Sept. 27, 1966 E. J. LAVANDER 3,275,318

SHEET CONVEYING APPARATUS

Filed Oct. 30, 1964 3 Sheets-Sheet 1

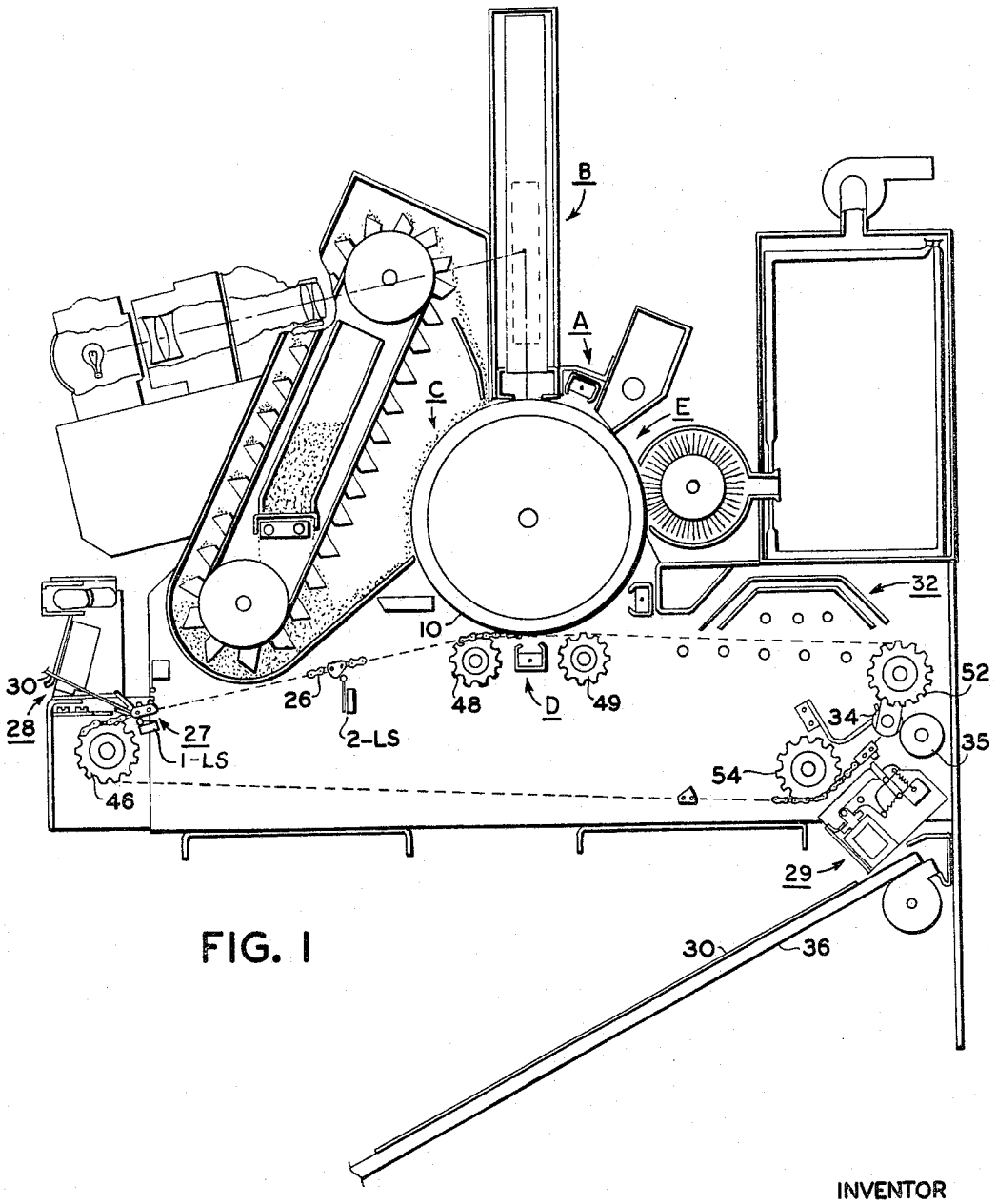


FIG. 1

