Oct. 23, 1956 A. G. JACOBSON ET AL 2,767,790

SHEET FED ROTARY PRINTING PRESS WITH SHEET SLITTING ATTACHMENT

Filed Aug. 15, 1951 3 Sheets-Sheet 1

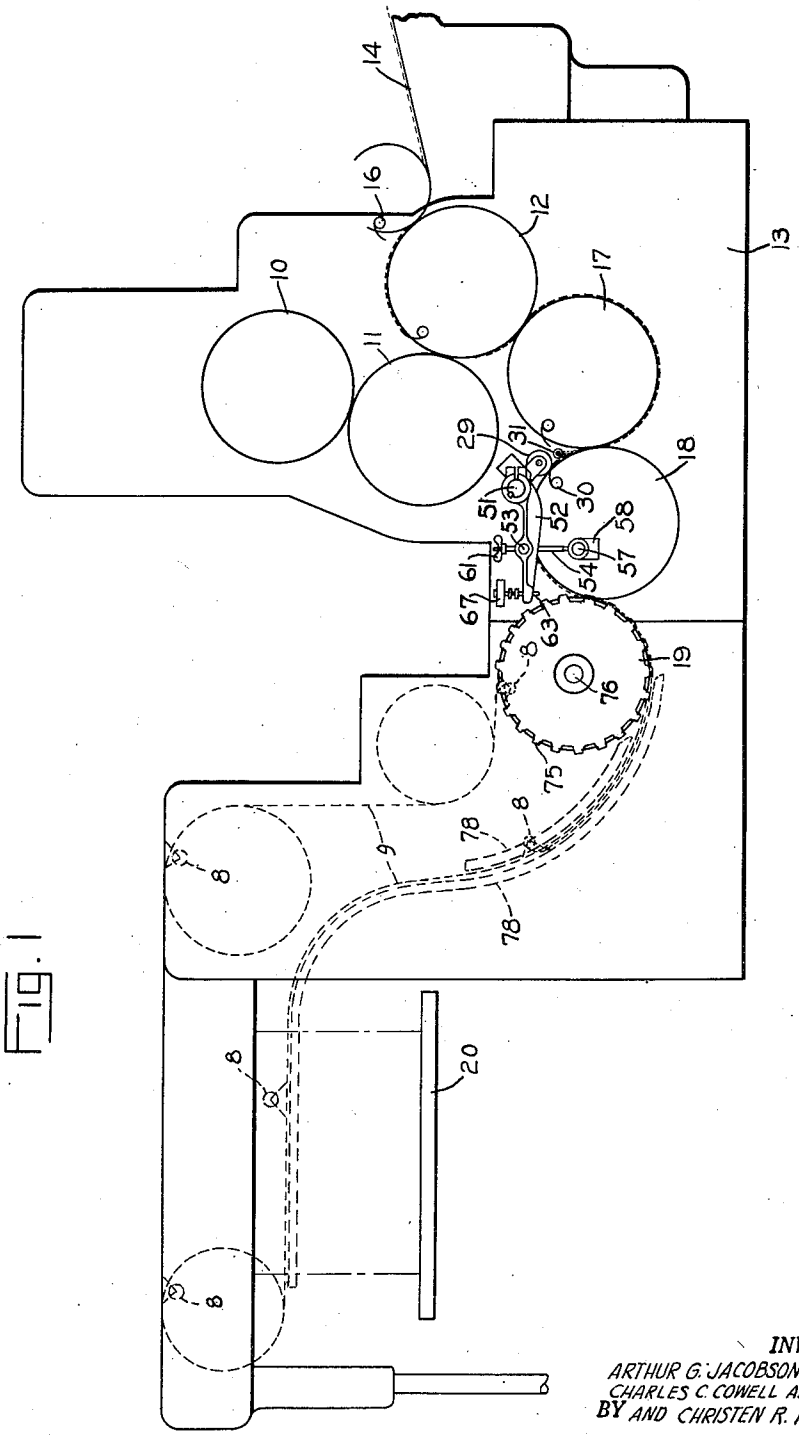


Fig. 1

INVENTORS
ARTHUR G. JACOBSON, DECEASED, BY CHARLES C. COWELL ADMINISTRATOR
BY AND CHRISTEN R. KADDELAND

Wilkinson Huxley, Byron & Hume
Attorneys

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3 Sheets-Sheet 2

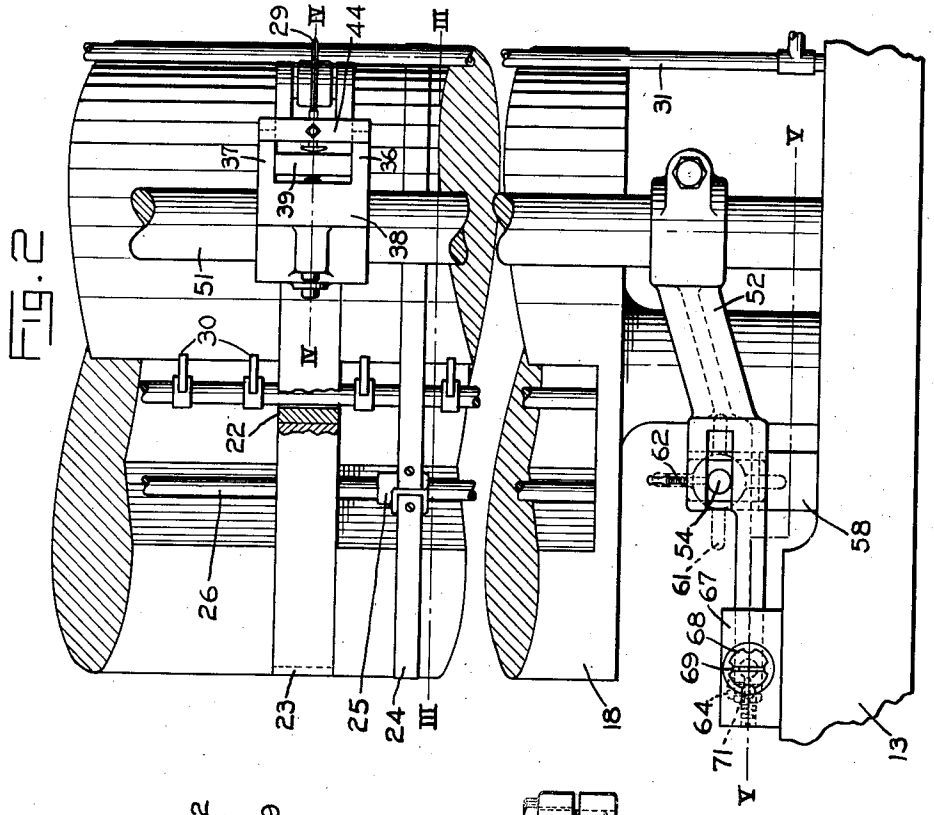


Fig. 2

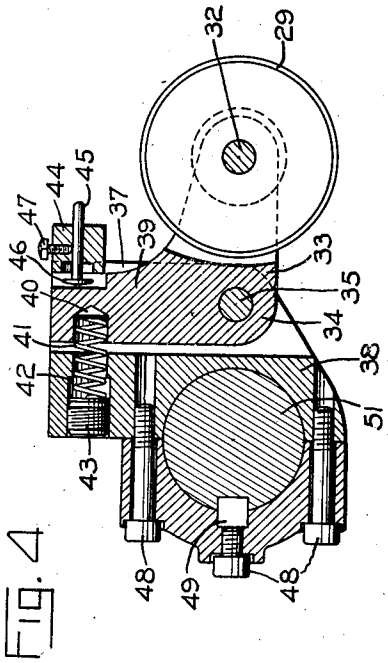


