United States Patent [19]

Berger

[11] **3,815,325**

[45] **June 11, 1974**

[54] **MECHANISM FOR OPENING ENVELOPES**

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[73] Assignee: **Thor Dahl, Inc.,** New York, N.Y.

[22] Filed: **June 14, 1972**

[21] Appl. No.: **262,762**

[52] **U.S. Cl.** ..... **53/381 R,** 83/912, 156/5, 156/154

[51] **Int. Cl.** **B65b 69/00**

[58] **Field of Search** ..... 53/381 R; 83/912; 118/316, 118/324, 64, 2, 8, 642, 643; 134/199; 156/5, 153, 154, 384

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Primary Examiner—Travis S. McGehee
Assistant Examiner—Horace M. Culver
Attorney, Agent, or Firm—Holland, Armstrong, Wilkie & Previto

[57] **ABSTRACT**

A machine for opening envelopes chemically which automatically loads a number of pre-treated envelopes onto a specially constructed tray; applies a developing solution thereto; and mechanically separates those areas of the envelopes which have been treated to open the envelopes.

29 Claims, 16 Drawing Figures

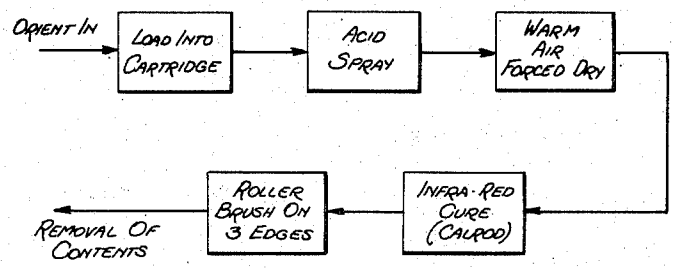
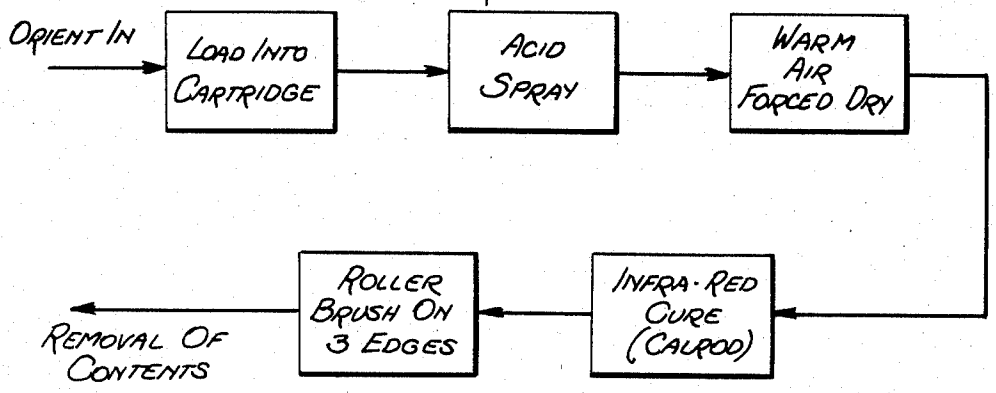


Fig. 1.


ORIENT IN
LOAD INTO CARTRIDGE
ACID SPRAY
WARM AIR FORCED DRY
INFRA-RED CURE (CALROD)
ROLLER BRUSH ON 3 EDGES
REMOVAL OF CONTENTS

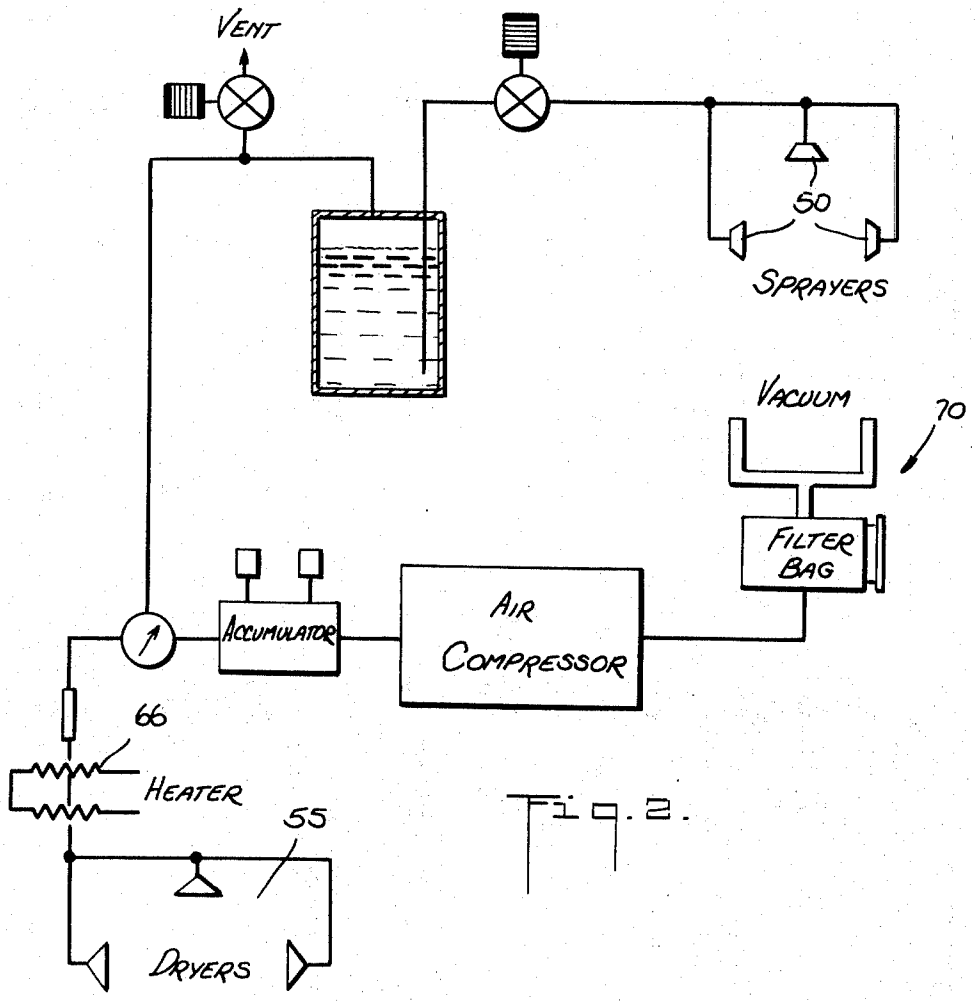

VENT
50
SPRAYERS
VACUUM
70
FILTER BAG
ACCUMULATOR
AIR COMPRESSOR
66
HEATER
55
DRYERS

Fig. 2.