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SHEET CONVEYING APPARATUS

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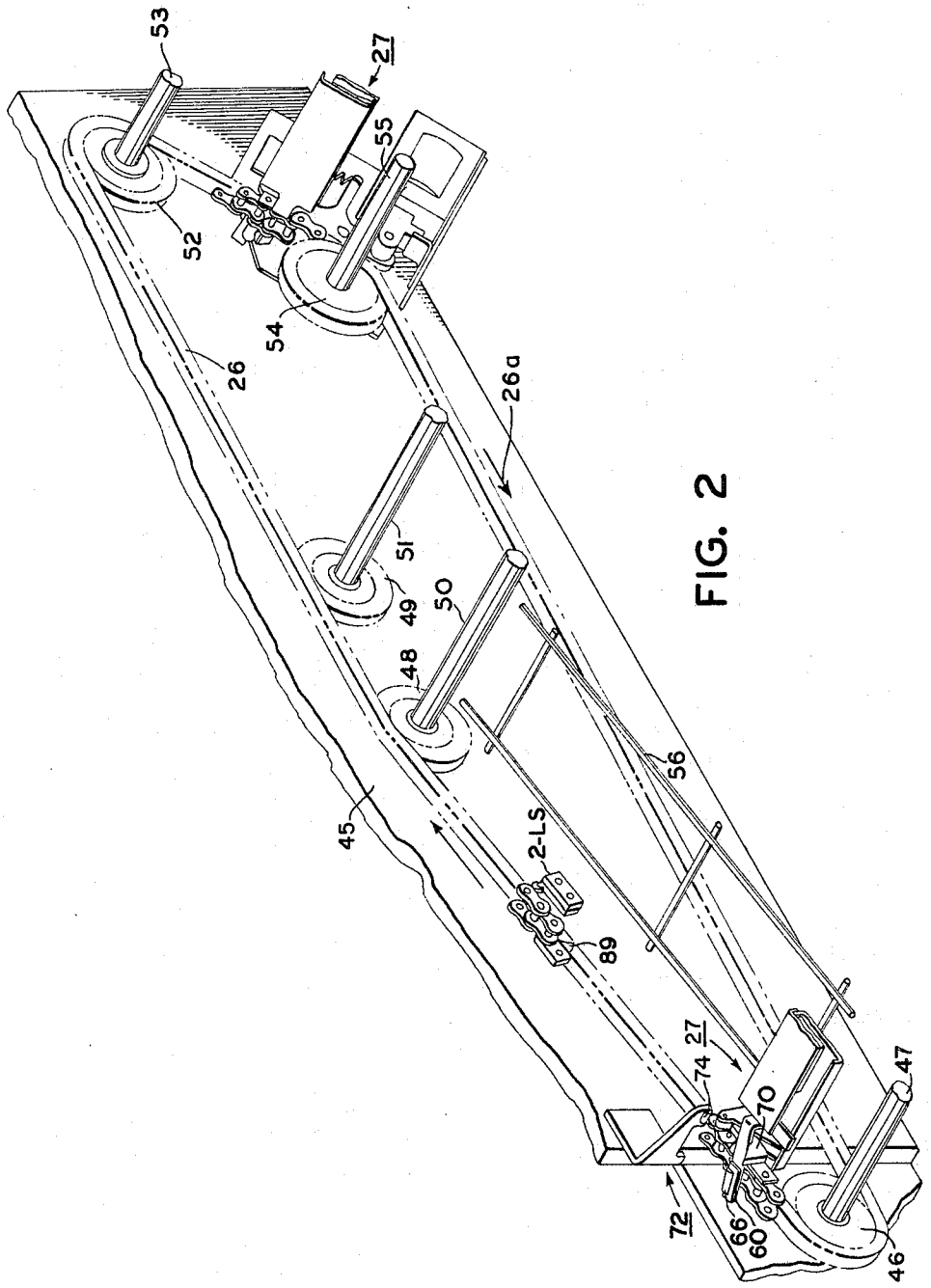