Fig. 4

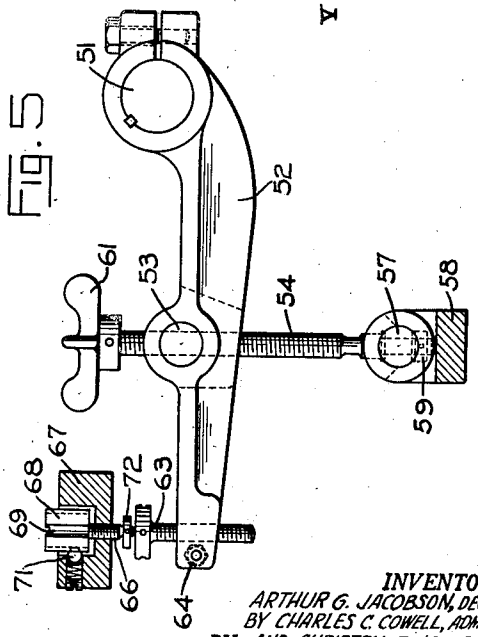


Fig. 5

INVENTORS
ARTHUR G. JACOBSON, DECEASED,
BY CHARLES C. COWELL, ADMINISTRATOR
BY AND CHRISTEN R. KADDELAND

Wilkinson Huxley Byron & Hume
Attorneys

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Filed Aug. 15, 1951 3 Sheets-Sheet 3

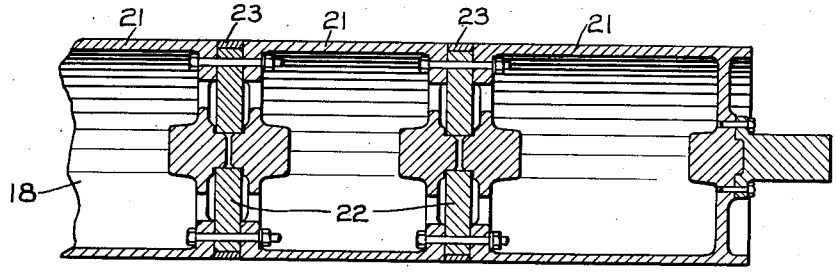


Fig. 6

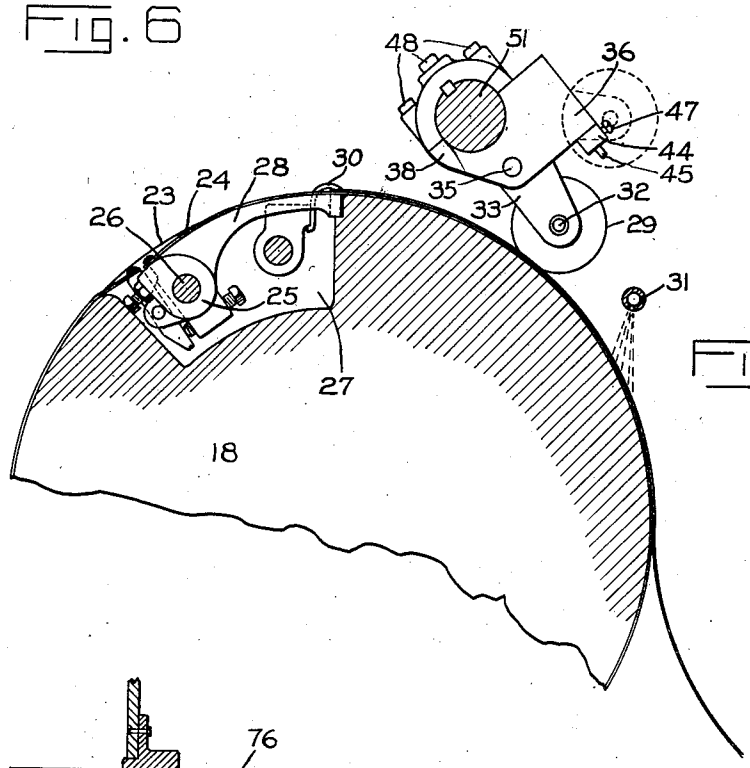


Fig. 3

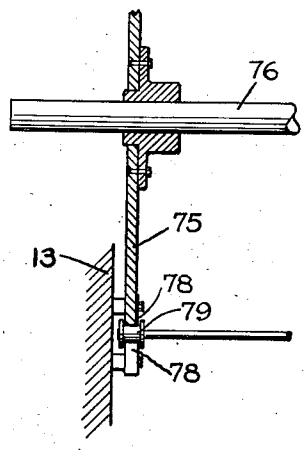


Fig. 7

INVENTORS
ARTHUR G. JACOBSON, DECEASED, BY
CHARLES C. COWELL ADMINISTRATOR
BY AND CHRISTEN R. KADDELAND

Wilkinson, Huxley, Byron & Hume
Attorneys

United States Patent Office 2,767,790 Patented Oct. 23, 1956

2,767,790

SHEET FED ROTARY PRINTING PRESS WITH SHEET SLITTING ATTACHMENT

Arthur G. Jacobson, deceased, late of Chicago, Ill., by Charles C. Cowell, administrator, Riverside, Ill., and Christen R. Kaddeland, Chicago, Ill., assignors to Miehle Printing Press & Manufacturing Company, Chicago, Ill., a corporation of Delaware

