation
interruption and the warning light to be lit more often
35 than is actually necessary.

Although the aforementioned envelope processing machine
has met with considerable success in facilitating the
manual removal of contents from envelopes, it has been
found in practice that when the candler device detects

5 the presence of unremoved contents from an envelope and
interrupts the operation of the machine and lights the
warning light, it is necessary for the operator to
manually pick up the envelope, part the side walls of the
envelopes, and look inside to verify whether all of the
10 contents have been removed therefrom. Obviously, this man-
ner of verifying the accuracy of the candler device
reduces the speed in which envelopes are processed. Not
only must the operator physically open the envelope to
see whether all of the contents have been removed there-
15 from, but additionally, during the time in which the
operator performs this verification function, the machine
is held stationary and not processing envelopes.

20 It is therefore an object of the present invention to
provide a new and improved envelope processing machine.

It is a more particular object of the present invention
to provide an envelope processing machine which facili-
tates the manual removal or insertion of materials of an
envelope which includes a detecting means for detecting
25 the incomplete processing of the envelopes and a means by
which the suspected incomplete processing of an envelope
may be readily verified.

30 It is a still further object of the present invention to
provide a new and improved envelope processing machine
wherein the suspected incomplete processing of an envelope
may be visually verified by an operator without requiring
the operator to physically open the envelope and view
inside.

35 The invention therefore provides a machine for processing
envelopes which includes a processing station arranged to
present each envelope in an opened condition to an
operator in one-by-one relation to facilitate the removal

5 of contents from or the insertion of materials into the
envelopes by the operator. The machine further includes
detecting means for acting upon the envelopes one at a
time for sensing a predetermined event corresponding to
suspected incomplete removal of the contents from or
incomplete insertion of materials into the envelopes, and
10 illumination means actuatable in response to the detecting
means sensing the predetermined event for directing light
through the envelopes to afford visual verification of
the predetermined event by the operator.

15 Brief Description of the Drawings

The features of the present invention which are believed
to be novel are set forth with particularity in the
appended claims. The invention, together with further
objects and advantages thereof, may best be understood
20 by making reference to the following description taken in
conjunction with the accompanying drawings, where, in the
several figures like reference numerals identify identical
elements, and wherein:

25 FIG. 1 is a general perspective view showing the machine
of the present invention in accordance with one selected
embodiment thereof;

30 FIG. 2 is a partial top plan view to an enlarged scale
with portions cut away of the machine of FIG. 1 particularly
showing an envelope processing verification means embodying
the present invention;

35 FIG. 3 is a partial cross sectional side view taken along
lines 3-3 of FIG. 2;

FIG. 4 is a top plan view of the verification means of
the present invention showing the operation thereof
in verifying the presence of detected unremoved contents

of an envelope; and

FIG. 5 is a partial schematic wiring diagram of the candling mechanism and verification means embodying the present invention.

Description of the Preferred Embodiment

Referring now to FIG. 1, the envelope processing machine thereshown constructed in accordance with the present invention generally includes lower and upper offset table structures 10 and 12 supported at table height by legs 14. The upper table 12 covers the internal mechanism of the machine and conveniently provides a work and table surface. The operator sits facing the lower table surface 10 and the front panel of the machine indicated by reference numeral 16. Between the upper table 12 and lower table 10 there is disposed a substantially horizontal plate 18 which extends across substantially the entire width of the machine. The plate 18 supports a pair of endless conveyor belts 20 and 22 which form an envelope transmitting means for conveying the envelopes to be processed from one station of the machine to the next in succession.

To the right of the upper table surface 12 there is provided a supply hopper 24 arranged to contain a plurality of envelopes 26 to be processed. The hopper 24 includes an inclined surface 28, a pair of endless belts 32 and 34 arranged to travel along the surface 28, a weight block 36, and a retainer 38 which projects in the direction of the envelopes 26 from a side abuttment plate 40. The envelopes 26 are arranged in stacked relationship and held in that position against the abuttment plate 40 by the coaction of the retainer 38, the weight 36, and an upwardly projecting lip 42 of the surface 28.

