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Thomson et al.

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[54] **APPARATUS FOR PRINTING BAGS**

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[21] Appl. No.: **314,042**

Related U.S. Application Data

[62] Division of Ser. No. 154,529, June 18, 1971, abandoned.

[52] **U.S. Cl.** **101/334**, 101/44, 271/131

[51] **Int. Cl.** **B41f 17/00**

[58] **Field of Search** 101/333, 334, 104, 101/105, 41, 44

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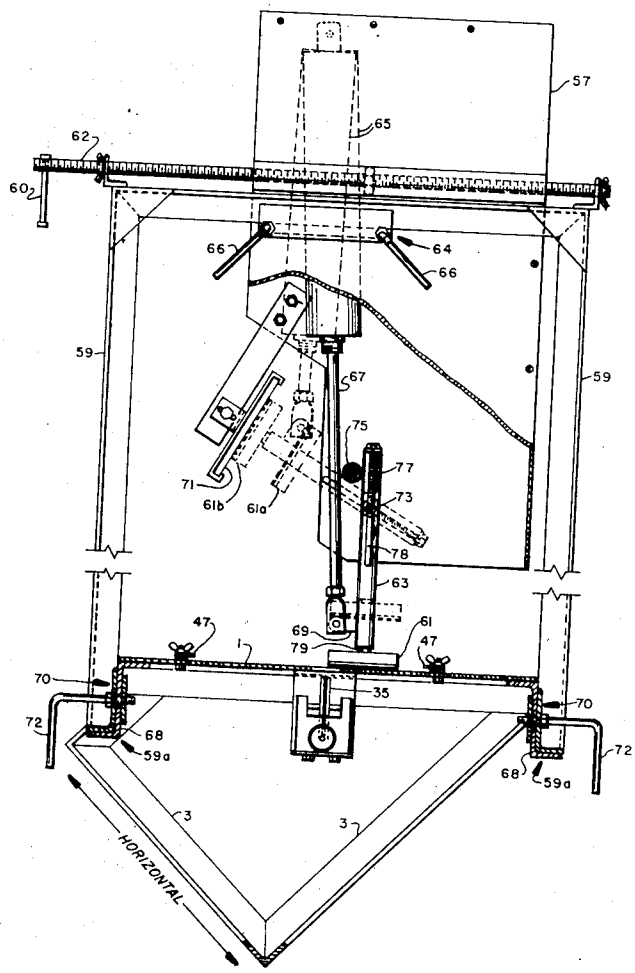
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Assistant Examiner—Clifford D. Crowder
Attorney—Jerry B. Peterson et al.

[57] **ABSTRACT**

Apparatus, for printing information on a paper bag, featuring a mechanism for raising a printing arm after a bag is printed, pivoting the arm in an arc to another position, and then actuating the arm toward an ink pad so that the printing plate contacts the pad. The cycles of operation are preferably sequentially timed with the operation of a device for stripping one bag at a time from a stack of bags.

