United States Patent

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[54] **WEB SEVERING AND EJECTION DEVICE**
3 Claims, 6 Drawing Figs.

[52] **U.S. Cl.** **197/133**
[51] **Int. Cl.** **B41j 15/00**
[50] **Field of Search** 197/133; 101/224, 226, 227; 83/542

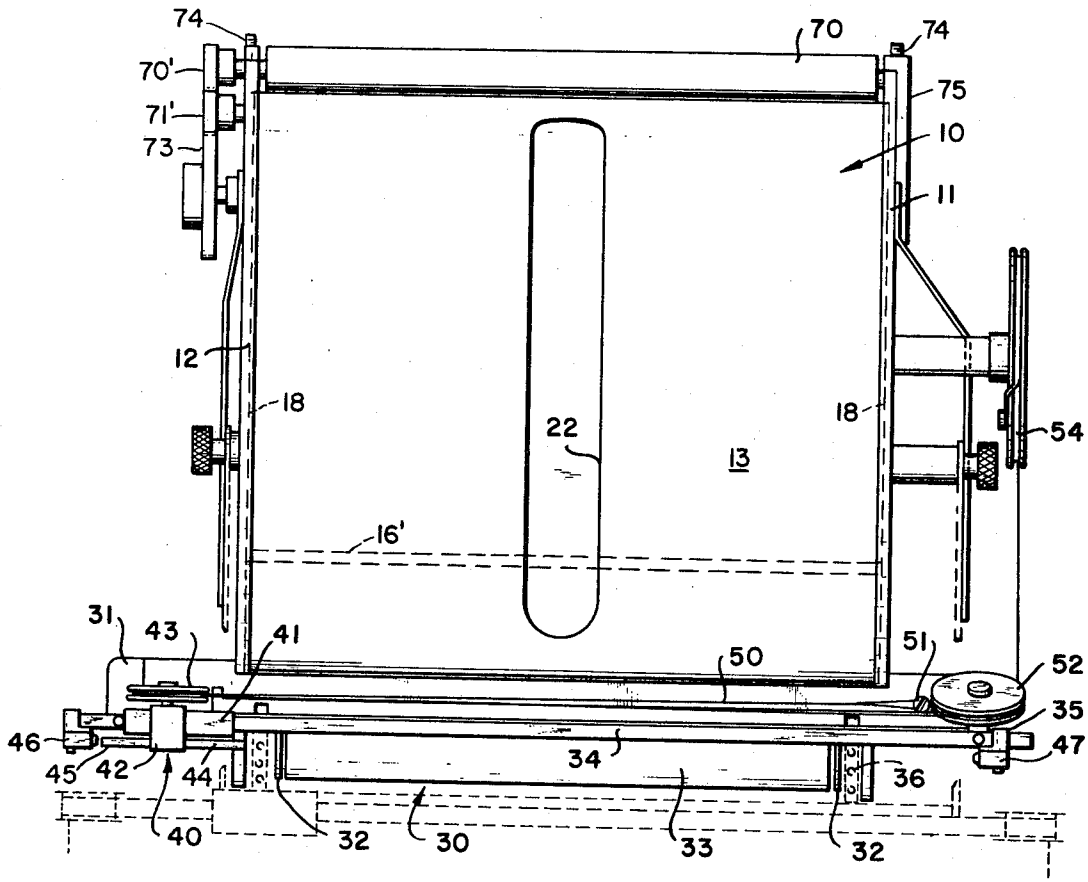
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ABSTRACT: An apparatus for detaching or separating completed multiply copy printed forms as they are discharged from an automatic printing or billing machine. The apparatus includes a main frame for supporting the printed forms and to which is attached a tension-applying pair of rollers at one end and a carriage at the other. The carriage moves transversely across the main frame and severs the printed forms by pulling a cutting line therethrough as it moves across the main frame. The operation of the apparatus is synchronized with the operation of the printing machine and will route the detached form to a designated location.