5 Between the hopper 24 and the control box 44 of the machine there is provided a feed means 46 which includes a reciprocating arm 48 and an envelope gripper 50. As fully described in the aforementioned Patent No. 4,159,611, the gripper 50 comprises a suction cup which is connected
10 to a source of negative air pressure by the reciprocating arm 48. As a result, the air suction at the suction cup causes the envelope to be gripped by the feed means 46. The arm 48 is arranged to pivot from a retracted position whereat the gripper 50 is beneath the plate 18 to the
15 illustrated position in FIG. 1 for gripping the envelopes 26 one at a time and placing the envelope onto the conveyor belts 20 and 22. As the arm 48 pivots to its retracted position, the envelope held by the gripper 50 is pulled free of the retainer 38 and downwardly to the conveyor. As the feed means 46 operates, the belts 32 and 34 travel
20 along the inclined surface 28 and the weight 36 descends along the inclined surface 28 to provide a continuous supply of stacked envelopes 26 for the feed means 46.

25 Once the envelopes are placed upon the conveyor, they are transmitted, one at a time, to the left as seen in the figure to a rotary cutting blade (not shown) which severs the envelopes along an edge thereof. Immediately after being severed by the rotary blade, the envelopes are then
30 conveyed by the belts 20 and 22 to the processing station whereat the envelopes are opened and retained in an opened position to afford ready extraction of the contents therein by an operator. In being so conveyed, the envelopes are caused to pass beneath a pressure roller 52 which
35 assures firm engagement of the envelopes with the belts 20 and 22.

The envelope processing station 54 includes an envelope opening means comprising a pair of envelope grippers 56

5 and 58 which are substantially identical to the gripper
50 of the feed means 46. The grippers 56 and 58 are
carried by reciprocating arms 60 and 62 respectively
which also serve to connect the grippers 56 and 58 to a
source of negative air pressure. Also as described in
10 the aforementioned Patent No. 4,159,611, the arms 60 and
62 are arranged for reciprocal movement so as to cause
the grippers 56 and 58 to engage and separate the
opposing side panels of the envelope 26 to thereby present
the envelopes to the operator in an opened condition as
15 illustrated. When the envelope is so positioned, the
machine may be set by the control box 44 to have a
preset dwell time whereby the envelope is remained opened
for a sufficient period of time to facilitate manual
extraction of the contents therefrom by an operator.

20 Now that the envelope has been opened, its contents
removed, and once again placed upon the belts 20 and 22,
the envelope is caused to be conveyed to a detecting station
70 which detects a predetermined event corresponding to
25 the presence of unremoved contents within the envelope.
The detecting station 70 includes a detecting means taking
the form of a candling mechanism comprising a light source
72 and a light sensitive element or photocell 74. The
light source 72 and photocell 74 are spaced apart for
30 receiving the envelope therebetween. The detecting
station 70 operates in such a manner that when the light
reaching the photocell 74 from the light source 72 passing
through the envelope is of an intensity below a predetermined
intensity, as for example when contents from an envelope
35 have been overlooked or otherwise not removed, the machine
will index by operating the belts 20 and 22 to convey
the envelope to an illumination station 80 and thereafter
stop until being reset by the operator depressing a reset
switch 100. After the machine conveys the envelope to
the illumination station 80 and thereafter stops, the

5 illumination station 80 will be actuated responsive to
the detecting station 70 sensing the predetermined event
corresponding to incomplete envelope processing, as, for
example, the presence of unremoved contents from an
envelope.

10

Referring now to FIGS. 2 and 3, it can be noted that the
illumination station includes a light transmissive top
plate 82 extending beneath and substantially parallel to
the top plate 18 adjacent to the belts 20 and 22 of the
15 conveyor. The top plate 82 may be formed from, for
example, clear glass, frosted glass, or the like. Beneath
the top plate 82 is provided a housing 84 which includes
a pair of sidewalls 86 and 88 and a bottom wall 90.
Within the housing 84 there is provided a light source
20 comprising, for example, a pair of instant-on florescent
lights which are mounted to the bottom wall 90 by a first
pair of socket fixtures 96 and 98 respectively and a second
pair of such sockets (not shown) at the opposite end of
the housing 84.