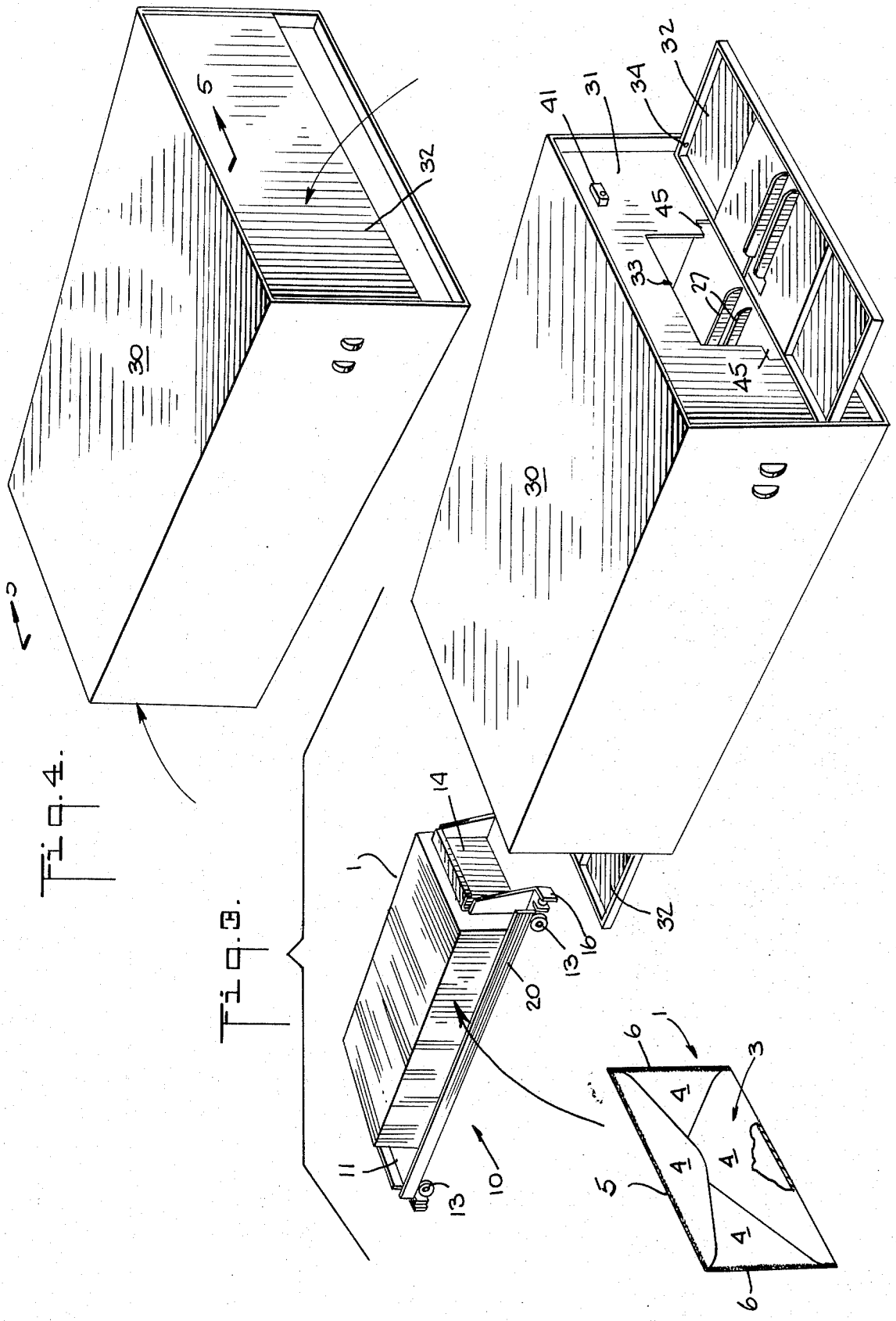


Fig. 4.

Fig. 5.

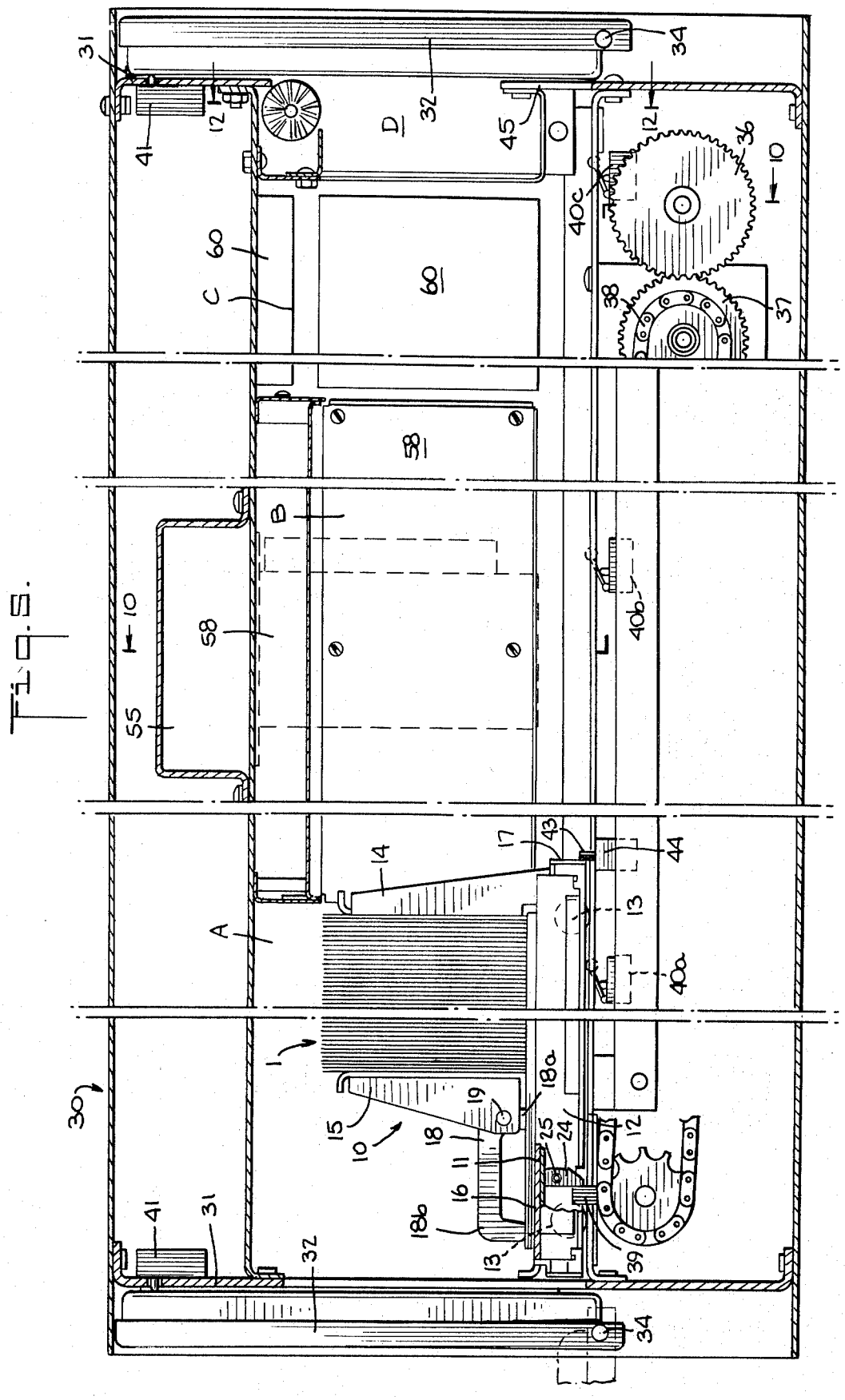

31
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12
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45
41
D
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36
10
40c
60
C
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38
37
58
B
10
58
40b
L
55
43
17
44
14
13
A
40a
1
18a
19
30
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18
25
24
12
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16
18b
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34

Fig. 5.