FIG. 2

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SHEET CONVEYING APPARATUS

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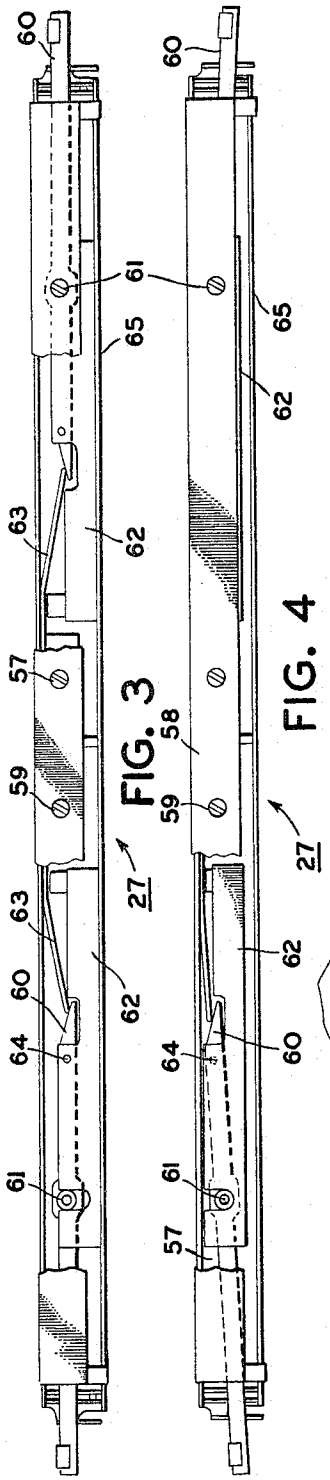