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SHEET 1 OF 3

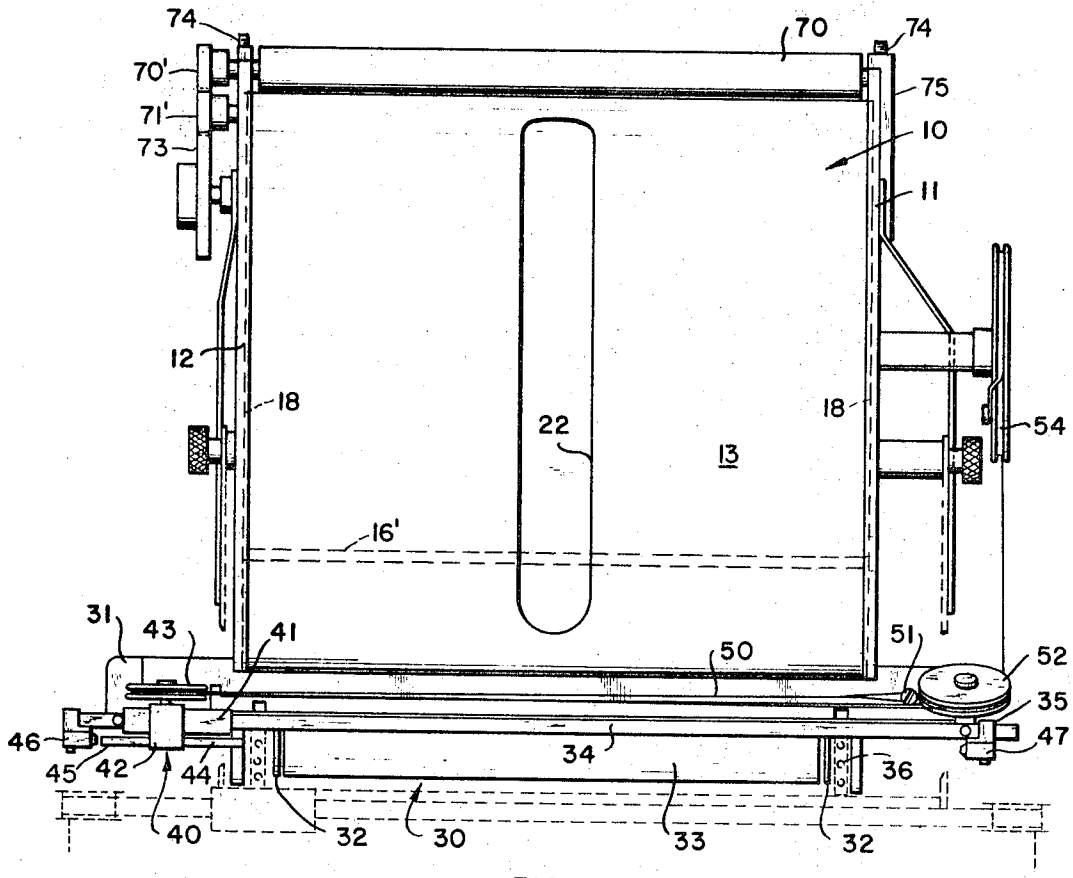


FIG. 1