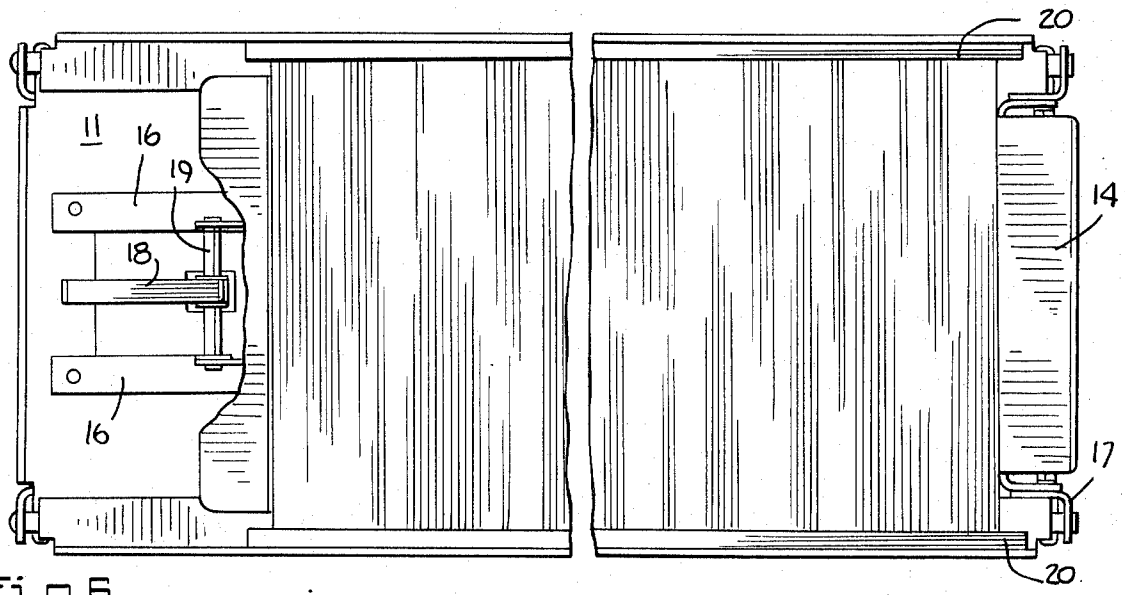


Fig. 6.

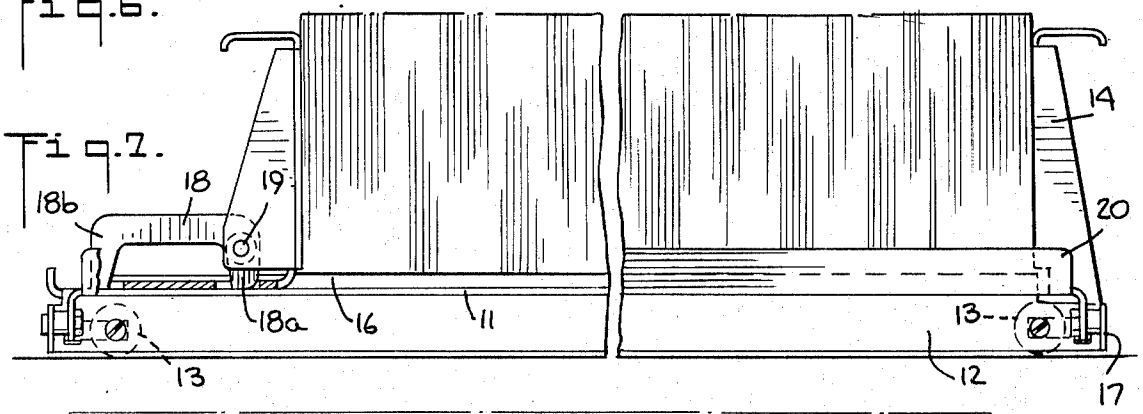


Fig. 7.

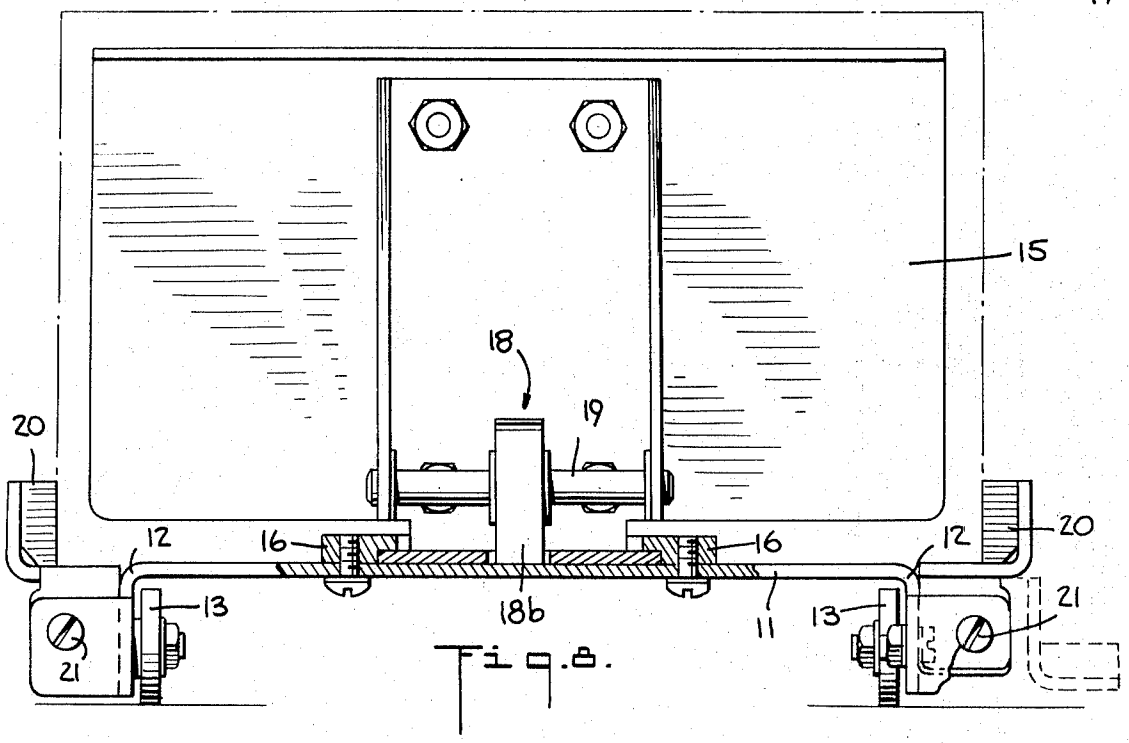


Fig. 8.