FIG. 3

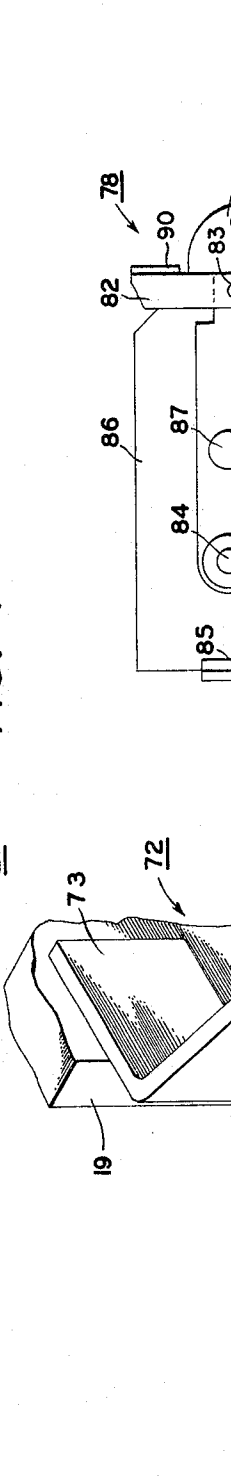


FIG. 4

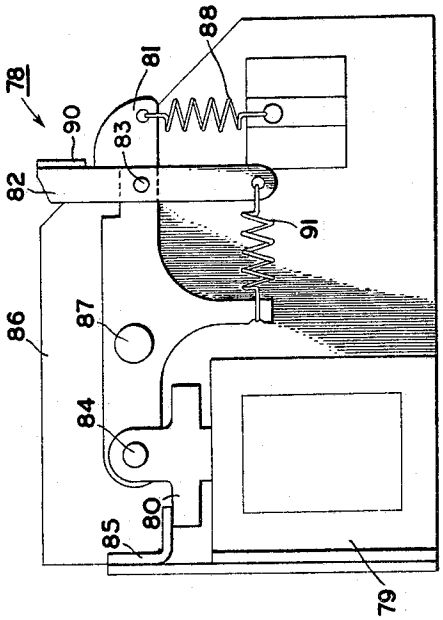


FIG. 6

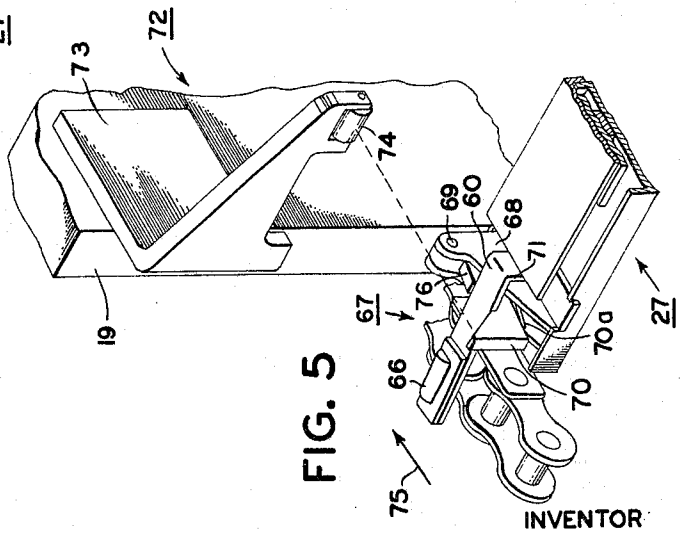


FIG. 5

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3,275,318

SHEET CONVEYING APPARATUS

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Filed Oct. 30, 1964, Ser. No. 407,698
3 Claims. (Cl. 271—68)

This invention relates in general to sheet conveyor systems and particularly to an improved sheet conveyor that is adapted for use in xerographic reproducing machines or comparable types of devices.

One type of conveyor mechanism employed in xerographic reproducing apparatus for conveying sheet support material from a receiving station into transfer contact with a xerographic plate and then to a delivery station is disclosed in Patent No. 3,071,370 issued January 1, 1963, to Robert A. Hunt and Gordon P. Taillie.

In this type of conveyor a gripper mechanism is used to transport a sheet of material through a predetermined path. Positive action of the gripper mechanism and accurate alignment of a chain drive carrying the gripper mechanism are necessary in this type of apparatus to insure proper alignment of the sheet material with a developed powder image on a xerographic drum as the sheet is moved through the path of travel. Further, minor misalignment of the conveyor results in variations of the gripper mechanism stopping position, resulting in misfeeding of sheet material to the gripper mechanism. The gripper mechanisms are biased in a closed position and must be cammed open, against the biasing action, to receive or release the sheet material.

When the gripper mechanism reaches the receiving position or releasing position, a pair of actuating arms encounter cams adjacent to the path of travel. The cams open the gripper mechanism as the conveyor stops. The gripper mechanism is held open until a sheet of material is inserted into the gripper and the conveyor is moved forward allowing the gripper to close. The forward movement of the conveyor, from a stationary position, against the action of the cams produces a strain on the whole conveyor system. This strain on the conveyor results in misalignments and consequently frequent readjustment of the conveyor. Repeated strains on the conveyor results in undesirable breakage and replacement of parts in the whole conveyor and associated drive mechanisms.

Therefore, it is an object of this invention to reduce the strain on conveyor systems having positive acting gripper mechanisms.

A further object of this invention is to reduce the force required to start movement of a conveyor system having a positive acting gripper mechanism.

Yet another object of this invention is to improve a sheet conveying mechanism.

Another object of this invention is to improve the means for holding the gripper mechanism of the sheet conveyor in an open position.

Still another object of this invention is to provide a gripper bar with a locking means, whereby the gripper bar is held in an open position until such time as a sheet of material is inserted in the gripper bar thereby actuating a switch which starts the conveyor which carries the sheet gripper mechanism along the path of movement whereby it contacts a means for actuating said locking means to grip the sheet material.