Application August 15, 1951, Serial No. 241,934

5 Claims. (Cl. 164—61)

This invention pertains to rotary printing presses and is directed more specifically to the combination of an improved sheet or web slitting mechanism with such presses.

The slitting device disclosed in this application was designed primarily for sheet fed rotary printing presses. However, it will be apparent that, with but minor modifications, the device may also be readily adapted to web fed presses with equally efficient results. Preferably, the press is equipped with two rotary sheet transfer members which convey the sheets from the last printing unit of the press to the delivery mechanism, and one of these members also functions as a slitter drum. The slitter unit is so arranged that the actual slitting of a sheet does not begin until all printing on a sheet has been completed.

There are many devices now in use for the purpose of slitting sheets or webs of paper into two or more sections. Most of these devices, however, are designed specifically for operation on web fed presses and, therefore, cannot be conveniently adapted for the slitting of sheets on sheet fed presses. On the other hand, the slitters that have been developed for sheet fed printing presses are generally unsatisfactory for the simple reason that they are arranged to coact with the impression cylinder of the press to slit the sheets while they are still held by the impression cylinder grippers and while the sheet is still receiving the impression.

When a slitter is arranged to slit sheets on the surface of the impression cylinder, it must of necessity, begin slitting the leading edge of a sheet while the trailing portion thereof is still receiving the impression. Consequently any distortion of the sheet, or any variation in the tension on the sheet resulting from the action of the slitter, will invariably disturb the register of the print on the trailing portion thereof and render the finished product unacceptable to the trade. Furthermore, it is exceedingly difficult to adjust such slitters properly because of the fact that in order to prevent damage to the impression surface of the cylinder, it is necessary to provide on the cylinder, for each slitter, a hardened steel band to coact with the slitter wheel. This requires that the sheet of tympan packing has to be cut into strips arranged on each side of such slitter band or bands.

In some instances the known slitters are arranged to slit the sheets after they have been released by the cylinder grippers and while they are being conveyed to a delivery pile support by a series of sheet delivery grippers. Such practice also has its drawbacks because it is exceedingly difficult to control the sheet, the trailing portion of which flutters and floats as it is being conveyed and, therefore it is virtually impossible to obtain a satisfactory, straight slit.

It is one of the primary objects of this invention to incorporate in a sheet fed rotary printing press, a slitter which coacts with a slitting drum built into the press assembly and against which the sheets are slit after the impression thereon has been completed, and while they

are still held and positively controlled by the sheet grippers of such drum.

A further salient object of the invention resides in the provision of means associated with the sheet delivery mechanism whereby the sheets to be slit are maintained under positive control in proper slitting register until the slitting operation is completed.

Another object is to provide means, associated with the slitter, for positively controlling the sheets until the impression thereon is completed and for thereafter presenting them printed side up, to the slitter.

A still further object is to provide a sheet slitting device which can be adjusted to accommodate cutting wheels of various diameters.

Another object is to provide means for adjusting the contact pressure of the cutting wheel with the slitting drum with micrometer precision.

A further object of this invention is to provide a slitting device which will be efficient in operation, extremely rigid in construction and economical to manufacture.

Other objects and distinct advantages of this invention will become apparent from the following specification when read in conjunction with the accompanying drawings which disclose a preferred embodiment of the invention and wherein:

Figure 1 is a schematic view in side elevation of a printing press embodying this invention.

Figure 2 is an enlarged plan view of the slitter head, its adjusting means, and its associated drum.

Figure 3 is a sectional view taken along line III—III of Figure 2.

Figure 4 is an enlarged sectional view along line IV—IV of Figure 2, and,

Figure 5 is an enlarged side view of the slitter adjusting mechanism taken along line V—V of Figure 2.