25

The interior surfaces of the walls 86, 88 and 90 of the
housing 84 preferably include a reflective coating. As a
result, when the florescent bulbs 92 and 94 are actuated,
the light which they emit will be directed upwardly through
30 the envelope which has been received thereon.

FIG. 4 illustrates the operation of the illumination
station 80 in verifying the presence of unremoved contents
from an envelope as detected by the detecting station 70.

35

As can be seen in the figure, the envelope 26 has been
deposited upon the top surface of the plate 82. Because
the light from the florescent bulbs 92 and 94 is directed
upwardly through the plate 82, the outline of the envelope

5 26 may be readily viewed. More importantly, because less
light will be transmitted through the unremoved contents
26a within the envelope, the surface area of the envelope
overlying the unremoved contents 26a will appear darker
than the margins 26b between the periphery of the unremoved
10 contents 26a and the periphery of the envelope 26. As a
result, the presence of the unremoved contents 26a within
the envelope 26 as detected by the detecting station 70
may be readily and visually verified by the operator with-
out requiring the operator to manually open the envelope
15 and view inside.

Of course, should the light passing through the envelope
26 be of uniform intensity over the entire envelope, the
operator will know that all of the contents have been
20 removed and that the detecting station 70 was in error.
After verifying the presence of the unremoved contents
within the envelope, the operator then must, of course,
remove the unremoved contents and then deposit the envelope
into the appropriate receptacle 17 provided at the end of
25 the machine.

Once the presence or absence of unremoved contents within
the envelope has been dealt with, the operator may resume
operation of the machine by depressing the reset switch
30 100. As will be clear subsequently, another switch referred
to herein as a set switch or "when in doubt" switch 102 is
provided so that the operator may simulate the control
signal provided by the detecting station 70 upon sensing
the predetermined event. As a result, a manual set is
35 provided by which the operator may initiate verification
even though the detecting station 70 did not detect incom-
plete processing of an envelope. In simulating the
operation of detecting station 70 by depressing the set
switch 102, the machine will operate in the previously

5 described manner by indexing the envelope suspected by
the operator of receiving incomplete processing to the
illumination station 80. Thereafter, visual verification
of the envelope may be performed in the previously
described manner until the reset switch 100 is again
depressed.

10

Referring now to the schematic wiring diagram of FIG. 5,
a pair of terminals 110 and 112 are adapted for connection
to an AC power source. The candling mechanism, in addition
to the light source 72 and the photocell 74 includes an
15 on-off switch 114, a primary variable resistor 116, a
secondary variable resistor 118, a variable capacitor
120, and a candler mechanism relay 122. The circuit of
FIG. 5 also includes the reset switch 100, the set switch
102, and the florescent light bulbs 92 and 94 of the
20 illumination station 80. Although the set switch 102 is
shown in an opened condition, the set switch 102 is pre-
ferably a normally closed switch which, unless depressed,
is in the condition as illustrated by the dashed lines.
Additionally, for a complete schematic wiring diagram
25 illustrating the remaining electrical connections associated
with the machine of the present invention, reference may
be had to the previously mentioned patent application
Serial No. 801,454.

30 The candler relay 122 preferably has a built in delay so
that when the light reaching the photocell 74 drops below
a predetermined intensity, as for example when contents
from an envelope have been overlooked or otherwise not
removed, the increased resistance thereby introduced into
35 the control circuit by the photocell 74 will cause the
candler relay to allow the machine to index for depositing
the envelope onto the illumination station and thereafter
cut off the power supply and immediately stop the machine.
Additionally, when the machine is stopped, the candler

relay 122 will cause the florescent bulbs 92 and 94 of the
5 illumination station 80 to be actuated. To vary the critical
control resistance, to accommodate for envelopes of different
thicknesses and character of paper, a primary voltage
resistor 116 is provided for major adjustment, and a second
variable resistor 118 is provided for secondary or
10 micrometer adjustment. Also, so that the machine will not
be stopped at the double thickness of the relatively
narrow seams of the envelope as it passes the photocell
74, the variable capacitor 120 is provided, so that the
transitory fluctuation due to such envelope seams will not
15 interrupt the operation of the machine.