Yet another object of this invention is to improve present endless conveyor apparatus such that the endless conveyor requires little or no adjusting.

A further object of this invention is to improve gripper mechanisms mounted on endless conveyors to eliminate the large force needed to initiate movement of the gripper mechanism.

Still a further object of this invention is to improve gripper mechanisms mounted on endless conveyors to simplify service and reduce cost of maintenance.

These and other objects of the invention are attained by a sheet gripper mechanism which cyclically carries sheet material from sheet feeding stations to sheet delivery stations, means to bias a sheet gripper mechanism to hold a gripper in a closed position, means to open the gripper mechanism, means to actuate the opening mechanism, a locking device mounted on the gripper mechanism to lock a gripper in an opened position against the action of the biasing means and means positioned at the sheet feeding stations to release the locking device to allow the gripper mechanism to close.

For a better understanding of the invention as well as other objects and further features thereof, reference is had to the following detailed description of the invention to be read in connection with the accompanying drawings, wherein:

FIGURE 1 illustrates schematically a preferred embodiment of the invention in a xerographic apparatus;

FIGURE 2 is a perspective view of the left side of the paper conveyor mechanism of the apparatus with parts broken away to show the arrangement of the various elements;

FIGURE 3 is a top view of a paper gripper suitable for use in the conveyor mechanism shown in FIG. 2 with the gripper in a closed position;

FIGURE 4 is a top view of the paper gripper shown in FIGURE 3 with the gripper in an open position;

FIGURE 5 is an enlarged perspective view of the left lock releasing means shown in FIGURE 2; and,

FIGURE 6 is an enlarged view of the left gripper bar actuating mechanism.

Referring now to FIGURE 1, there is shown a continuous xerographic reproduction machine containing the preferred embodiment of the present invention. The machine is of the type disclosed in the above-mentioned patent to Hunt et al. The xerographic apparatus comprises a xerographic drum 10 which rotates in the direction indicated by the arrow to cause the drum surface sequentially to pass a plurality of xerographic processing stations.

For the purpose of the present disclosure, several xerographic processing stations in the path of movement on the surface may be described functionally, as follows:

A charging station at which a uniform electrostatic charge is deposited on the photoconductive layer of the xerographic drum is shown at A. An exposure station at which a light to be reproduced is projected onto the drum surface to dissipate the drum charge on the exposed areas thereof, and thereby from a latent electrostatic image on the copy to be reproduced is shown at B. A developing station, where a xerographic drum is developed is shown at C. A transfer station at which the xerographic powder image is electrostatically transferred from the drum surface to the material is shown at D. A drum cleaning and discharge station is shown at E.

In the embodiment shown in FIGS. 1 and 2, the sheet feeding mechanism includes a chain conveyor **26** which moves in a direction **26***a* carrying one or more paper gripper mechanisms **27** in a circuit between sheet feeding station **28** and a sheet delivery station **29**. Means are provided to activate the grippers to cause the grippers to take hold of the front edge of a sheet of support material **30** inserted into the machine at a station **28** and to hold the sheet while traveling to the delivery station and there to release the sheet for removal from the machine. In the embodiment shown, a sheet of transfer material is fed manually by an operator to paper gripper **27** and is forwarded by the paper gripper into contact with a xerographic drum at image transfer station D.

As the paper gripper is advanced by the chain conveyor,

it strips the sheet of transfer material from the drum and transports it to a fixing device, such as a heat fuser **32** where the xerographic powder images previously transferred to the support surface are permanently fixed thereto.

After fusing, the finished copy is discharged from the apparatus at a sheet delivery station **29**. To accomplish this, there is provided a pair of delivery rollers **34** and **35** which receive the sheet from a paper gripper and deliver it to a collecting tray **36**.

Operation of a paper conveyor is effected by actuation of a limit switch **1**–LS, upon insertion of the sheet of transfer material into paper gripper **27** at the sheet feeding station **28**.