8 Claims, 7 Drawing Figures



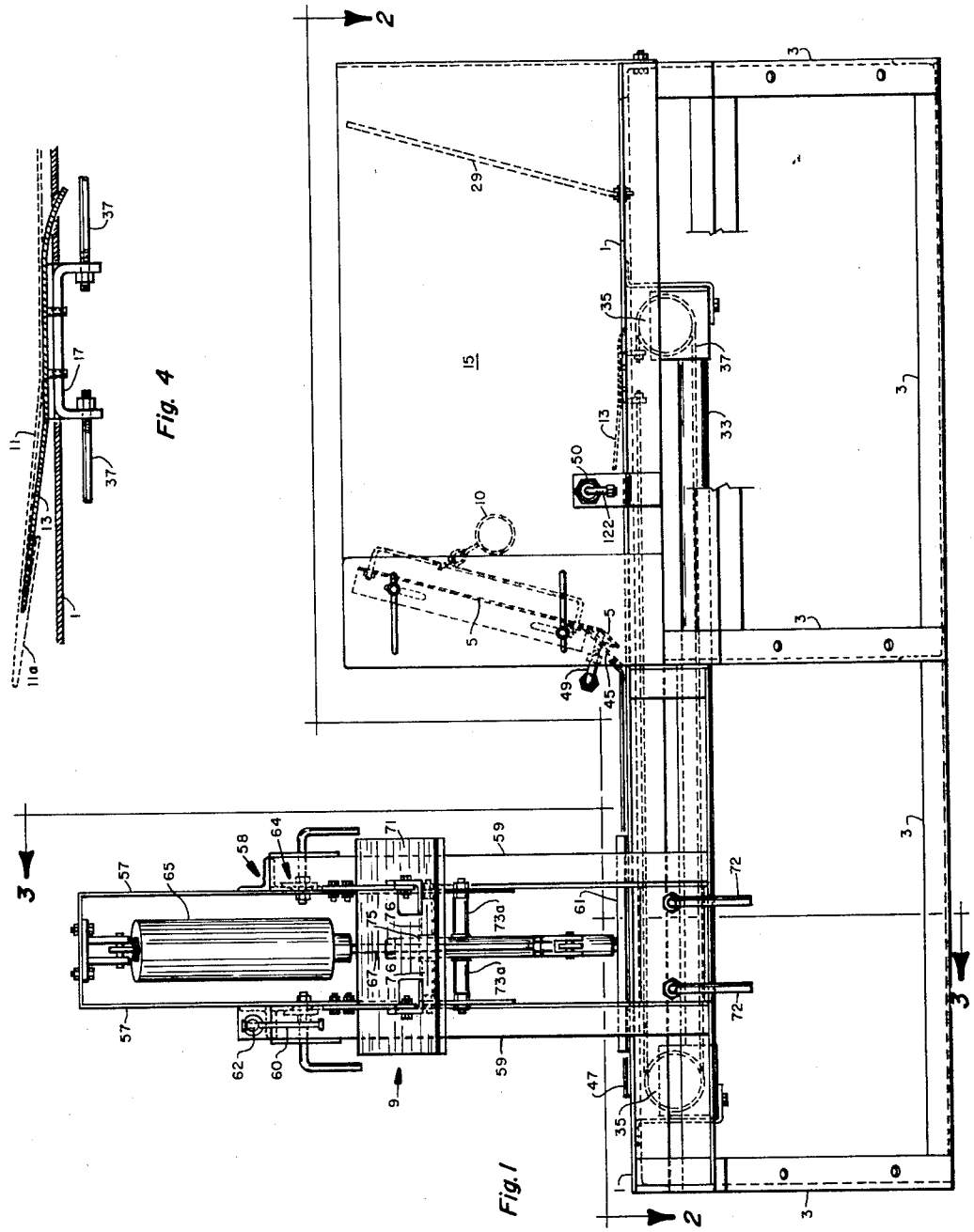


Fig. 4

Fig. 1

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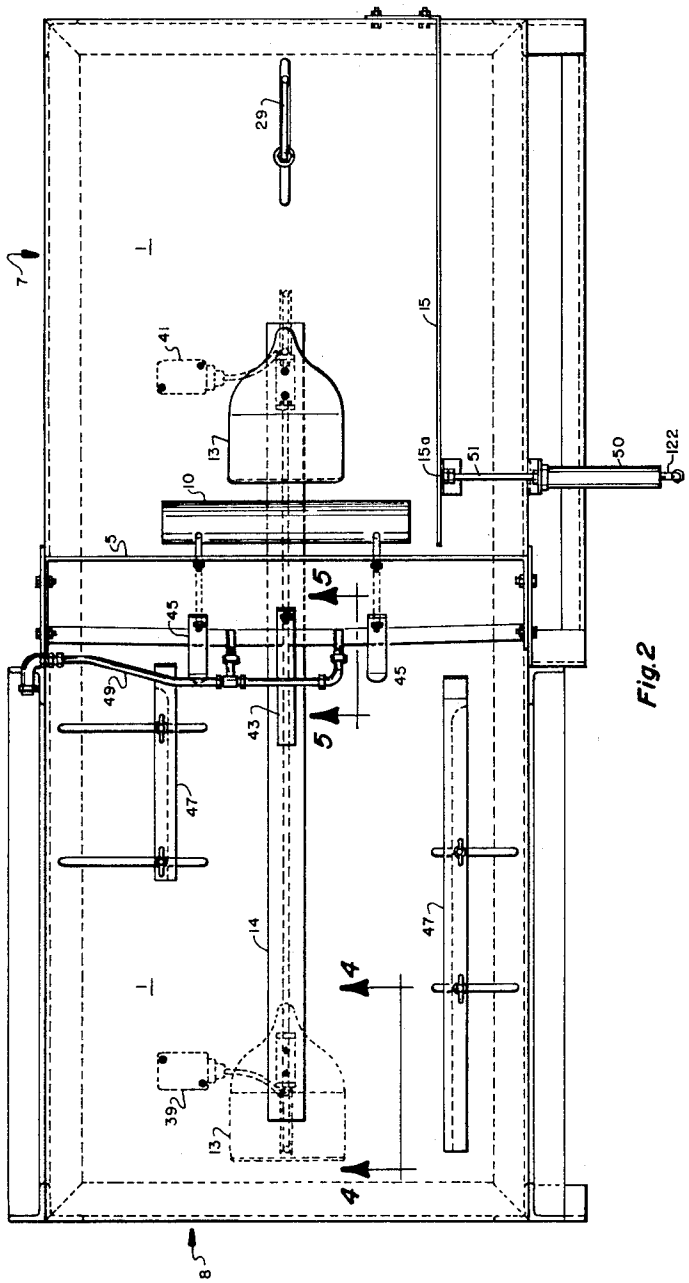