After an improperly emptied envelope is retrieved and
acted upon by the operator, the reset switch 100 is actuated
to turn off the florescent light bulbs 92 and 94 of the
20 illumination station 80 and restore operation of the machine.
When the operator wishes to manually simulate the detector
station and provide the high resistance control signal
normally provided by the photocell 74 of the detecting
station 70, the operator depresses the set switch 102 so
25 as to open the set switch 102. When the set switch is
opened, the increased resistance introduced into the control
circuit by the opening of the switch 102 will cause the
machine to act as previously described for indexing the
envelope onto the illumination station, for stopping the
30 machine, and for actuating the illumination means.

While this preferred embodiment has been generally directed
to an envelope processing machine which facilitates the
manual removal of contents from envelopes, it can of
35 course be appreciated that the present invention is not
so limited, and, in fact, is also particularly adapted for
use in an envelope processing machine which facilitates the
manual insertion of materials into envelopes as well. For
either type of envelope processing machine, it can be seen

5 from the foregoing that the present invention provides a
new and improved envelope processing machine whereby the
incomplete removal or insertion of contents of envelopes
may be readily verified by an operator. More particularly,
such a condition may be visually verified by the operator
10 without requiring the operator to manually open and view
into the suspected envelope.

While a particular embodiment of the present invention
has been shown and described, modifications may be made,
15 and it is therefore intended to cover in the appended
claims all such changes and modifications which fall
within the true spirit and scope of the invention as
defined by said claims.

20

CLAIMS:

1. A machine for processing envelopes characterized by a processing station (54) arranged to present each
5 envelope in an opened condition to an operator in one-by-one relation to facilitate the removal of contents from or the insertion of materials into the envelopes by the operator; detecting means (70) for acting upon the envelopes one at a time for sensing a predetermined
10 event corresponding to suspected incomplete removal of the contents from or incomplete insertion of materials into the envelopes; and illuminating means (80) actuatable in response to said detecting means sensing said predetermined event for directing light through
15 the envelope to afford visual verification of said predetermined event by the operator.
2. A machine as defined in claim 1 further characterized in that said processing station (70) is arranged
20 to be disabled responsive to said detecting means sensing said predetermined event.
3. A machine as defined in claim 2 further characterized by reset means (100) for disabling said illumination means and enabling said processing station.
25
4. A machine as defined in claim 1 further characterized by set means (102) for actuating said illumination means manually by an operator independently of said
30 detecting means.
5. A machine as defined in claim 4 further characterized in that said processing station (54) is arranged to be disabled responsive to said set means.

6. A machine as defined in claim 5 further characterized by reset means (100) for disabling said illumination means and enabling said processing station.

5 7. A machine as defined in claim 1 further characterized by means (20, 22) for conveying said envelopes from said processing station (54) to said detecting means (70) in a substantially horizontal orientation and wherein said illumination means (80) comprises a
10 substantially horizontal light transmissive top plate (82) and a light source (92, 94) beneath said top plate (82), and further characterized in that said conveying means (20, 22) is arranged to convey the envelopes to said top plate (82) for being supported by said top
15 plate (82).

8. A machine as defined in claim 1 further characterized in that said detecting means comprises a light source (72) and a light sensitive element (74) arranged
20 to receive light from said light source, wherein said light source (72) and said element (74) are spaced apart for receiving the envelopes therebetween, and wherein said detecting means (70) senses said predetermined event when the light from said source (72) passing through an envelope and received by said element
25 (74) is below a predetermined intensity.