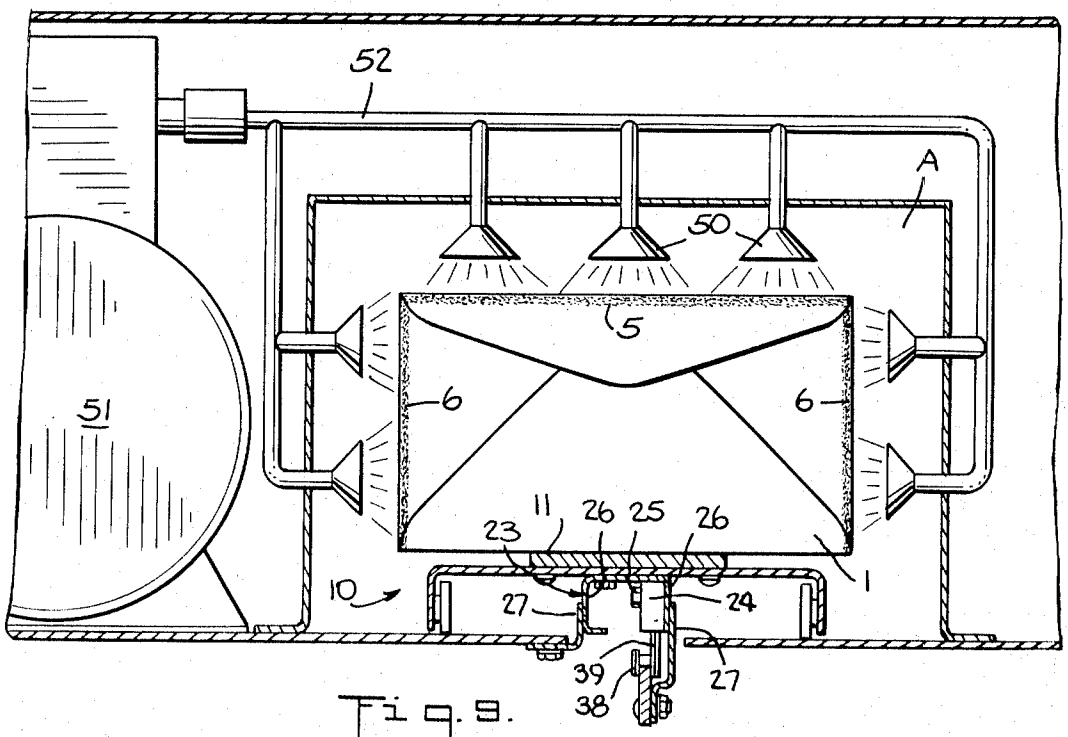

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A
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11
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Fig. 9.

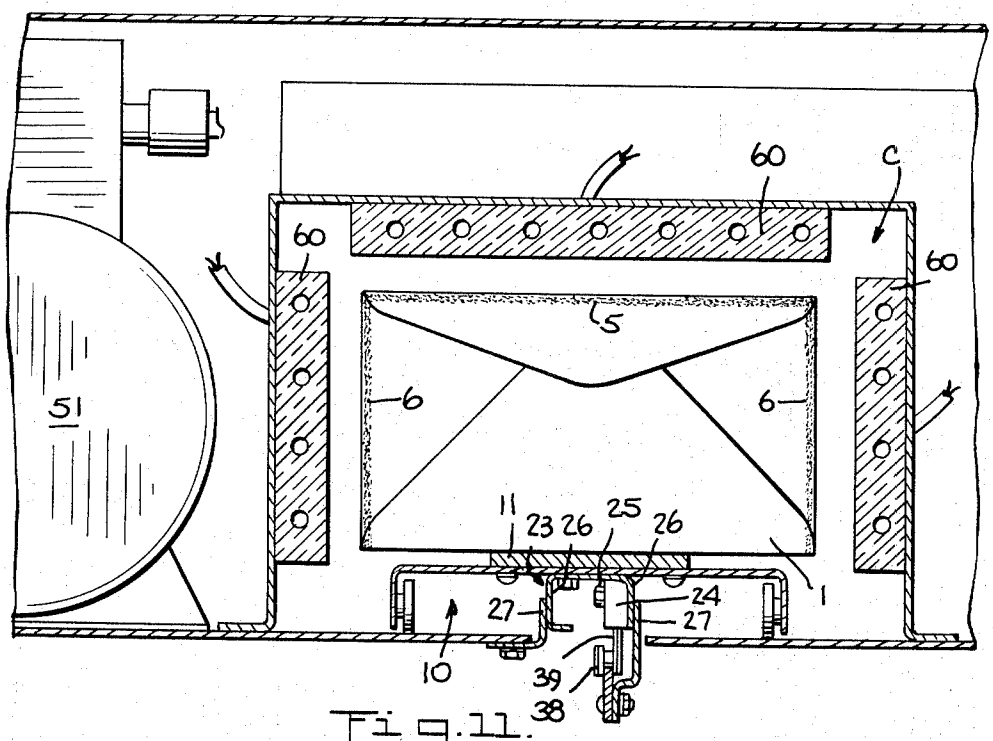

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Fig. 11.

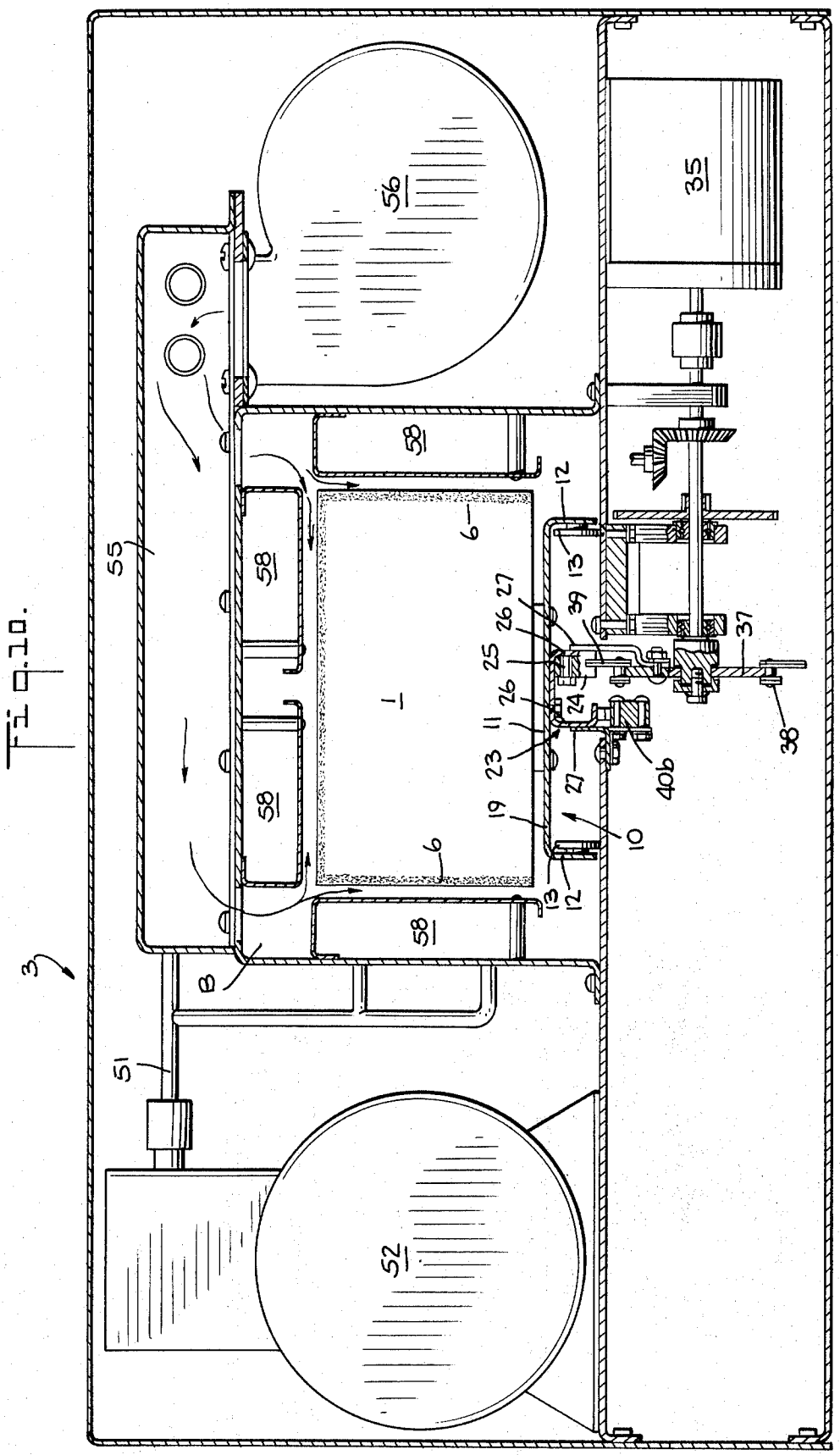

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B
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Fig. 10.