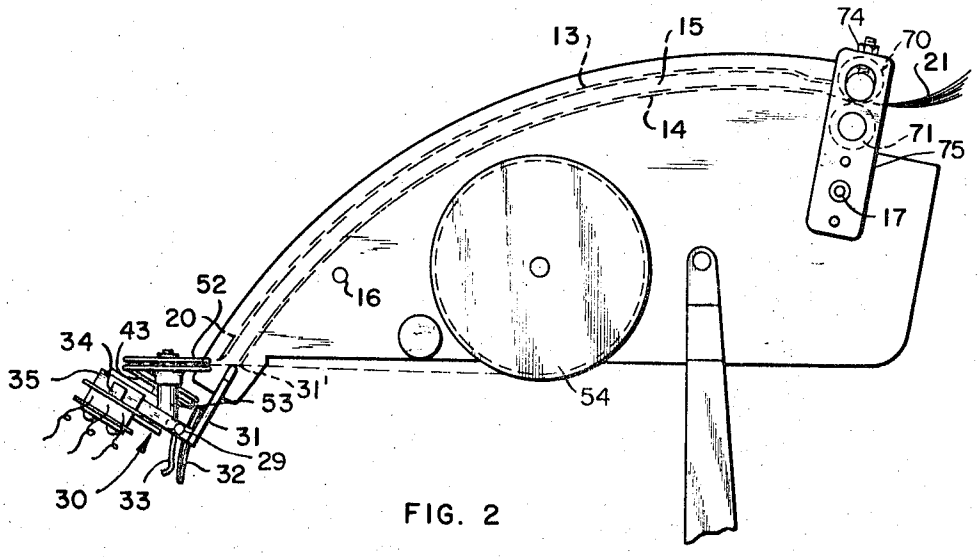


FIG. 2

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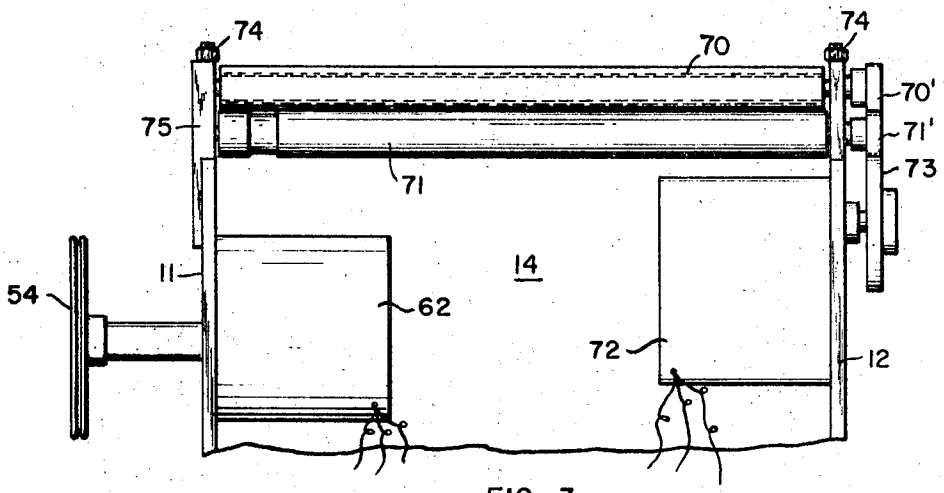