9. A machine which facilitates the removal of contents from envelopes characterized by a processing station
30 (54) arranged to present the envelopes in an opened condition to an operator in one-by-one relation to facilitate the removal of the contents from the envelopes by the operator; detecting means (70) for sensing the presence of unremoved contents within the envelope
35 and for providing a control signal responsive thereto;

and illumination means (80) arranged to receive the envelopes after being sensed by said detecting means and actuatable responsive to said control signal for directing light through the envelope to afford visual
5 verification by the operator of the presence of un-removed contents.

10. A machine as defined in claim 9 characterized in that said processing station (54) is arranged to be
10 disabled responsive to said control signal.

11. A machine as defined in claim 10 further characterized by set means (102) for manually generating said control signal for actuating said illumination means
15 (80) and disabling said processing station (54).

12. A machine as defined in claim 11 further characterized by reset means (100) for disabling said illumination means (80) and enabling said processing station
20 (54).

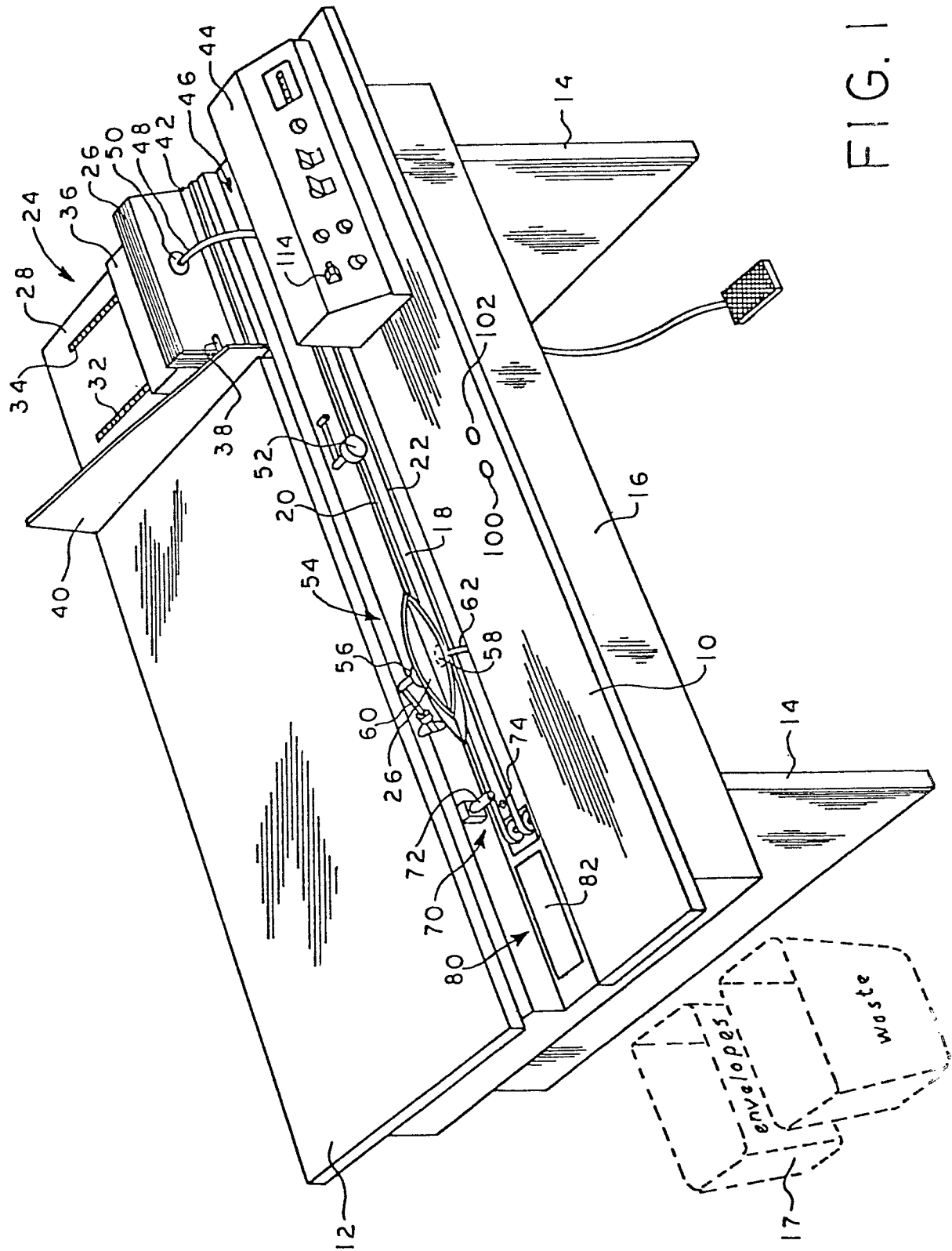


FIG. 1

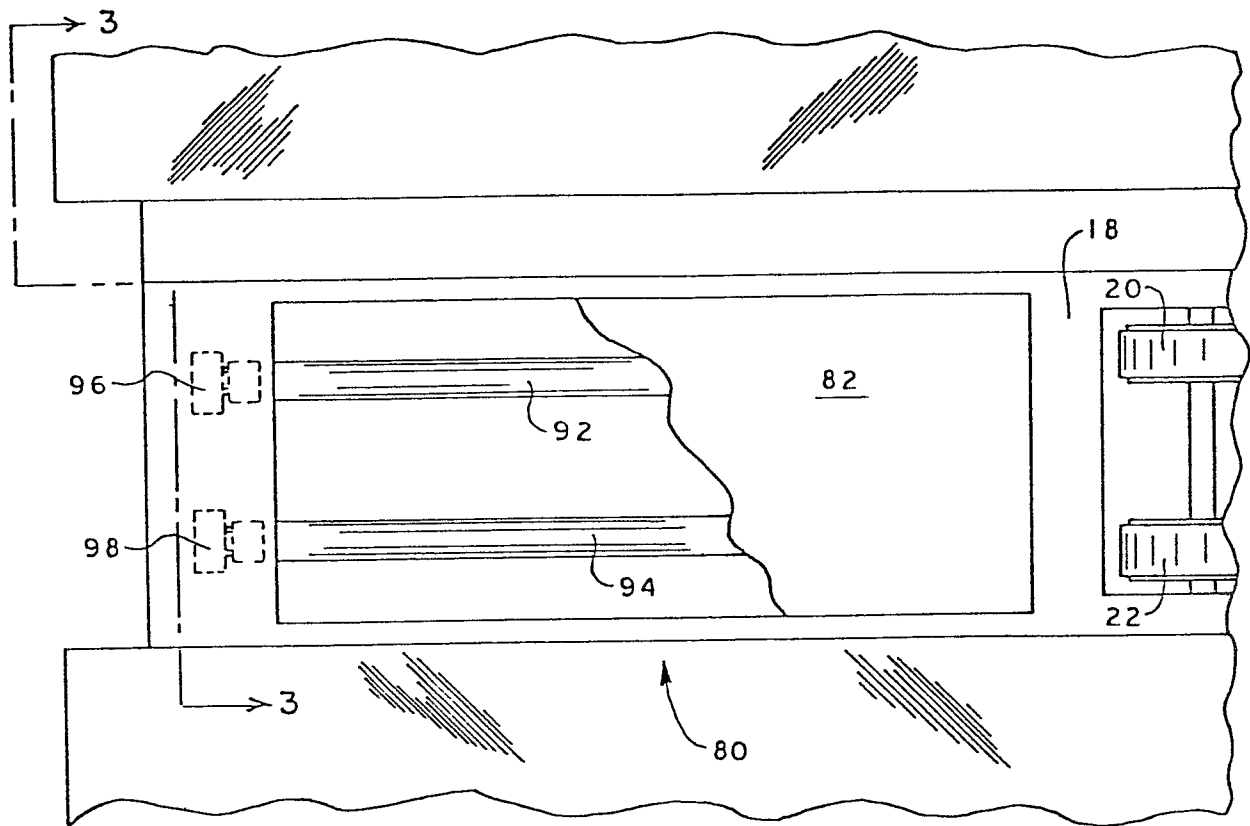


FIG. 2

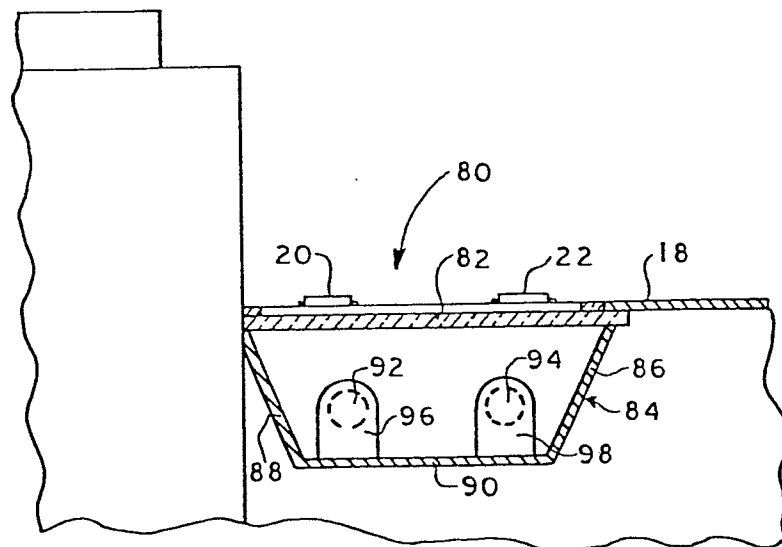
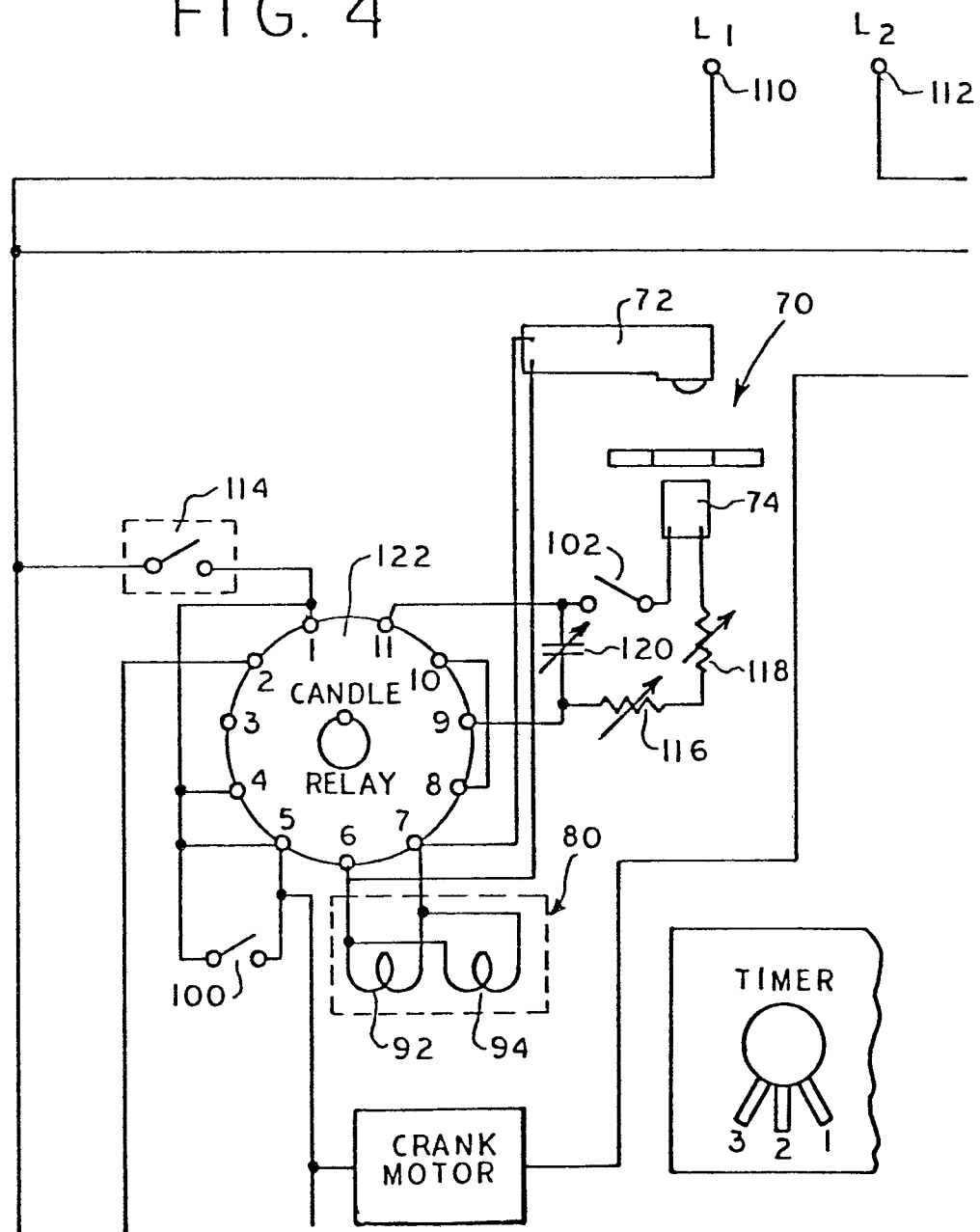
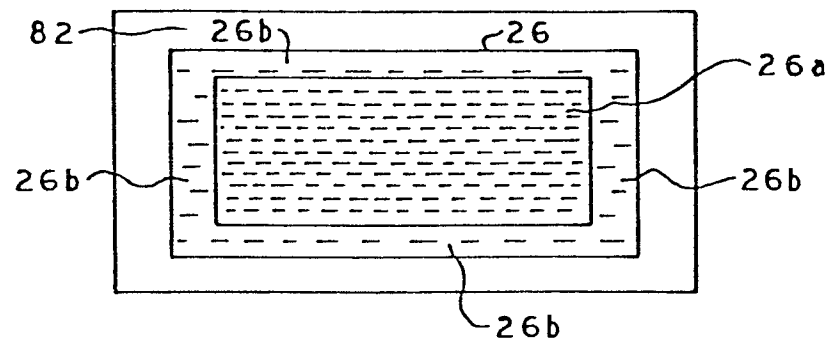