Referring in particular to FIGURES 2 and 4, the conveyor **45** includes a pair of endless roller chains **26**, only one of which is shown, which passes from sprocket **46** carried by axle **47** over sprockets **48** and **49** carried by axles **50** and **51** respectively. Sprockets **48** and **49** guide the chain in a path tangential to the surface of the drum. The chain is then carried over and around a second sprocket **52** on axle **53** down to sprocket **54** secured to drive shaft **55** and then back to the sprocket **46** and axle **47**. Although only the left hand side of the conveyor has been shown, it is understood that a similar half (not shown) exists on the right hand side.

Therefore, it is understood that a second set of sprockets are positioned on their respective shaft or axles to space the chains apart from each other by a distance greater than the length of the drum. The chains **26** carry two paper grippers **27** which are spaced equally from each other along the length of the chain. The paper grippers are positioned on the chain at right angles to the path of travel of the chain for movement therewith and in a circuit between the sheet feeding and sheet delivering stations.

A wire grid **56** is positioned between axle **47** and axle **50**, to guide the trailing edge of a sheet of transfer material carried by the paper gripper.

The gripper bar housing includes a bottom panel **57** and a top panel **58** held together in spaced parallel relation to each other by screws **59**.

The gripper levers **60** are pivotally supported near their center by gripper lever pivot pin **61**. The gripper lever normally holds the gripper bar **62** biased in a closed position by means of a spring **63**. The gripper lever **60** is pivotally secured near one end of the gripper bar **62** by a dowel pin **64** held in place by the top and bottom panels. The other end of this lever extends beyond the end of the gripper bar housing whereby it may be actuated to effect movement of the gripper bar away from the lip **65** of the bottom panel thereby opening the gripper mechanism. Attached to the gripper bar lever **60** is a gripper bar roller **66**.

The locking assembly **67** locks the lever **60** in an open position. The locking assembly consists of a locking bracket **68** mounted on the gripper mechanism **27**. The pivot pin **69** is mounted in the bracket **68** for holding a locking lever **70**. The locking lever **70** has therein a notch **71** for holding the gripper bar in an open position. The lever **70** is urged upward by a spring **70***a*.

The releasing assembly generally indicated as **72** comprises a bracket **73** mounted on wall **19**. The bracket has mounted thereon a release cam or roller **74** for releasing the locking lever **70**.

In operation of the sheet conveying mechanism, a sheet is inserted into the gripper bar mechanism **27** thereby actuating limit switch **1**–LS which will start the conveyor chain moving along with the gripper bar. For clarification, this distance is exaggerated in FIGURE 5. Upon movement of the gripper bar, the cam **74** will immediately contact the locking lever **70** thereby releasing the gripper lever **60** and firmly grip the sheet material. The gripper bar will pivot about point **64** due to the pressure of spring **63**. The gripper lever **60** will move in a direction **75** indicated in FIGURE 5 and will thereafter rest on surface **76** of the locking lever. The gripper mechanism will then move along the path of the conveyor in unlocked closed position firmly gripping the sheet material to be conveyed until such time as the sheet material is to be released.

The actuator assembly generally designated as **78** is shown in FIGURE 6 in detail. The actuator assembly comprises a solenoid **79** which actuates an arm **80** which moves pivot arm **81** which is pivotally connected to actuating lever **82**. Actuating lever **82** pivots about point **83**. Pivot arm **81** is pivotally mounted to arm **80** at point **84**. Surface **81***a* acts as a stop surface for lever **82**. Mounted above arm **80** is a stop **85**. Pivot arm **81** is mounted on actuator bracket **86** at pivot point **87**. The actuator bracket **86** is mounted on wall **19**.

Pivot arm **81** is normally held in the position shown in FIGURE 6 by a tension spring **88**.

Mounted on conveyor chain **26** is an actuator **89** which at a predetermined point in the conveyor path will operate a limit switch **2**–LS which will actuate solenoid **79**. Upon actuation of the solenoid **79**, the pivot arm **81** will move lever **82** into an operative position. The arm **80** will move away from the stop **85** pivoting the arm **81** about the point **87**, thereby moving the lever **82** in an operative position.