Fig.2

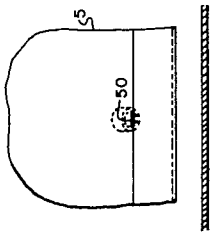


Fig.6

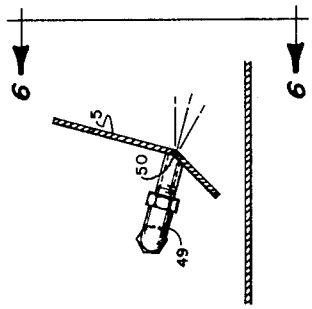


Fig.5

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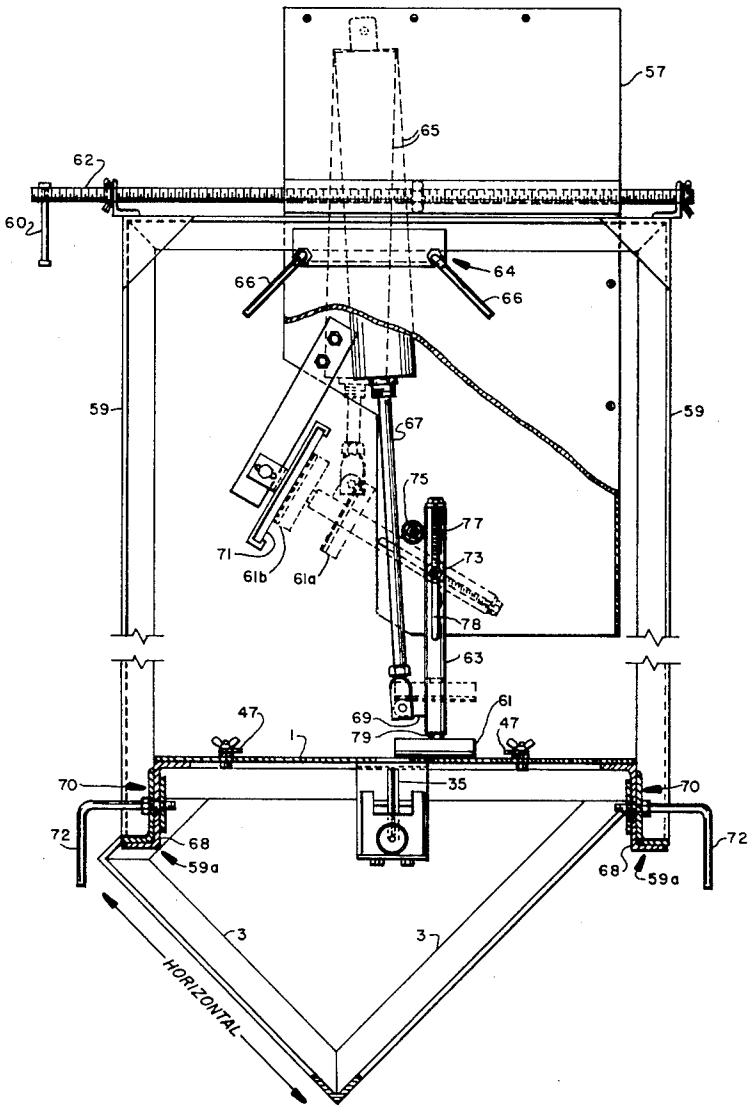