FIG. 3

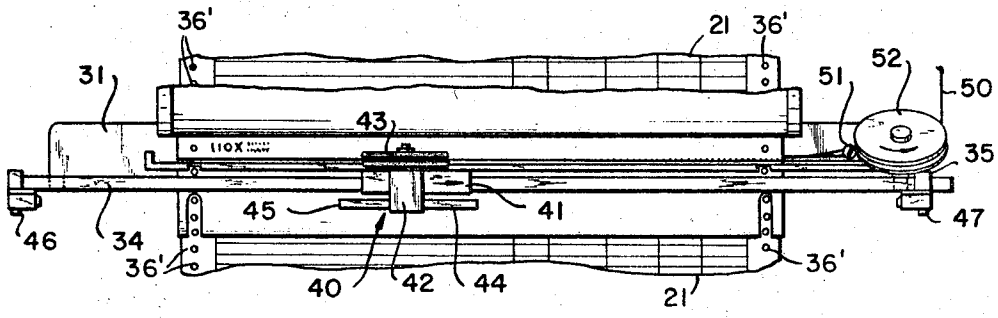


FIG. 4

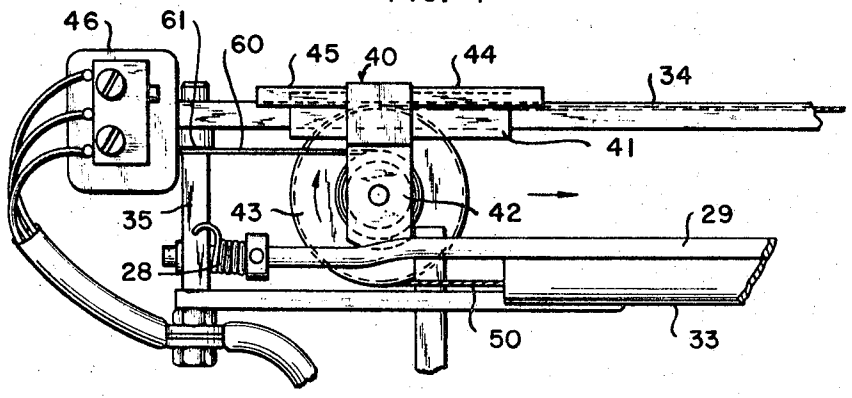


FIG. 5

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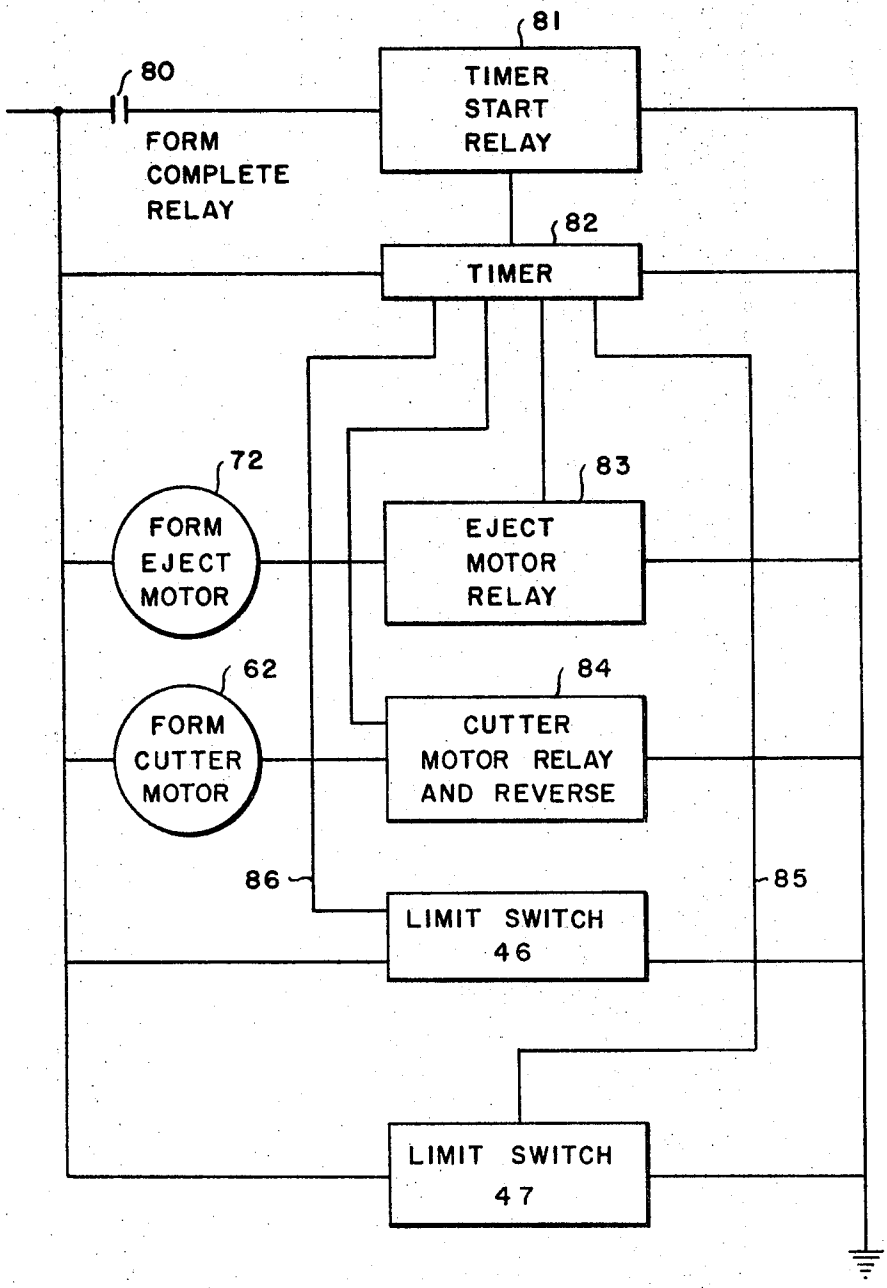