Figure 6 is a longitudinal cross section taken through the slitting drum and showing a plurality of drum sections and steel inserts or slitting rings, and

Figure 7 is a partial cross section illustrating means whereby the chain delivery mechanism is prevented from lateral movement during the slitting operation.

Referring now to Figure 1 of the drawings, it will be seen that this invention is disclosed, merely by way of example, as embodied in a conventional sheet fed rotary lithographic printing press. In such presses, the printing couple comprises a plate cylinder **10**, a blanket cylinder **11** and an impression cylinder **12**, all of said cylinders being journalled for rotation in side frame members **13**. The sheets to be printed are fed over a feed table **14** to conventional transfer grippers indicated at **16** which grip, accelerate, and transfer the sheets to grippers provided on the impression cylinder **12** to receive a printing image from the blanket cylinder **11** which is substantially the same diameter as the impression cylinder.

By means of the grippers on the transfer drum **17**, the sheet is withdrawn from the impression cylinder under positive control and steady, even tension until the impression is completed on the trailing portion of the sheet to thereby assure perfect register of the printing impressions over the full length of the sheet. From the drum **17** the sheet is then transferred to a slitter drum **18**, also of substantially the same diameter, where it is slit into any desired number of sections and transferred to delivery grippers **8**, carried by chains **9**, which pass around sprockets located at each end of a conventional delivery reel indicated generally as **19** and which grippers convey the sheets, or the several sections, to a delivery pile **20**. The position of consecutive sheets is indicated by dotted lines in Figure 1 and it will be noted that the trailing portion of a sheet is controlled by the drums **17** and **18** as it passes therebetween during the slitting operation.

Heretofore, in presses of the sheet fed, rotary class, the sheets were transferred from the impression cylinder directly to the delivery chain grippers, and in most instances the slitter was adapted to coact against the impression cylinder surface whereby the slitting and/or delivering of the sheets commenced before the sheets were completely printed. It was found by actual test, that under such conditions, the sheets were stripped off the impression cylinder under tension which varied across the width of the sheets, and that stresses were induced in the sheets by the action of the slitter knife or by the sheet delivery conveyor. As a result, the register of the impressions on the trailing portion of the sheets was invariably defective.

This condition was found to be especially noticable on rotary sheet fed letterpresses because the printing plates used on such presses are not always evenly distributed over the entire surface of the plate cylinder and, as a result, the tension on the sheet is not uniform as it is being stripped off the impression cylinder by the grippers of a sheet conveyor such as a chain delivery. However, by inserting the full size, transfer drum **17** and the equal size slitter drum **18** between the impression cylinder **12** and the delivery reel **19** of substantially the same diameter, the sheet can be removed from the impression cylinder under tension which is equalized across its entire width and the impression can be completed on the trailing portion thereof before the grippers on the transfer drum **17** transfer its leading edge to the grippers on the slitter drum **18**, and before actual slitting thereof commences. Furthermore, the sheets will be controlled and maintained in slitting registration during the entire slitting operation.

In addition, drum **17** also enables the sheet to be presented to the slitter drum **18** with its printed side up to prevent offsetting of the freshly deposited ink onto the surface of drum **18**.

The slitter drum **18**, see Figures 1, 2, 3, and 6, is also journalled in the side frames **13** and is preferably formed of two or more cylindrical sections **21** between which are arranged the discs **22** which are provided about their periphery with hardened steel rings **23**. These rings afford a continuous hardened surface to coact with the cutting wheel when slitting sheets, and are located in predetermined positions axially of the drum.

When sheets are to be slit along lines which do not coincide with the rings **23**, an auxiliary hardened steel band **24** is used. See Figures 2 and 3. This band may be located in any desired position axially on the drum **18** and its ends are secured in position on the bracket **25**, mounted on the shaft **26** within the gap **27** of the drum **18**. As shown in Figure 3, bracket **25** is provided with an arcuate arm **28** which spans the greater portion of the gap **27** and acts as a backing for the flexible band **24** against the pressure of the cutting wheel **29** as it passes over the gap **27**.