Fig. 3

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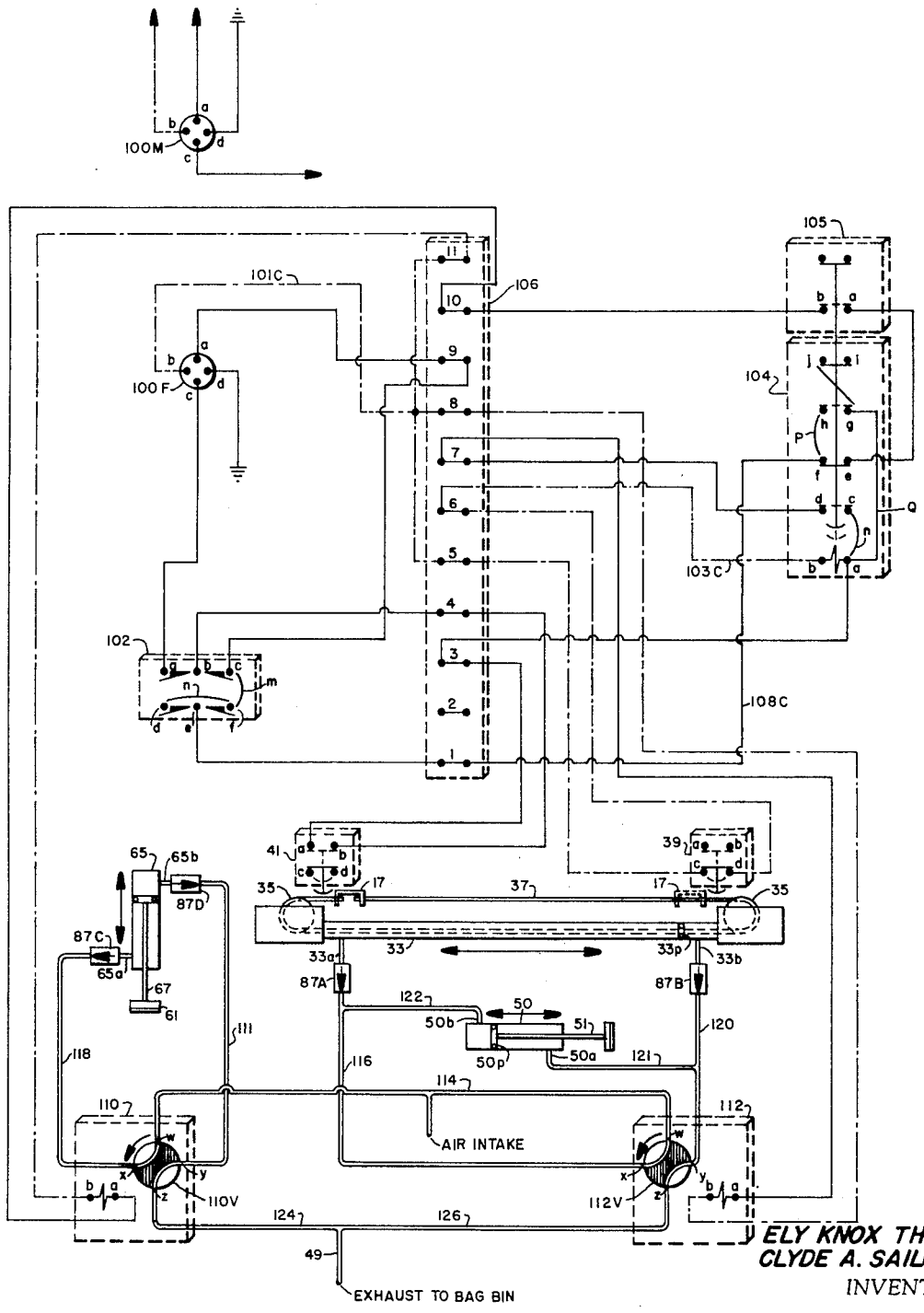


Fig. 7

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APPARATUS FOR PRINTING BAGS

This is a division of application Ser. No. **154,529,** filed June **18, 1971,** now abandoned.

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention is a method and apparatus for stripping one bag at a time from the bottom of a stack of empty paper bags and moving the stripped bag into position for a subsequent operation such as the printing of information on the bag. Also included may be apparatus, sequentially timed with operation of the stripper, for automatically printing information on the stripped bag. The stripper-printer combination may be integrated with a bag filling machines so that one empty bag is stripped and printed each time a bag is filled with product. Alternately, the combination may be operated as a self-contained unit which will automatically supply the momentary impulse for the beginning of a cycle.

This invention was developed primarily for use in the carbon black industry, in which for several years different grades of carbon black have been packaged in bags of different colors. This practice is known as "color-coding." In view of the recent development of many new grades of carbon black, the present system, in which each bag is printed by the bag manufacturer with the grade designation, is believed to have become obsolete. This invention was developed in order to provide a relatively simple and economical means of using one color for all bags and for printing the desired grade and other nomenclature on the bags immediately prior to the filling thereof. If desired, the printing may include the use of a set of color-coded inks, either as background or as the printing type. It will be apparent that the method and apparatus of this invention will be applicable to the packaging of products other than carbon black.

2. Description of the Prior Art

So far as we know there is no prior art disclosing or similar to our method and apparatus for stripping bags from the bottom of a stack of empty bags.

OBJECTS OF THE INVENTION

The objects and advantages of this invention are as follows:

1. An economical and convenient means to identify material packaged in paper bags with the proper nomenclature, with or without color-coding.
2. Bag inventories can be reduced by using the same properly sized bags for different grades of black or other material.
3. Only those bags actually filled will have identification and printing in the space provided.
4. An interchange of bag supplies between plants during an emergency shortage can be initiated.
5. Customers can receive shipments from any one of several plants with the assurance that the bags will be the same color and appearance and that they will have the proper markings appearing in the identical location on each bag.
6. Elimination of the need for printing presses at the plants.
7. Elimination of the possibility of using an improperly-marked bag.
8. Elimination of the possibility of printing the wrong quantity of bags for a given quantity of product.