FIG. 6

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WEB SEVERING AND EJECTION DEVICE

BACKGROUND OF THE INVENTION

The present invention relates to machines which print or complete multiple-copy accounting forms, for example, billing or invoice forms. The present practice in the case of billing and invoicing of customers is to use automatic equipment controlled by computers for completing invoice forms. The invoices themselves are preprinted in the form of continuous strings of accordian-folded forms with perforations between the individual forms for separating the individual invoices. In addition the strings include the required number of copies with carbon inserted between the copies.

It is the present practice to complete the invoice and then transfer the string of completed invoices to a separate machine which separates the individual invoices. At times the invoices are separated manually by an operator tearing off the completed invoice as it is discharged from the machine. Both of these operations require the use of additional labor to separate the invoices. In addition, when the invoices are manually separated as they are completed, additional persons are required to be present in the area where the invoices are prepared. At times this can be undesirable, since it increases the security problem.

SUMMARY OF THE INVENTION

The present invention would solve the above problems by providing an apparatus which operates in response to the printing or billing machine to automatically separate the completed forms and discharge them into a hopper or route them to other equipment. The device consists of an apparatus which is mounted directly on the form printing machine and includes a cutting means responsive to the form printing machine for cutting or separating the completed form from the remainder of the forms on the preprinted string. After the forms are separated, the device ejects the forms into the hopper or routes it to other equipment.

The form separating means consists of a carriage that travels across the form pulling a cutting means that separates the form. The cutting means may take various forms, for example, a cutting line may be anchored at one end, passed behind the forms over a sheave mounted on the traveling carriage to a cable drum. Thus, as the cable is reeled in on the drum, the carriage will travel across the form at the cutting line and separate the forms. Of course, it is preferable that the forms be perforated to assist the cutting means in separating the forms.

The device is responsive to a timing means that is operated by the billing or printing machine. For example, the apparatus may be an automatic typewriter or teletypewriter that is coupled to a computer or other device for transcribing the billing information from the computer onto the forms. With the completion of the printing of the form the computer can signify the end of the cycle. This will then start the timing means which operates the device to separate the forms and eject the separated forms from the billing machine.

BRIEF DESCRIPTION OF THE DRAWING

The construction and operation of the invention will be more easily understood from the following detailed description of a preferred embodiment when taken in conjunction with the attached drawing in which:

FIG. 1 is a top view of the device constructed according to this invention;

FIG. 2 is an end view of the device shown in FIG. 1;

FIG. 3 is a partial bottom view of the device;

FIG. 4 is a front view of the device showing the completed form partly separated by the device;

FIG. 5 is a bottom view of the form-separating means shown in FIG. 4; and

FIG. 6 is a block diagram of a circuit for controlling the operation of the device shown in FIGS. 1—5.

DESCRIPTION OF A PREFERRED EMBODIMENT

Referring now to the drawing there is shown a device for separating completed forms from a continuous string of forms. More particularly, the device is particularly adopted to separate multiple copies of a form from a continuous preprinted string of forms. This type of form is normally used for invoicing or billing customers and may be printed or completed on an automatic typewriter that is coupled to a computer programmed to do accounting and billing of customers. Of course, the device can also be used for separating forms that are manually prepared on a typewriter or similar device. The printing machine must be of the type where the platen remains stationary and the printing mechanism travels across the platen.