When the gripper bar **27** comes into the position shown at **29** the cam **90** mounted on the actuating lever **82** will contact the gripper bar roller **66** thereby releasing the sheet material moving the gripper bar **60** off the surface **76** and positioning the bar in the notch **71** of locking lever **70**. The impact of the gripper bar **60** hitting the cam portion **90** of the actuating lever **82** will be cushioned by spring **91**.

Upon insertion of an additional sheet of material into the next gripper bar mechanism **27**, thereby actuating limit switch LS–**1** the solenoid **79** will them be released, moving actuating lever **82** out of position so that the gripper bar **27** will continue along the path of movement of the conveyor chain unobstructed. The gripper bar will therefore remain in this locked open position until such time as it returns to its original position. The gripper bar will return to the feeding station **28** wherein the cycle can be repeated.

Although the sheet conveyor mechanism and the gripper bar actuating mechanism has been described with reference to the structure of a preferred embodiment disclosed herein, it is not confined to the details set forth, and this application is intended to cover such modification or changes as may come within the purposes of the improvements of the scope of the following claims.

What is claimed is:

1. Apparatus for use in a device having side frames and pulley means mounted in said side frames supporting an endless conveyor of the type having a sheet gripper mechanism adapted to cyclically carry sheet material from sheet feeding stations to sheet delivery stations including:

biasing means in the sheet gripper mechanism to hold the gripper mechanism in a closed position;

a gripper lever mounted on the sheet gripper mechanism to open the gripper mechanism against the action of the biasing means;

an actuating lever positioned at the delivery stations adjacent the path of movement of the gripper mechanism movable into interfitting relation with the gripper lever to affect operation of the gripper mechanism;

means to move the actuating lever into interfering relation with the gripper mechanism;

a locking device on the gripper mechanism to lock the gripper in an open position against the action of the biasing means; and,

a releasing bracket mounted on the side frame at the sheet feeding stations to release the locking device

to allow the gripper mechanism to close thereby gripping the sheet material inserted in the gripper mechanism.

2. Sheet conveying apparatus including:
side frames;
pulley means mounted in said side frames;
endless conveyor supported by said pulley means;
a gripper mechanism adapted to carry sheet material from a sheet feeding station to a sheet delivery station;
biasing means in the sheet gripper mechanism to hold the gripper mechanism in a closed position;
a gripper lever mounted on the sheet gripper mechanism to open the gripper mechanism against the action of the biasing means;
an actuating lever positioned at the delivery station adjacent the path of movement of the gripper mechanism movable into interfering relation with the gripper lever to affect operation of the gripper mechanism;
means to move the actuating lever into interfering relation with the gripper mechanism;
a locking device on the gripper mechanism to lock the gripper lever in an open position against the action of the biasing means; and,
a releasing bracket mounted on the side frame at the sheet feeding station to release the locking device to allow the gripper mechanism to close thereby gripping sheet material inserted in the gripper mechanism.

3. Apparatus for use in a device having side frames and pulley means mounted in said side frames supporting

an endless conveyor of the type having a sheet gripper mechanism adapted to carry sheet material from a sheet feeding station to sheet delivery station including:
biasing means in the sheet gripper mechanism to hold the gripper mechanism in a closed position;
a gripper lever mounted on the sheet gripper mechanism to open the gripper mechanism against the action of the biasing means;
an actuating lever positioned at the delivery stations adjacent the path of movement of the gripper mechanism movable into interfitting relation with the gripper lever to affect operation of the gripper mechanism;
means to move the actuating lever into interfering relation with the gripper mechanism;
a locking device on the gripper mechanism to lock the gripper in an open position against the action of the biasing means; and,
means positioned at the sheet feeding station to release the locking device to allow the gripper mechanism to close thereby gripping sheet material inserted in the gripper mechanism.

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