9. Simplicity of manufacture and operation.

SUMMARY OF THE INVENTION

One aspect of this invention is a method and apparatus for stripping one bag at a time from the bottom of a stack of empty paper bags and moving the stripped bag into position for a subsequent operation such as the printing of information or pictorial matter on the bag. The key element of the stripper is a pick-up member which engages the folded lip of the bottom bag and carries the bag forward into position for the subsequent operation. Another aspect of the invention is apparatus, sequentially timed with operation of the stripper, for automatically printing the stripped bag. The stripper-printer combination may be integrated with a bag filling machine so that one empty bag is stripped and printed each time a bag is filled with product. Alternately, the combination may be operated as a self-contained unit which will automatically supply the momentary impulse for the beginning of a cycle.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a side elevation view of the entire combination of stripper and printer;

FIG. **2** is a partial plan view of the combination taken along lines **2—2** of FIG. **1**;

FIG. **3** is an end elevation view of the combination, taken along the lines **3—3** of FIG. **1**;

FIG. **4** is a sectional view of the bag pickup and including a bag, taken along section lines **4—4** of FIG. **2**;

FIG. **5** is a fragmentary sectional view taken along section line **5—5** of FIG. **2**;

FIG. **6** is a view taken along the line **6—6** of FIG. **5**;

FIG. **7** is a schematic diagram of the electrical and pneumatic control circuits and associated switches, valves, and air cylinders.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The basic components and operation of the invention will first be described. Referring to FIGS. **1–3,** table **1,** supported by base frame **3,** is divided by divider **5** into two general sections; namely, a bag-holding and stripping section generally shown at **7,** and a bag printing section **8** on the other side of divider **5** and including printer **9.** The bags are stacked in the bag-holding section **7,** and when the operation is commenced, the bottom bag **11** is engaged (at the folded lip **11a**) by bag pickup **13,** and is moved to the bag printing section by movement of pickup **13,** along slot **14** to the position shown in dotted lines of FIG. **2.** When the bag reaches the printing position, printer **9** automatically prints the desired identification on the bag. By means of a switch and air cylinder, pickup **13** then returns to its rest position as shown in solid lines in FIG. **2.**

Referring to FIGS. **1–6,** the construction and operation of the stripper will now be described in somewhat greater detail.

In order that bags may be stripped from a rather large stack of bags without the weight preventing proper stripping, the table **1** is preferably inclined at an angle with respect to the horizontal so that part of the weight of the bags is resting on side panel **15.** The preferred horizontal is shown in FIG. **3.** We prefer to use an angle of about 45° although other angles ranging from horizontal up to about 60° can be used.

The angle of the table, however, has a tendency to cause the bags to curl up the side of the side panel **15.** In order to obviate this curling action of the bags on panel **15,** we prefer to allow the end **15a** of panel **15** to move inwardly against the bags once each cycle by means which will be described below with reference to the description of the electrical and pneumatic control assembly. Of course, this action of panel **15** could be initiated by purely mechanical means; for example, by a lever actuated by bracket **17.**

Movable tubular bag weight **10** rides on the top of the bag pile to keep the bottom bag in proper position.

Bag stop **29** is adjustably secured to table **1** as shown.

The movement back and forth of bag pickup **13** is controlled by air cylinder **33** connected by means of pulleys **35** (FIG. 7) to cable **37.** The air supply to cylinder **33** is controlled by micro switches **39** and **41.**

Retainer **43** (FIG. 2) is desirably included in order to hold the bags in proper position during printing.

Retainers **45** are desirably included in order to prevent any bags other than the bottom bag from moving into the printing position.

Adjustable bag guide bars **47** are desirably included to aid in guiding the bag to its proper position.

Referring to FIG. **5,** the apparatus preferably includes air pipe **49** for supplying a plurality of air jets through holes or slits **50** in the pipe divider **5.** Exhaust air is supplied for this purpose four times each cycle in order to prevent the bags from sticking together and to take part of the weight off the bottom bag.

Referring now to FIGS. **1** and **3,** the action of the printer **9** will now be described. The printer is mounted within cover plates **57,** and the printer assembly is slideably supported (at **58**) by printer mounting frame **59.** Referring to FIG. **3,** the position of the printer in one direction can be adjusted by turning lever **60** attached to threaded rod **62,** after releasing the locking devices **64** by means of levers **66.** The position of the printer in the other direction is preferably adjustable because frame **59** is slideable (at **59***a*) on angle member **68,** after releasing locking devices **70** by means of levers **72.**

The printing plate **61,** containing the desired identification or nomenclature, is pressed against the bag (not shown) on table **1** by means of downward movement of printing arm **63** actuated by air cylinder **65** through rod **67.** Rod **67** is pivotally secured to tongue **69** as shown in FIG. **3.** After the bag is printed, air cylinder **65** is actuated in the opposite direction, thereby raising the printing arm and pivoting the printing plate to the position shown at **61***a* in dotted lines in FIG. **3,** and then to the position **61***b* against printing ink pad **71.** The angle of such pivot is about 110°–140° and preferably about 120°–130°. A printing arm mounting shaft **73** (hidden by spacers **73***a* in FIG. **1**) is secured to cover plates **57** to prevent lateral movement of the arm. Proper movement of the printing arm so as to provide movement of the printing plate from position **61***a* to **61***b* is assured by the fact that the outer surface of the printing arm contacts bearing **75** affixed to a bearing mounting shaft (hidden by spacers **76**), which in turn is secured to cover plate **57.** Slot **78** is included to allow movement of arm **63.**