As shown in FIG. 1, the device has a main frame **10** that consists of side members **11** and **12** and two curved top and bottom plates **13** and **14**. The top and bottom plates **13** and **14** are spaced to provide a space or opening **15** through which the forms **21** may pass and be ejected from the device. The side members **11** and **12** are clamped or attached to the edges of the top and bottom plates **13** and **14** by means of through bolts **16** and **17** that pass through suitable spacers **16'**. The spacers **16'**, of course, space the side members **11** and **12** apart the width of the top and bottom plates **13** and **14**. The top plate **13** is also provided with an elongated slot **22** in order that the travel of the forms **21** through the space between the top and bottom plates **13** and **14** may be observed. This also provides a means by which a malfunction of the printing equipment can be detected and corrected.

The top and bottom plates **13** and **14** are preferably formed of sheet metal with the lower edge **20** of the top plate **13** being curved slightly upward to assist the entry of the forms **21** into the device as the forms **21** exit from the printing equipment (not shown). In addition, the side members **11** and **12** may be provided with grooves **18** on their inner surfaces into which the ends of the top and bottom plates **13** and **14** may fit.

The form cutting or separating mechanism **30** is attached to the lower edge of the bottom plate **14** and includes a mounting plate **31**. The mounting plate **31** may be attached to the lower edge **31'** of the bottom plate **14** by suitable means, as for example, small bolts or the like (not shown). The mounting plate **31** is provided with a pair of paper guides **32** which are curved slightly backward, as shown in FIG. **2**, to assist the entry of the forms **21** into the opening **15** between the top and bottom plates **13** and **14**. The paper guides **32** also assist in lifting the forms **21** from the drive sprockets **36** on the printing equipment. In addition, an elongated paper clamping plate **33** is attached to the mounting plate **31** and cooperates with the paper guides **32** to form a feed slot for the forms **21**. The paper clamping plate **33** is supported by a rod member **29** that is pivotally mounted in end brackets **35**. A spring **28** is used to provide a torsional biasing to the paper clamping plate **33** in order that the clamping plate **33** may clamp the forms **21** to the platen (not shown) on the printing equipment. The clamping plate **33** also insures that the perforations **36'** at the edges of forms **21** engage the drive sprockets **36**.

The separating or cutting mechanism **30** utilizes a guide bar **34** having a rectangular or square cross section on which a carriage **40** travels. The ends of the guide bar **34** are supported in end brackets **35** that are secured to the mounting plate **31**. The carriage **40** consists of a tubular slide **41** which travels along the guide bar **34**. As shown in FIG. **5**, the slide **41** supports a bracket **42** on which the sheave **43** is mounted. In addition, the bracket **42** is provided with limit stops **44** and **45** that contact microswitches **46** and **47** disposed at the opposite ends of the guide bar **34**. The microswitches **46** and **47** control the operation of the invoice or form **21** separating mechanism **30** as more fully explained below.

The cutting means used for separating the printed invoice from the remaining string of invoices consists of a cutting-line **50** having one end secured or deadended as by means of a

loop that is fastened to the mounting plate 31 by a small bolt 51. The cutting-line 50 passes over the sheave 43, around an idler sheave 52 mounted at the right-hand end of the guide bar 34 and then to a drum 54. The other end of the cutting-line 50 is deadened or fastened to the cutting-line drum 54. Thus, as the drum 54 is rotated, it will take in the cutting-line 50 and the carriage 40 will move from the left to the right across the guide bar 34. The forms 21 are pulled taut and kept in place by pinch rollers 70 and 71. Since forms 21 passes between the portion of the cutting-line 50 that is deadened and the portion that passes between the sheaves 43 and 52, the cutting-line 50 will separate the forms 21 as the carriage 40 passes across the front of the device.

When the carriage 40 reaches the right-hand limit switch 47, the cutting motor 62 reverses, allowing the carriage 40 to return to its starting position. Spring 60 keeps a constant tension on the cutting-line 50. One end of the spring 60 is deadended at 61, while the opposite end of the spring 60 is fastened to the carriage 40. Thus, the spring 60 is uncoiled as the carriage 40 moves to the right and will maintain sufficient tension on the cutting-line 50 when the carriage 40 returns to the left at completion of the separating operation.