The slitter drum **18** is also provided with sheet grippers **30** which maintain the leading edge of the sheet securely in register while it is being slit and until it is transferred to the grippers of the chain delivery. An air brush, preferably in the form of an air blast tube **31**, Figures 2 and 3, is also provided adjacent the slitter drum **18** and immediately forward of the cutting wheel for applying a blast of air onto the trailing portion of the sheet along its entire width to thereby hold it flat against the drum **18** and prevent buckling or twisting of the sheet while it is being slit.

The cutting wheel assembly, as best shown in Figures 2, 3, and 4, comprises the cutting wheel **29** which is rotatably mounted on shaft **32** between the parallel faces of the bifurcated arm **33** of bell crank lever **34** which is pivoted at **35** between the projecting parallel side walls **36** and **37** of bracket **38**. An arm **39** of bell crank **34** projects upwardly between the side walls **36** and **37** and is formed with a recess **40** in which one end of compression spring **41** is seated. The free end of spring **41** projects into an opening **42** provided therefor in the bracket **38** and it is retained in said opening by means of the threaded plug **43** whereby the pressure of the spring against the arm **39** and therewith of the cutting wheel **29** against the material to be slit, can be adjusted. When first assembled, plug **43** is adjusted to thereby preload spring **41** so that a pre-determined pressure is exerted against arm **39** after which plug **43** is set against further movement by any preferred conventional means.

Immediately forward of the arm **39** and rigidly secured to the side walls **36** and **37**, is a cross member **44** in which is slidably mounted a stud **45** with its head **46** adjacent a machined face provided on the arm **39**. Stud **45** is locked in its adjusted position preferably by means of a set screw **47**.

The purpose of stud **45** is to limit the clockwise movement of bell crank **34** and therewith of the cutting wheel **29** as the latter passes the gap **27** in drum **18** when slitting is accomplished against the auxiliary band **24**, as will be explained more fully hereinafter.

The cutting wheel supporting bracket **38** is clamped in position by any conventional means, such as by the bolts **48** and key **49**, on a transverse shaft **51** which is arranged parallel to the axis of the slitter drum **18**, and has its ends journalled for rotation in the side frame members **13** of the press. It will be apparent, therefore, that the bracket **38** and therewith the cutting wheel assembly may be adjusted to any location axially of the drum **18** by loosening bolts **48** and sliding the bracket axially on the shaft **51**.

Rigidly secured to one end of shaft **51** and preferably on the feeder side of the press, is a lever **52** by means of which the pressure of the cutting wheel **29** against the steel rings **23** and/or steel band **24** on the drum **18** is controlled. See Figures 2 and 5. The lever **52** projects substantially horizontally from shaft **51** and midway of its length it is provided with the rotatably mounted stud **53** which is drilled and tapped to receive an adjusting screw **54**.

The depending end of said screw is rotatably inserted in the pivot pin **57** which in turn is rockably mounted in a bracket **58** fixed to the press frame member **13**. A collar **59** is pinned to the projecting end of screw **54** to hold it in position in the pin **57** and prevent any vertical movement thereof.

At the upper or free end of screw **54** is a handwheel **61** by means of which the screw is rotated to either raise or lower the lever **52**, which motion in turn rocks the shaft **51** either clockwise or counter-clockwise to vary the pressure of the cutting wheel **29** with respect to the drum **18**. The screw **54** may also be adjusted to thereby raise the cutting wheel **29** to an inoperative position as indicated by the broken lines in Figure 3. The adjusting screw **54** is locked against unintended movement, after adjustments have been completed, by means of the thumb screw **62**, see Figure 2, which is threaded into the end of stud **53** for engagement with screw **54**.

At the free end of lever **52** is an adjustable stop member **63**, see Figure 5, which is set with relation to the diameter of the cutting wheel being used and which is clamped in position by a bolt **64**.

The pressure of the cutting wheel **29** on the drum **18** is regulated with micrometer precision by means of the calibrated pressure screw **66** which is adjustably mounted in a bracket **67** fixed to the press frame member **13** and which is arranged to engage the head of the stop member **63** whereby the extent of movement of lever **52** is determined. The pressure limiting screw **66** has an elongated head **68** which is provided with axially aligned grooves **69** at 90° intervals about its periphery and a spring urged ball **71** is arranged to successively engage the grooves **69** as the screw **66** is being turned for adjustment.