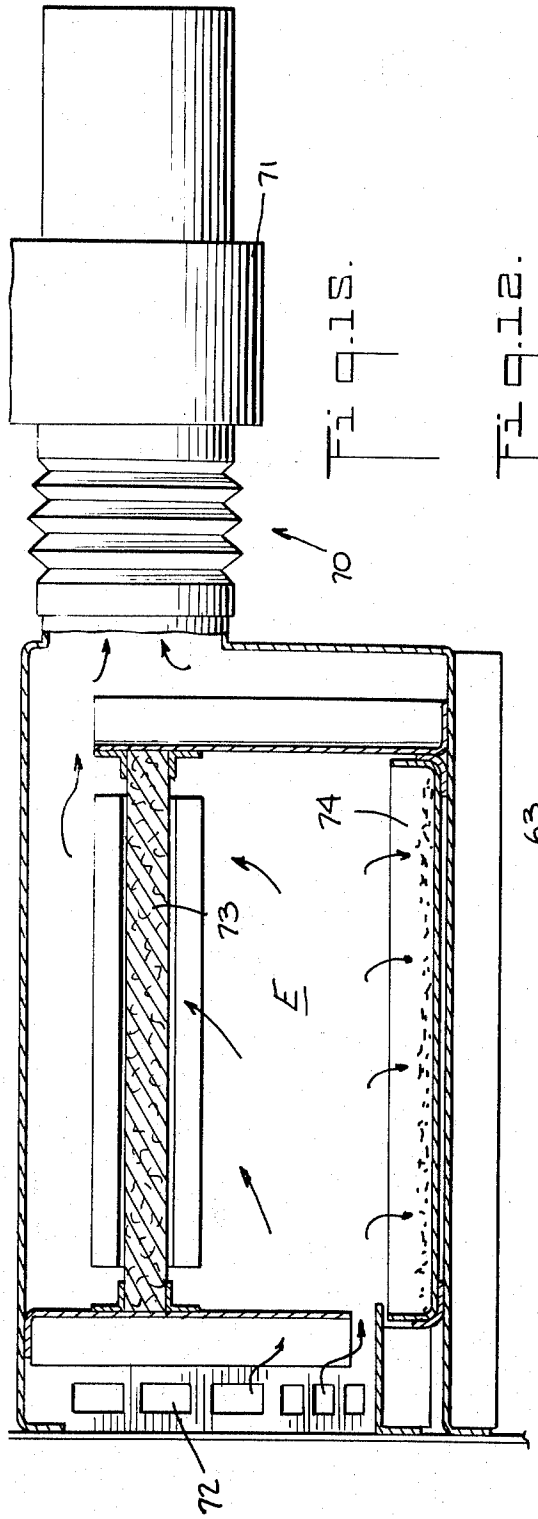
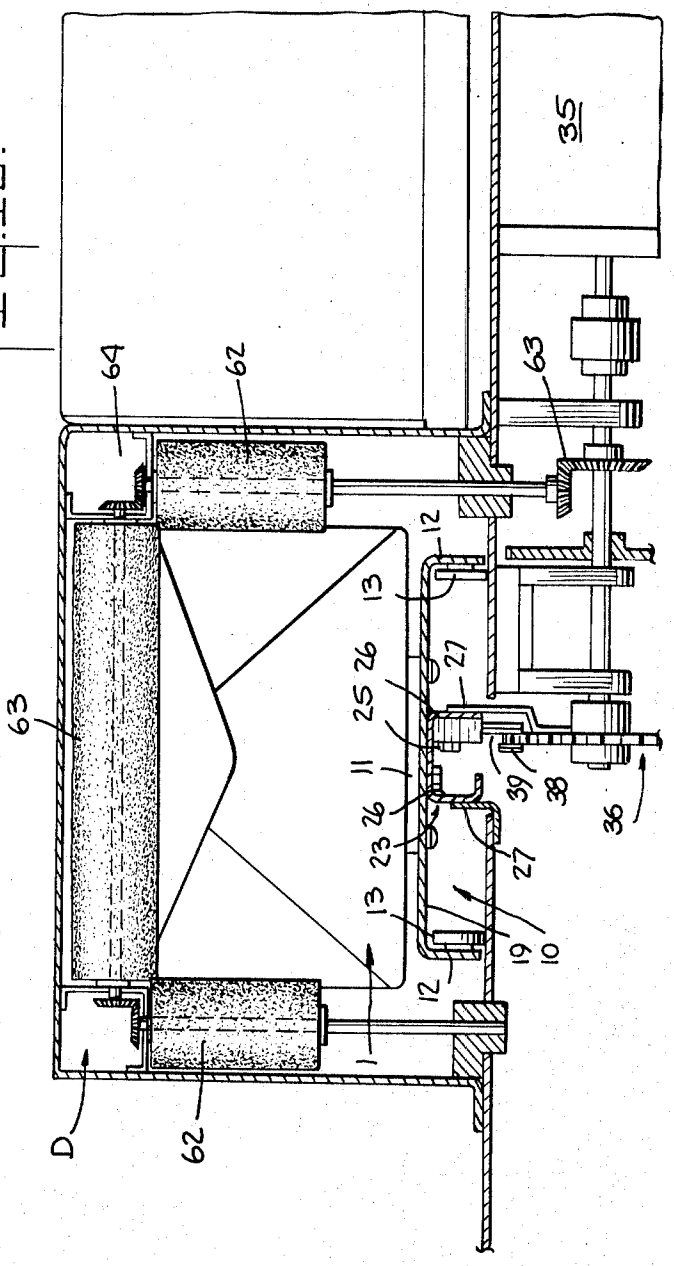


Fig.15.

Fig.12.



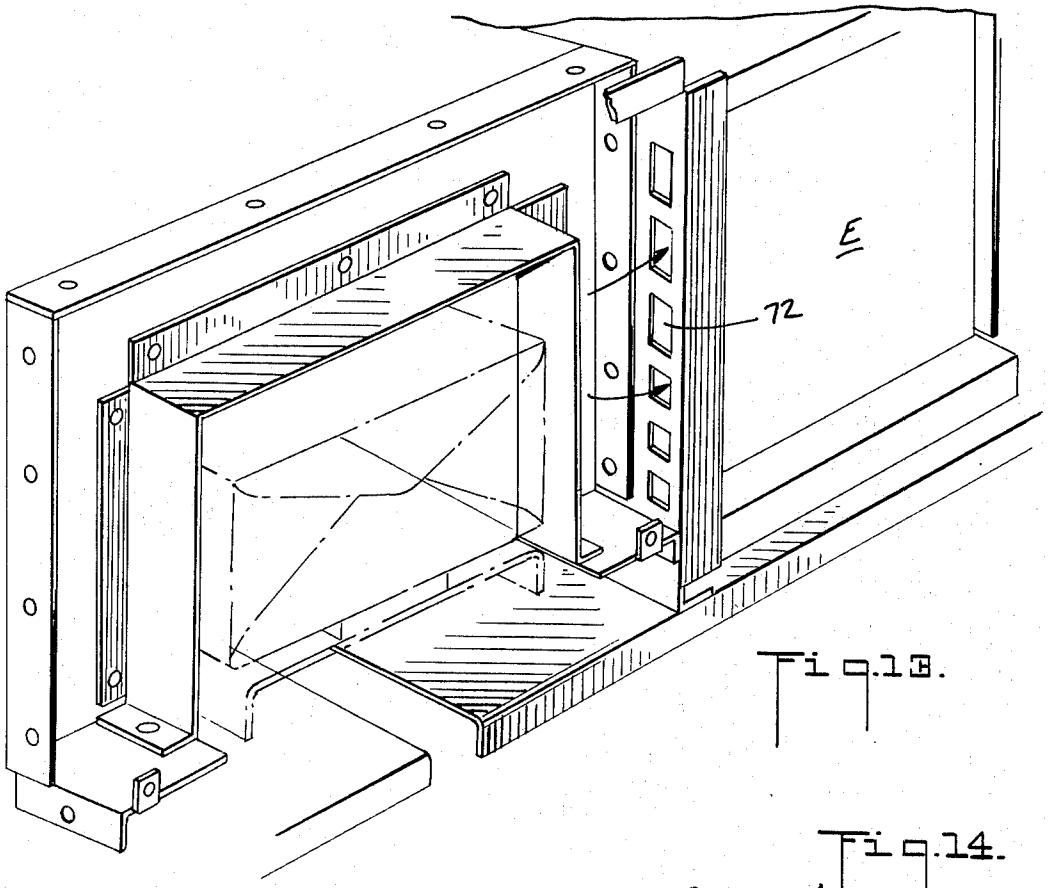


Fig. 13.