The drum 54 is driven by a cutting motor 62 which may be a geared motor in order that the drum 54 will rotate at a slow speed. The cutting motor 62 is controlled by the circuit shown in FIG. 6 and described below.

After the completed forms 21 are separated from the remaining forms 21 they are ejected from the device by means of pinch rolls 70 and 71. The pinch rolls 70 and 71 are provided with a bias so that they exert a force on the complete forms 21 sufficient to permit the forms 21 to be ejected when the pinch rolls 70 and 71 are rotated. Pinch rolls 70 and 71 are rotatably mounted on bracket 75 on one side. On the other side, pinch rolls 70 and 71 extend through side member 12 and are integrally connected to gears 70′ and 71′. The pinch rolls 70 and 71 are driven by a form-eject motor 72 through a reduction gear 73 that engages gear 71′. The motor 72 is also controlled by the circuit shown in FIG. 6 and ejects the forms 21 after they have been separated from the remaining forms.

Referring now to FIG. 6, there is shown a simplified schematic diagram of the control circuit for the invoice separating means shown in FIGS. 1—5. More particularly, there is shown a set of contacts 80 indicated as being the form complete relay. These contacts 80 are operated by the equipment that prints or completes the forms 21 and are closed upon the completion of the form 21. Closure of these relay contacts 80 actuates a timer or start relay 81 that actuates a timer 82 which controls the operation of the remainder of the equipment. More particularly, the timer 82 actuates the cutting motor relay 84 which actuates the form cutting motor 62 and the eject motor relay 83 which actuates form-eject motor 72. This, of course, causes the carriage to 40 travel across the front of the device and separate the completed form 21 from the remainder of the forms 21. The energizing of the form-eject motor 72 will place a tension on the forms 21 and hold them in place so that the cutting-line 50 can separate the forms 21. The clamp plate 33 will hold the forms 21 firmly against the platen (not shown) on the printing equipment and allow the pinch rolls 70 and 71 to apply tension to the forms 21. As the carriage 40 reaches the right-hand edge of the equipment, it actuates the microswitch 47 which in turn causes the timer 82 to reverse the cutting motor 62 to return the carriage 40 to the left. As the carriage 40 returns to the left the form-eject motor 72 will discharge the forms 21 to any desired location. When the carriage 40 has returned to the left as shown in FIG. 1, it will operate the microswitch 46 which indicates that the separating operation is complete. The operation of the microswitch 46 will actuate the timer 82 to open the relay contacts 80 and start the printing of the next set of forms 21.

The above-described form separating means can be attached to any form printing equipment without requiring modification of the equipment. As pointed out above, the equipment must be of the type wherein the platen remains stationary and a printing head moves across the platen. Of course, the use of continuous strings of preprinted forms 21 requires this type of equipment.

While not shown the pinch rolls 70 and 71 can eject the completed forms 21 and route them to any desired location. The routing can include all copies in the series or only some of the copies.

I claim:

1. An apparatus for separating multiple copies of a printed form from a string of forms as they are discharged from an automatic printing machine, said apparatus comprising:

a main frame, said main frame including means for supporting said printed forms as they are discharged from said printing machine;

a tension means, said tension means being mounted on said main frame and disposed to apply tension to the discharged forms;

a cutting means, said cutting means being mounted on said main frame and disposed to be aligned with the end of said printed form, said cutting means comprising a carriage means disposed on the main frame for travel across the face of the form adjacent said end thereof, a cutting-line, one end of said cutting-line being fastened to said main frame and passing over a sheave mounted on said carriage means, the other end of said cutting-line being fastened to a drum, a drive means associated with said drum to take in said cutting-line to move said carriage means across said forms whereby said cutting-line will separate said printed forms from the remainder of said string of forms; and

control means, said control means being responsive to the operation of said printing machine to operate said drive means.

2. The apparatus of claim 1 and in addition a clamp plate, said clamp plate being disposed to hold said printed forms firmly in place as said carriage means moves across said forms.

3. The apparatus of claim 2 and in addition means responsive to the movement of said carriage means for returning said carriage means upon the completion of the separation of the forms.