The screw **66** is calibrated with direct relation to the

spring **41** so that any angular displacement of screw **66** will effect a pre-determined change in the pressure of the cutting wheel **29** against the drum **18**. For example, a quarter turn of the screw **66**, i. e. from one groove **69** to the next, in either direction, will vary the pressure of the cutting wheel against the drum a definite amount, for instance 5 pounds.

As a result, the cutting wheel pressure can be readily ascertained at any time while the press is in operation. Moreover, it may be varied accurately and efficiently to any desired degree of pressure within the limits of the device by turning screw **66** through the required number of increments.

The screw **66** is also provided with a collar **72** which limits its upward movements and thereby determines the maximum pressure of the cutting wheel **29** against the drum **18**.

After the leading edge of a sheet passes beneath the cutting wheel **29**, it is transferred to the chain delivery grippers **8** which thereafter maintain control of the sheet until it is completely severed and then convey the slit sections to the delivery pile **20**.

In order that the slitting of the tail end of the sheet will be straight and without any distortion, the sprockets **75**, see Figure 7, one of which is provided at each end of the delivery reel **19** to drive the delivery chains **9**, are adjusted axially on their supporting shaft **76** until they engage the inner surface of the outer links of the chain **9**. As a result, the lateral movement of the chains and therewith the delivery grippers is reduced to a minimum and the alignment of the sheet will be maintained as its leading edge is transferred from the grippers **30** of the slitter drum to the grippers **8** of the delivery conveyor.

In addition, tracks **78**, see Figures 1 and 7, are provided above and below the chains to guide them through their endless path. These tracks are supported on the side frame members and are positioned so that they are also adjacent the outer links of the chains to thereby maintain the alignment of the delivery grippers after they leave the sprockets **75** and until the trailing portion of the sheet has been slit. The sprockets and tracks are positioned at the time of assembly of the press and no further adjustments are necessary.

The procedure for setting the slitter mechanism is as follows:

When the sheets or web are to be slit on the center line, for example, bolts **48** in bracket **38** are loosened and the bracket adjusted axially on shaft **51** to bring the cutting edge of wheel **29** in line with the location of the slit. Bolts **48** are then tightened to lock the bracket **38** against any unintended axial movement.

With the stop member **63** and the pressure regulating screw **66** in their lowermost position and with thumb screw **62** backed off, handwheel **61** is rotated to raise lever **52** and thereby rock the shaft **51** until the cutting wheel **29** contacts the periphery, i. e. the steel ring **23** of drum **18**. Then the stop member **63** is raised until it contacts screw **66** after which it is locked in position by tightening the bolt **64**.

With the parts so set, the cutting wheel is merely contacting the ring **23** and is not under operative pressure. Therefore, the next step is to apply pressure to the cutting wheel to an extent that will be sufficient to slit the material being processed, but not to a degree that it will cause premature wear of the cutting edge. The extent of pressure necessary is dependent, of course, upon the quality and thickness of the material to be slit and in most instances, the pressure will have to be varied at the start of a job until the proper setting is arrived at.

The extent of pressure applied to the cutting wheel **29** is accurately controlled by adjusting the regulating screw **66** through the necessary number of increments, i. e. grooves **69**, until the desired pressure is indicated. Handwheel **61** is then rotated to raise lever **52** which action rocks the shaft **51** clockwise causing the bell crank lever

34 to pivot counterclockwise and its arm **39** to compress spring **41**. This movement continues until stop member **63** again contacts screw **66** at which time thumbscrew **62** is tightened to lock the screw **54** against further movement.

When making the slit on any of the steel rings **23** of the drum **18**, no further adjustment of the slitter assembly is necessary because the rings **23** present an endless track on which the cutting wheel **29** travels. However, when the location of the slit does not coincide with any of the rings **23** and the slitting is to be done on the auxiliary band **24**, it is necessary to control the clockwise movement of bell crank **34** and therewith wheel **29** as it passes the gap **27** on the drum **18**.

As shown in Figure 3, the ends of the band **24** are located within the periphery of said drum and fastened in the gap **27** on the bracket **25**. Therefore, unless the clockwise movement of the bell crank **34** is controlled in order to maintain the cutting edge of the wheel **29** substantially tangent to the periphery of the drum **18** as it passes over the gap, it will dip into the gap, due to the pressure of spring **41** on arm **39**, and strike the heads of the band retaining screws. This would result in severe shocks and damage to the wheel, as well as to the band **24**.