Fig. 14.

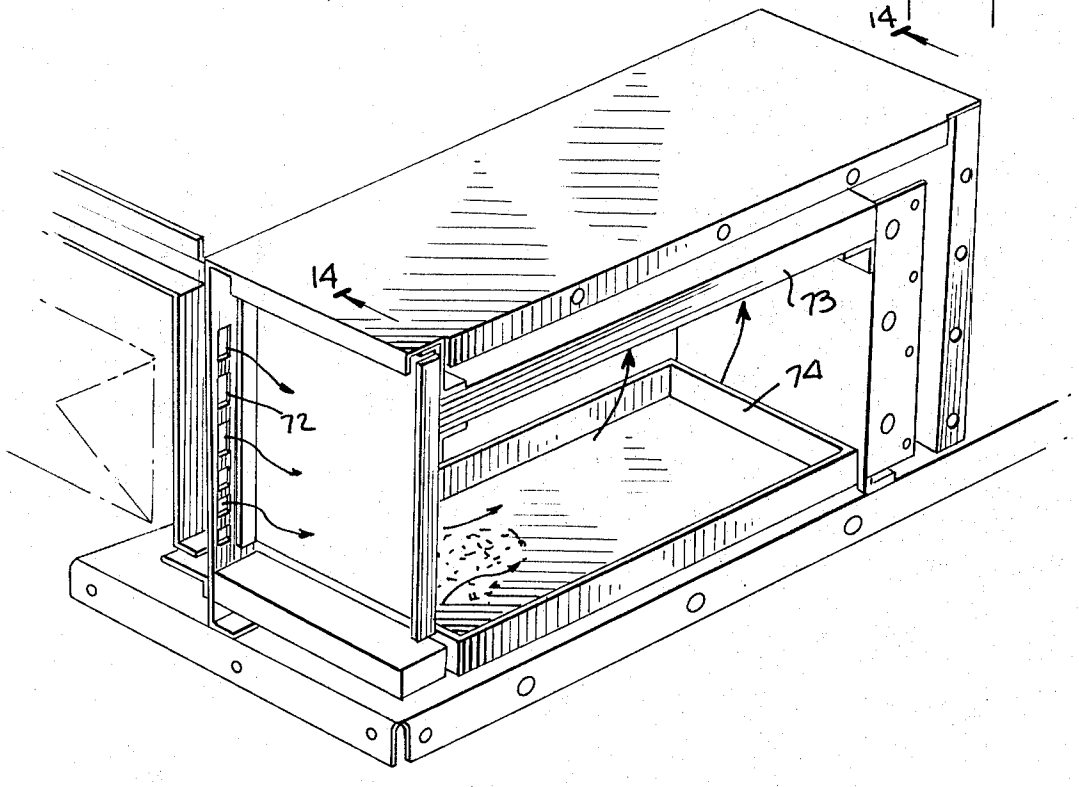
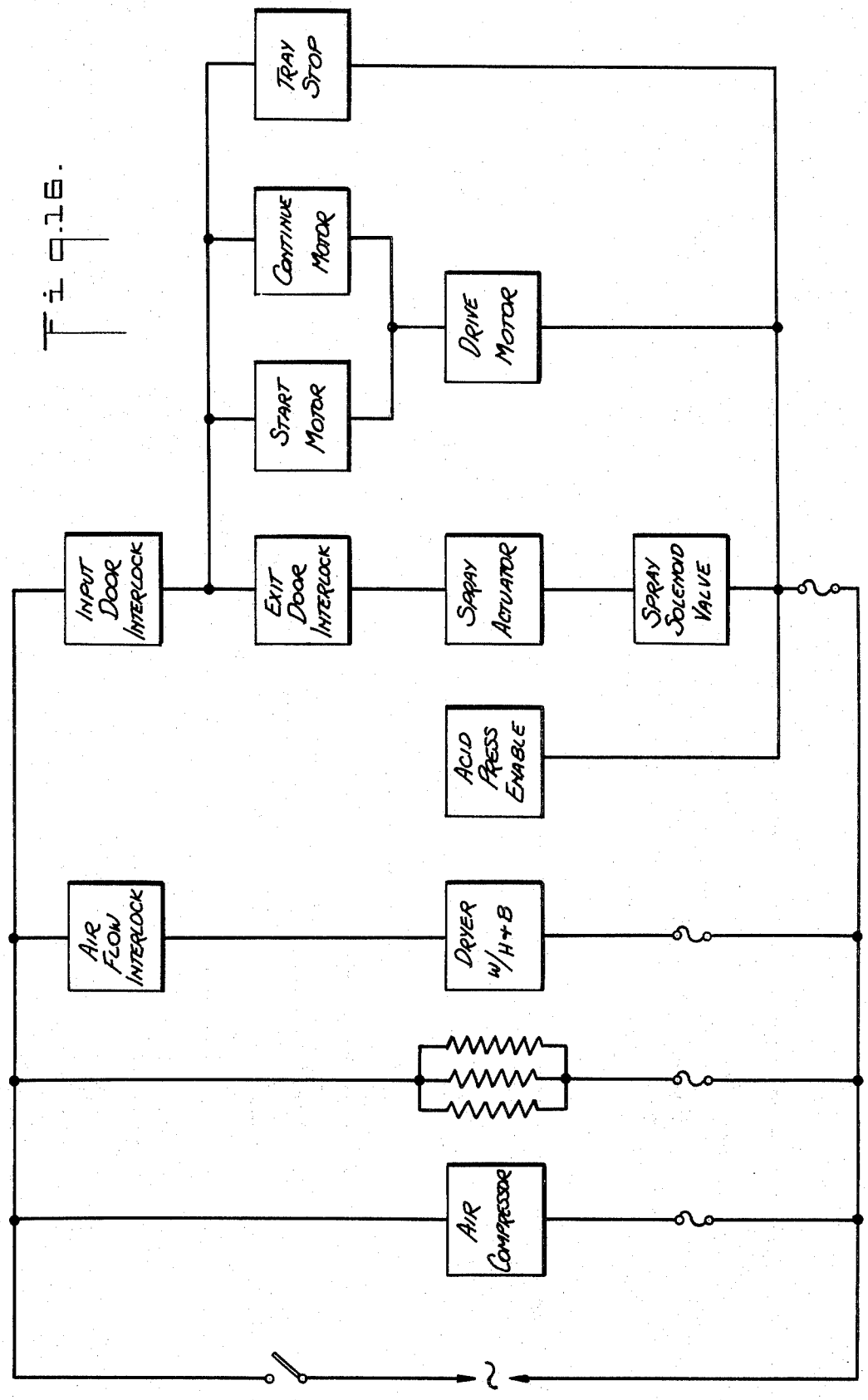


Fig. 16.