The upper portion of printing arm **63** has a hole drilled down the center to accommodate a compression spring **77.** With no pressure on air cylinder **65** and consequently no force on rod **67,** the force of spring **77,** the spring being under some compression, forces the bottom of the slot **78** into registry with the shaft **73.** For proper operation, the static compression of spring **77** must be set to overcome the combined weight of the arm **63** and the printing plate **61** to maintain the bottom of the slot **78** in registry with the shaft **73.**

As force is applied to rod **67** by the piston in cylinder **65,** the arm **63** is restrained between shaft **73** and bearing **75** to impart a linear motion to rod **63** and printing plate **61,** so that the type on printing plate **61** will move linearly against the bag or other piece to be printed, rather than in an arc which would cause smearing of the printing.

As the assembly moves downward, more compression is applied to spring **77.**

Conversely, when force is applied in the reverse direction on rod **67** by the piston in cylinder **65** without the spring force applied to arm **63,** the arm would tend to move in an arc, since the direction of force applied by rod **67** is tangential to the axial line of arm **63.** Since the force applied by the spring is greater than the initial force applied by rod **67,** the spring force prevails to move arm **63** in a linear direction away from the table **1** until the bottom of the slot **78** contacts shaft **73,** at which time the force applied through rod **67** exceeds the force applied by the compression force of spring **77.** Since rod **67** is tangential to the linear axis of arm **63,** arm **63** pivots on shaft **73,** and arm **63** again moves in an arc toward position **61a.** Thus, the function of spring **77** is to exert a linear force upon printing arm **63** in a direction opposite to the forward motion of the arm. By "forward motion," we mean motion toward table **1** or printing ink pad **71.** Alternately, a tension spring could be mounted externally of arm **63** to accomplish the same results.

Printing plate **61** is secured to printing arm **63** by means of a screw (not shown), but proper alignment is assured by the use of dowel pins **79** passing through holes in the bottom end of the printing arm into contact with tension springs (not shown).

The necessary control components such as solenoids, air valves, switches, relays, and terminals are mounted to the inside of one of the cover plates **57.**

The electrical and pneumatic controls will now be described.

In FIG. **7,** the plug **100** is composed of two parts; a male portion **100M** and a female portion **100F** which, when connected, have common electrical terminals **100***a*, **100***b*, **100***c*, and **100***d*. In operation, the terminal **100***a* of plug **100M** is connected to one leg of an AC circuit through a conduit represented by a solid line and the terminal **100***b* of **100M** is connected to the opposite leg of the AC circuit as represented by the dot-dash line. Terminals **100***d* of plugs **100M** and **100F** are connected to ground.

In the present invention the mechanism can be operated in either of two modes, namely: (*i*) controlled by a separate machine (such as a bag-filling machine) having an electrical circuit that will provide a momentary impulse of electric current to start the operation, in which case terminal **100***c* of plug **100** will be connected to the separate mechanism that supplies the electrical impulse, or (*ii*) it can be operated as a self-contained unit that will automatically supply the momentary impulse for the beginning of a cycle and will continuously cycle as long as electric power and air power are supplied to the machine.

The circuit breaker **102** is a three-position switch, center-off as shown. In FIG. **7**, the electrical connections in the control side of the circuit are represented by solid lines; the common electric circuit is represented by dot-dash lines; and all air conduits are represented by double lines. The circuits are drawn to show the standby condition except that with air pressure applied rough through **114** and thence through line **116**, the supporting means or bracket **17** will move to its leftmost position (to the left of the position shown in FIG. 7) to actuate the switch **41**.

The first mode of operation described will be as specified in mode (*i*) above in which the present invention operates as a slave to a second electro-mechanical device which supplies the mutual electrical impulse to start the cycle. To ready the cirduit for operation, switch **102** is thrown to establish contact between points **102***a* and **102***b*, and between points **102***e* and **102***d*, of switch **102**. With air applied at the air intake line **114** and with points **100***a*, **100***b* and **100***c* of plug **100M** connected to their proper electrical source, the machine is in a standby position with air applied through ports **112W** and **112X** of the four-way air valve **112** to control valve **87A** (via line **116**) and then to port **33***a* of cylinder **33**; and air is also supplied through ports **110W** and **110X** of four-way valve **110** to control valve **87C** (via line **118**) and then to port **65***a* of cylinder **65**. When an electrical impulse is applied through point **100***c* of plug **100**, an electrical connection is established through points **102***a* and **102***b* of switch **102** to terminal **106-4** of terminal strip **106** and thence through points **41***a* and **41***b* of switch **41** through terminal **106-3** to point **104***a* of the solenoid **104***a–b* of relay **104**, since point **104***b* is connected to the common leg **103***c* of the AC circuit through terminal **106-6** and thence through points **39***c* and **39***d* of switch **39** and back through terminal **106-5** to the common leg **101***c* of the electrical circuit through point **100***b* of plug **100**. At the instant relay **104** is actuated, the off-delay timer **105** is also actuated, completing a circuit between point **105** *a* and **105***b*. When relay **104** deactuates, off-delay timer **105** remains actuated for a pre-set time period and then deactuates, breaking connection between points **105***a* and **105***b*.