FIG. 3





European Patent
Office

EUROPEAN SEARCH REPORT

0025294

Application number

EP 80 30 2859

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl. 3)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
	<u>US - A - 3 979 884 (RUSSELL)</u> * Claims 1,5; column 3, line 67 to column 4, line 7 *	1,8,9	B 43 M 7/02 3/00
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D	<u>US - A - 4 159 611 (RUSELL)</u> * Column 8, lines 17-24; column 10, lines 16-30; claims 1, 17-19 *	1,2, 8-10	
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A	<u>US - A - 3 152 800 (HANSON)</u> * Column 9, lines 37-39 *	1	TECHNICAL FIELDS SEARCHED (Int. Cl. 3) B 43 M 3/00 5/00 7/00
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	<u>US - A - 4 124 968 (STEVENS)</u> * Column 7, line 14 to column 8, line 43 *	1,2, 8-10	
	--		
A	<u>CH - A - 410 494 (GEBR. MAAG)</u> * Page 1, line 50 to page 2, line 8 *	1	

			CATEGORY OF CITED DOCUMENTS
			X: particularly relevant A: technological background O: non-written disclosure P: intermediate document T: theory or principle underlying the invention E: conflicting application D: document cited in the application L: citation for other reasons
			&: member of the same patent family, corresponding document
☒ The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 14-10-1980	Examiner LAMMINEUR