TRAY STOP
CONTINUE MOTOR
START MOTOR
DRIVE MOTOR
INPUT DOOR INTERLOCK
EXIT DOOR INTERLOCK
SPRAY ACTUATOR
SPRAY SOLENOID VALVE
ACID PRESS ENABLE
AIR FLOW INTERLOCK
DRYER W/H+B
AIR COMPRESSOR

MECHANISM FOR OPENING ENVELOPES

DESCRIPTION

The opening of envelopes which are received in large quantities by advertisers, publishers, etc. has become an increasingly expensive and time consuming problem. Manual methods of opening such envelopes are tedious and require expensive and time consuming efforts which increases the costs. In some advertising and mailback campaigns, literally thousands of reply envelopes are received which take an inordinate amount of time to open and which require a large staff of letter openers to process.

There are automatic letter openers presently being used but it is believed that most of them comprise mechanical methods for opening the envelopes. One letter-opening method that has been recently developed comprises the chemical deterioration of three sides of the envelope to facilitate opening. Such a process involves the treatment of the edges of a standard envelope with a chemical. This first chemical is chemically activated by an additional developing chemical so as to deteriorate the paper along the edges. Thus, the sheets of the envelope along the treated edges can be separated by mild mechanical action.

It will be recognized that even such a chemical envelope-opening system would be time consuming if each envelope were to be processed individually.

The present invention avoids this problem and has for one of its objects the provision of a mechanism for permitting large numbers of envelopes to be chemically opened.

Another object of the present invention is the provision of an improved mechanism for chemically opening envelopes which automatically moves a batch of envelopes through a machine so that very little, if any, manual processing is required.

Another object of the present invention is the provision of an improved tray mechanism for transporting the envelopes through the processing unit.

Other and further objects of the invention will be obvious upon an understanding of the illustrative embodiment about to be described or will be indicated in the appended claims, and various advantages not referred to herein will occur to one skilled in the art upon employment of the invention in practice.

A preferred embodiment of the invention has been chosen for purposes of illustration and description and is shown in the accompanying drawings, forming a part of the specification, wherein:

FIG. **1** is a diagrammatic flow chart showing the manner in which a group of envelopes may be processed by the machine of the present invention;

FIG. **2** is a diagrammatic view of the units which are used in the present invention;

FIG. **3** is an exploded perspective view showing the units used in the present invention including the improved tray and the processing tunnel member;

FIG. **4** is a perspective view of the processing tunnel member when the doors are closed in its operative position;

FIG. **5** is a sectional view taken along line **5—5** of FIG. **4**;

FIG. **6** is a top view of the improved tray of the present invention;

FIG. **7** is a side view of the improved tray shown in FIG. **6**;

FIG. **8** is a rear end view of the improved tray shown in FIG. **6**;

FIG. **9** is a sectional view of the processing tunnel showing the manner of spraying the developing solution onto the tray of envelopes;

FIG. **10** is a sectional view along line **10—10** of FIG. **5** showing the drying of the envelopes;

FIG. **11** is a sectional view of the processing tunnel showing the infra-red curing section;

FIG. **12** is a sectional view along line **12—12** of FIG. **5** showing the brushes for separating the sheets of the envelopes that have been treated;

FIG. **13** is a perspective view showing the blower system of the processing tunnel;

FIG. **14** is a perspective view showing the filters for the blower system;

FIG. **15** is an end view of the blower system; and

FIG. **16** is a block diagram diagrammatically showing the control system for the mechanism of the present invention.

Referring to the drawings and more particularly to FIG. **3**, the envelope **1** which is to be processed by the present invention is a standard envelope and has rear and front panels **2** and **3**. The rear panel **3** may be formed from the usual flaps **4**, which are adhered to each other as is well known in the art. The areas adjacent some of the edges of both panels **2** and **3** are pre-treated with a chemical. In the embodiment of FIG. **3**, the pre-treated areas **5** and **6** are along the top edge and both end edges of the envelope. It will be understood, of course, that the pre-treated areas may be along all four edges or any portion of the edges **5** and **6** without departing from the spirit of the present invention.

In accordance with the present invention, the pre-treated envelope **1** is loaded onto a tray **10** with a number of other envelopes and, as shown in FIG. **1**, the tray **10** moves through a processing tunnel member **30** which processes the envelopes. First, an acid, or some other developing chemical, is sprayed or otherwise applied to the pre-treated edges **5** and **6** in the spraying section *A* so that the developing chemical reacts with the chemical in the pre-treated areas to start deteriorating the paper of the envelope panels **2** and **3**.

The tray **10** is then moved through a drying section *B* where the wet developing acid is dried, preferably by forced hot air. Next, the tray **10** is moved to a curing section *C* of the processing tunnel where the developed pre-treated areas **5** and **6** are cured by heat in order to accelerate the paper deteriorating process. After this has been accomplished, the tray moves through a separation section *D* where the two panels **2** and **3** are separated from each by a mechanical action to open the envelope. Finally, the envelope moves to the vacuum section *E* where any loose fibers and dust are removed.

The processing tunnel **30** comprises front and rear end walls **31** with doors **32** hingedly mounted thereon at **34** to swing downwardly. The front and rear walls **31** have openings **33** therein in order to allow a tray **10** loaded with envelopes **1** to be moved therethrough. The processing tunnel **30** comprises a series of sections having mechanisms for performing the functions outlined above, as will be described in greater detail hereinbelow.

The processing tunnel comprises a motor assembly **35** which is connected by gears **36** and **37** to a drive chain **38**. The drive chain **38** has drive teeth **39** extending outwardly therefrom which engage a drive arm **24**

depending from the tray 10 in order to move the tray 10 through the processing tunnel 30. A plurality of microswitch assemblies 40*a*, 40*b* and 40*c* are provided in the path of the tray 10 which are tripped by the tray 10 as it moves along in order to enable the various mechanisms to function only when the tray is in the proper position.

In order to be certain that the doors 32 are closed before any of the mechanisms operate, a microswitch assembly 41 is mounted on the rear and front walls 31. These microswitches 41 are adapted to be tripped by the closing of the doors 32. The closing of a circuit by these two microswitches 41 together with the closing of microswitch 40*a* by the tray 10 will close the circuit to enable the mechanisms to operate thus preventing operation until the doors 32 are closed and the tray 10 is in the proper position.

A solenoid operated stop 43 is mounted adjacent in the path of the front tab 17 of the tray 10 in order to prevent the tray 10 from moving through the tunnel 30. The stop 43 is lowered out of the path of the tray by energizing the solenoid 44 with the closing of the three switches 41 and 40*a*.

The front and rear walls 31 of the tunnel 30 each have entrance and exit openings 33 therein. The lower portions of the entrance and exit openings have expanded lower control slots 45. These control slots 45 prevent the tray 10 from being admitted into the tunnel 30 until such time as the envelopes 1 are properly in position in the tray 10 and the envelope-retaining side walls 20 of the tray 10 are in the upward position. If the retaining walls 20 were in their lowered position, they would not fit through the slots 45 so as to prevent the tray from entering the tunnel 30.

The tray 10 comprises a bottom wall 11 having carriage member 19 therebeneath with spaced downwardly extending flanges 12 with wheels 13 thereon. A centering assembly 23 depending from carriage member 19 is present with aligning bars 26 movable between aligning plates 27 in the tunnel 30 to prevent the tray 10 from lateral movement. A bottom portion of centering assembly 23 is adapted to actuate the switches 40*a*, 40*b* and 40*c* as the tray 10 passes thereover.