Simultaneously with actuation of relay **104**, electrical current is applied to point **104***c* of relay **104** by the jumper wire **104***n*, and thence, since the relay **104** is actuated, through points **104***c* and **104***d* to terminal **106-7** of terminal strip **106** and thence to point **112***a* of the solenoid **112***a–b* in the four-way air valve **112**. This circuit is completed through point **112***b* of the air valve **112** through terminal **106-8** and thence through the common leg **101***c* to point **100***b* of plug **100**.

When the solenoid **112***a–b* of the air valve **112** is actuated as indicated above, the air valve element **112V** shifts position in the direction indicated by the arrow to connect port **112W** to port **112Y** and port **112X** to port **112Z**. At this instant, the air inlet **114** is connected through ports **112W** and **112Y** through line **120**, to control valve **87B**, then to port **33b** of cylinder **33**. This causes the piston **33***p* to move to the left as shown in FIG. **7**, and being connected to cable **37**, causes bracket **17** to move to the right carrying the bag pickup mechanism **13** shown in FIGS. **2** and **4** to the left or forward, to engage a bag. In addition air flows through line **121** to port **50***a* of cylinder **50** causing piston **50P** to retract rod **51** which is affixed to the flexible side panel **15** (FIG. **1**) of the bag bin. Air is then exhausted through port **50***b*, into line **122**, into line **116**, and through pipe **49**.

When the bracket **17**, FIG. **7**, moves to the right sufficiently to deactuate the switch **41**, the points **41***c* and **41***d* of switch **41** close, establishing a circuit from point **100***a* of plug **100** through terminal **106-9**, through **102***c* and jumper wire **102***m* to point **102***f*, and by the jumper wire **102***n* to point **102***d*, and thence through point **102***e* to terminal **106-1** via wire **108***c* to **104***f*, **104***h* via jumper wire P, through point **104***g*, via jumper wire Q to point **104***a*, to point **104***c* via jumper wire *n*, and then to **104***d* of relay **104**. From point **104***d*, this current is connected through terminal **106-7** to the solenoid **112***a–b* of air valve **112**, maintaining this air valve in an actuated condition until bracket **17** moves all the way to the right (FIG. **7**) and actuates switch **39** thereby breaking the contacts **39***c* and **39***d* of switch **39** which are in the common return circuit **103***c* of solenoid **104***a–104b*. This breaking of contacts **39***c* and **39***d* thus results in the relay **104** returning to its normal or deactuated condition, thereby closing points **104***i* and **104***j*, and points **104***f* and **104***e*, of relay **104**. At this instant the following actions occur:

1. Solenoid **112***a–b* of air valve **112** is deactuated, and by spring return the valve element **112V** revolves clockwise, connection port **112X** with port **112W** and port **112Z** with port **112Y**. This results in air pressure being applied through line **114** through air valve **112** and line **116** to port **33***a* of cylinder **33** causing the piston **33P** of cylinder **33** to move to the right as shown in FIG. **7**. Also, air pressure is applied through line **122** to port **50***b* of cylinder **50** causing piston **50P** to extend rod **51** which is affixed to the flexible end **15***a* of the bag bin. Air is then exhausted through port **50***a* into line **121** which connects to lines **120**, **126**, and **49**.
2. A circuit is completed between point **100***a*, through terminal **106-9** through points *c*, *f* (via jumper *m*), *d* (via jumper *n*), and *e* of switch **102**, to terminal **106-1** and points **104***f* and **104***e* of relay **104**. Thence the circuit is completed through points **105***a* and **105***b* of off-delay timer **105**, then to terminal **106-10**, and point **110***a* of solenoid **110***a–b* of air valve **110**. This circuit is completed from point **110***b* through terminals **106-11**, and then back through the common leg **101***c* to point **100***b* of plug **100**.
3. When the solenoid 110*a–b* is actuated, the valve element **110V** of air valve **110** rotates in the direction of the arrow to connect port **110W** with port **110Y** and port **110X** with port **110Z**. This applies air pressure through ports **110W** and **110Y** and line **111** to control valve **87D** and to the port **65***b* of cylinder **65** causing rod **67** to actuate printing plate **61** to print the bag positioned by bag pickup **13**. Air is also exhausted through port **65***a* and lines **118** and **124** to pipe **49**.
4. The piston **33***p* of cylinder **33** having moved all the way to the right with bracket **17** actuating switch **41**, opening contact points **41***c* and **41***d* and closing points **41***a* and **41***b*. The points **105***a* and **105***b* of the off-delay timer **105** now open after concluding the pre-set delay period, breaking the circuit and deactuating solenoid **110***a–b* of air valve **110**. By spring return the valve element **110***v* revolves clockwise, connecting port **110W** with port **110X**

and port **110Z** with port **110Y**. This applies air pressure through ports **110W** and **110X** and line **118** to control valve **87C** and to port **65***a* of cylinder **65** causing rod **67** to actuate and move printing plate **61** in position against ink pad **71** as shown in FIG. **3**. Air is also exhausted through port **65***b* and lines **111, 124,** and pipe **49.**