A pivotally mounted finger 24 pivoted at 25 is adapted to be engaged by the drive mechanism finger 39 on the chain 38 in order to move the tray 10 along the tunnel 30. The downwardly extending finger 24 is pivotally mounted at 25 for movement in one direction only so that it can pivot over obstructions in the path of the tray 10 but remains rigid when force is applied from the rear by the drive finger 39.

A front wall assembly 14 is provided which acts as a stop for the envelopes 1. A rear wall assembly 15 is movable relative to the front wall 14 along guide bars 16 so that a number of envelopes can be mounted in the tray and moved to a substantially upward position by forward movement of the rear wall 15. The rear wall 15 is adapted to be locked in place by a handle mechanism 18 pivoted at 19 which has toe 18*a* and heel 18*b* to lock it in place when moved in a downward position and which releases wall 15 when moved in an upward position.

The side walls 20 of the tray are pivotally mounted at 21 to a front plate 22 on the downwardly extending flanges 12 so that when they are in the upward position they will hold the envelopes in place to prevent transverse movement and when walls 20 are in the downward position they prevent the tray from being inserted in the processing tunnel 30, as was explained in greater detail hereinabove.

The tray 10 is first moved through the spraying section *A* where spray heads 50 are provided which spray the three sides of the envelope 1 with a developing or activating solution from a reservoir 51 through piping 52, as shown in FIG. 9. This reacts with the chemicals in the pre-treated areas 5 and 6 to start deterioration of the edges of the panels 2 and 3.

The tray 10 is then moved through the drying section *B*, shown in FIG. 10, which applies forced warm air against the envelopes by means of a manifold 55 which directs air from source 56 into the drying section *B* through openings 57. Baffles 58 may be provided along the top and side edges in order to force the warm air immediately against the edges of the envelopes 1 before the air cools.

After the spray is dried, the tray 10 is moved through a plurality of heaters 60 (FIG. 11) which cure the activated edges 5 and 6 of envelopes 1 so that the deterioration of the paper is insured. After curing, the tray 10 is moved through the separation section *D* which includes a pair of vertical brushes 62 to brush lightly along the end edges 6 of the envelopes 1 and a top horizontal brush 63 to brush against the top edge 5 of the envelopes 1. These are driven by motor 35 through gear assembly 63 and 64. The mechanical action from the rotating brushes 62 and 63 separates the panels 2 and 3 of the envelopes 1 whose areas 5 and 6 have been previously deteriorated by chemical treatment, as described above.

Since the deterioration of the panels and the mechanism action of separation may create loose fibers, lint, etc., vacuum means 70 are provided in the vacuum section *E* to remove these loose fibers, etc. The vacuum means 70, as shown in FIGS. 13, 14 and 15, comprise a suction mechanism 71 which sucks out lint and fibers and any other loose paper through openings 72 in the tunnel and directs it through a filter 73 which preferably is removable and replaceable. Heavier dust, etc. will fall onto a settling tray 74.

The tray 10 is then removed from a machine and an operator may release the envelope by moving the lock handle mechanism 18 upwardly and remove the contents from the separated panels of the envelopes.

It will, therefore, be seen that the present invention comprises a mechanism for permitting large numbers of envelopes to be chemically opened automatically, which automatically moves a batch of envelopes through a machine so that very little, if any, manual processing is required and provides an improved tray mechanism for transporting the envelopes through the processing unit.

As many and varied modifications of the subject matter of this invention will become apparent to those skilled in the art from the detailed description given hereinabove, it will be understood that the present invention is limited only as provided in the claims appended hereto.

Having thus described my invention, I claim:

1. A mechanism for opening a plurality of envelopes in a stack, each envelope having a pair of opposed panels, said mechanism comprising means on the mechanism for applying a chemical to a portion of each envelope to deteriorate a portion of the envelope adjacent

the edges thereof, means for applying heat to the envelopes in said stack to cure the said portion, and means on said mechanism for separating the two panels of each envelope along said deteriorated portions, and moving means for moving said stacks of envelopes past said chemical applying means, said curing means, and said separating means.

2. A mechanism as claimed in claim **1,** wherein said envelope is moved by the moving means relative to a drying station immediately after the chemical is applied.

3. A mechanism as claimed in claim **2,** wherein the envelope is moved past a curing station after the drying section.

4. A mechanism as claimed in claim **3,** wherein said chemical applying means comprises means for spraying the envelope with a chemical.

5. A mechanism as claimed in claim **4,** wherein said spraying means comprises a plurality of spraying heads.

6. A mechanism as claimed in claim **5,** wherein said spraying heads are positioned above the envelope and along the side edges thereof.

7. A mechanism as claimed in claim **6,** wherein said drying station comprises a manifold for directing warm air against the envelope.

8. A mechanism as claimed in claim **7,** wherein baffles are provided along the top and side edges of the envelope to direct the air directly against the envelope.

9. A mechanism as claimed in claim **8,** wherein said curing section comprises heaters along the top and sides therein.

10. A mechanism as claimed in claim **9,** wherein said separating section comprises rotatable brushes adapted to brush against the top and side edges of the envelope.

11. A mechanism as claimed in claim **10,** wherein a vacuum section is provided to remove loose material.

12. A mechanism as claimed in claim **11,** wherein said vacuum section comprises openings adjacent the brushing section and is comprised of a filter and a settling tank.

13. A mechanism as claimed in claim **12,** wherein said mechanism comprises a tunnel having front and rear walls and openings therein to accomodate the envelope.

14. A mechanism as claimed in claim **13,** wherein doors are provided to close the openings.

15. A mechanism as claimed in claim **14,** wherein switches are provided operable by said doors to prevent operating of the mechanism until the doors are closed.

16. A mechanism as claimed in claim **15,** wherein switches are provided along the path of the envelope to prevent the mechanism from operating until the envelope is in proper position.

17. A mechanism as claimed in claim **16,** wherein a stop is provided operable by the switches to prevent the envelope from moving through until the doors are closed.

18. A mechanism as claimed in claim **17,** wherein said envelopes are adapted to be mounted in a tray movable through the mechanism.

19. A mechanism as claimed in claim **18,** wherein the side walls of the tray are pivotally mounted so as to be unable to enter the opening in the front wall until they are in the upward envelope-holding position.

20. A mechanism as claimed in claim **19,** wherein said tray is movable on wheels.

21. A mechanism as claimed in claim **20,** wherein the tray has an aligning mechanism depending therefrom adapted to move relative to a guiding means in the mechanism.

22. A mechanism as claimed in claim **21,** wherein said tray has a finger depending therefrom adapted to be engaged by a drive mechanism to move the tray through the tunnel.

23. A mechanism as claimed in claim **22,** wherein a chain sprocket is provided comprising a plurality of drive fingers extending therefrom to engage the finger depending from the tray.

24. A mechanism as claimed in claim **23,** wherein said finger is pivotally mounted for movement in one direction.

25. A mechanism as claimed in claim **24,** wherein the tray is provided with a movable rear follower plate to hold the envelope in an upright position.

26. A mechanism as claimed in claim **25,** wherein locking means are provided to lock the follower plate in position.

27. A mechanism as claimed in claim **26,** wherein the follower plate is adapted to move in tracks on the tray.

28. A mechanism as claimed in claim **27,** wherein said locking mechanism is a pivoted lever having a toe and a heel.

29. A mechanism as claimed in claim **28,** wherein a U-shaped element extends downwardly from the tray and wherein the walls are mounted on the element.

* * * * *