The speeds of movement of the piston in the cylinders **33** and **65** are controlled by the flow control valves **87A, 87B, 87C** and **87D**. The flow control valves **87** are characterized in that through a ball-check arrangement there is free flow of air through the valve in the direction opposite the arrow and a variably restricted flow of air in the direction of the arrow. Since the ports **110Z** and **112Z** of the air valves **110** and **112** are connected to exhaust, by the restriction of air flow through the valves **87,** the movement of the pistons in cylinders **33** and **65** can be controlled by controlling the speed with which the air is exhausted from the cylinders through lines **124** and **126.** In this way, together with the electrical circuit, the action of the cylinders is synchronized. This provides a wide latitude in the speeds at which the mechanism can be operated, the speed with which bags can be stripped, and the periods of time that the printing plate **61** is in contact with the ink pad and with the bag to be printed.

Lines **124** and **126** are connected to pipe **49** for the purpose described previously.

The second mode of operation (*ii*) is fully automatic and is attained when point **100***a* of plug **100** is connected with the proper electrical voltages and when the switch **102** is manually closed to connect point **102***b* with point **102***c* and point **102***e* with point **102***f*. When point **102***b* is connected with point **102***c* of switch **102,** an electrical circuit is established between point **100***a* of plug **100** through terminal **106-9** through points **102***c* and **102***b* and thence through terminal **106-4** through points **41***a* and **41***b* of switch **41** to terminal **106-3,** to point **104***a* of relay **104,** and thence through the solenoid **104***a–b* through the common leg **103***c* as previously described. This actuates relay **104** and connects points **104***c* and **104***d* and points **104***g* and **104***h*. The operation of the circuit from this point forward is identical to that as previously described; however, each time bracket **17** (FIG. **7**) returns to its leftmost position it reactivates the circuit enabling the machine to repeat the cycle without utilizing an outside momentary electrical impulse.

While we have thus described the preferred embodiments of the present invention, many variations will be suggested to those skilled in the art. The foregoing description and examples should therefore not be considered limitative; and all such variations and modifications as are in accord with the principles described are meant to fall within the scope of the appended claims.

We claim:

1. A printer comprising:

reciprocal rod actuating means pivotally fixed at a stationary point;

a rod attached at one end to said actuating means and pivotally attached at the other end to a tongue projecting from the side of a printing arm, said tongue being located at a point intermediate of the ends of said printing arm;

said printing arm having a printing plate attached to one end thereof;

said rod and said printing arm being substantially aligned in one plane but being slightly out of parallel when viewed perpendicular to said plane when said rod is in its extended position, the angle between said rod and said arm being convergent in a direction toward said tongue;

said arm being pivotally secured to a fixed point intermediate said tongue and the opposite end of said arm;

said arm containing a longitudinal slot in which is located a fixed printing arm shaft, the axis of said shaft being perpendicular to said arm and parallel to the axis of pivot of both said rod actuating means and said tongue, said shaft being located at a point intermediate said tongue and the opposite end of said arm;

a bearing surface mounted on a fixed bearing mounting shaft, said bearing mounting shaft being parallel to said printing arm shaft and being positioned between said rod and said arm at a point intermediate said printing arm shaft and the end of said arm opposite the end on which said printing plate is affixed;

whereby said printing arm is pivotable from an extended position, at which said rod is in its extended position, to a partially retracted position, at a pivot angle of about 110°–140° from said extended position, in which said arm contacts said bearing surface, and whereby said arm is movable in a straight line along said bearing surface to a fully-retracted position; and

a printing ink pad in a fixed position, said position being located so that said printing plate contacts said pad when said arm reaches said fully-extended position.

2. The printer of claim **1** in which said pivot angle is about 120°–130°.

3. The printer of claim **1** in which the reciprocal rod actuating means is a pneumatic system responsive to an electrical control circuit.

4. The printer of claim **3** in which the pivot angle is about 120°–130°.

5. The printer of claim **3** including a spring means for exerting a linear force upon the printing arm in a direction opposite to the forward motion of said arm.

6. The printer of claim **5** in which the pivot angle is about 120°–130°.

7. The printer of claim **5** in which said spring means is a spring mounted within a hole drilled down the center of said printing arm from the end of said arm opposite said printing plate to said printing arm shaft.

8. The printer of claim **7** in which the pivot angle is about 120°–130°.

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