When, as indicated herein, sheets are to be slit on the auxiliary band, then the movement of the bell crank **34** is controlled by means of the stud **45**, see Figure 4. After the wheel **29** is set to the required pressure against the drum **18**, i. e. band **24**, the set screw **47** is backed off and the stud **45** is moved inwardly until its head **46** has but a slight clearance with respect to the machined face on the arm **39**. The set screw **47** is then tightened to lock the stud **45** in position. Consequently, as the wheel **29** passes over the gap **27**, the clockwise movement of bell crank **34** will be limited to a very small extent so that the wheel **29** will remain substantially tangent to the periphery of the drum **18** until it again engages the band **24**.

It will be understood that the embodiment of the invention herein disclosed is merely by way of example and that modifications in the construction and arrangement of parts may be made without departing from the spirit and essence of the invention as represented by the appended claims.

We claim:

1. In a sheet fed rotary printing press having an impression cylinder, the combination comprising, a first cylinder having gripper elements thereon for taking printed sheets from the impression cylinder, a second cylinder having gripper elements to which the sheets are conveyed by said first cylinder, sheet slitting means adapted to co-act with the cylindrical surface of said second cylinder for slitting sheets carried thereby, said cylinders being adapted to carry the sheets completely past the point of impression before they are engaged by the slitting means, and sheet delivery means including a delivery reel and a chain conveyor having gripper elements for transferring the slit sheets from said second cylinder to a pile support, said first and second cylinders and the delivery reel having diameters substantially equal to the diameter of the impression cylinder and being arranged in a substantially horizontal plane below and forward with respect to the axis of the impression cylinder.

2. In a machine of the class described, an impression cylinder, a sheet delivery conveyor, a plurality of sheet transfer drums each having gripper elements thereon and having operation to transfer sheets of material sequentially from said impression cylinder to the delivery conveyor, a slitter unit including a cutting wheel having an operative position wherein it coacts with the cylindrical surface of one of said drums for slitting sheets while they are held by the gripper elements on said drum, supporting means for said wheel including resilient spring means

for urging said cutting wheel against the periphery of said drum, a manually operable lever connected with said supporting means and operable from a remote position at one side of the machine for varying the tension of said spring means while the machine is in operation to thereby vary the pressure of said wheel on said drum while said wheel is in its operative position, and an adjustable stop member having coaction with said lever to define the extent of adjustment imparted thereto, said stop member being calibrated with relation to said spring means whereby the pressure of said wheel on said drum can be accurately regulated and readily ascertained.

3. In combination with a rotary, sheet fed printing press, a slitter drum having sheet engaging elements, a slitter associated with said drum, an impression cylinder, a sheet transfer drum having grippers arranged to transfer printed sheets directly from the impression cylinder to said elements in a curvilinear path whereby printing of the sheet is completed before its leading edge is engaged by the slitter, the cylindrical surfaces of said transfer drum and slitter drum coacting to control the trailing portion of said sheet while it is being slit, air blast means mounted immediately forward of said slitter and having operation in conjunction with said drums to control the trailing portion of the sheet, a delivery reel, and a chain conveyor associated with said reel, for delivering the slit sheets from the press.

4. A slitting mechanism for a sheet fed rotary printing press comprising, a slitter drum, a rotatable shaft mounted above and parallel with said drum, a supporting member fixed to said shaft, a bracket pivotally mounted on said supporting member, a rotary cutting wheel carried by said bracket for coaction with the cylindrical surface of said drum, resilient spring means interposed between the supporting member and said bracket for urging the cutting wheel into contact with said surface, means for adjusting the angular position of said shaft and thereby the pressure of said wheel on said surface including a lever fixed to the end of said shaft and operable from one side of the printing press, a stop member calibrated with relation to said spring means and adjustable to define the angular position of said lever and thereby the pressure of the cutting wheel on said surface, and screw means threadedly engaging said lever for adjusting the lever relative to said stop member.

5. A sheet delivery mechanism for conveying printed sheets from the impression cylinder of a printing press to a delivery pile comprising, a sheet transfer drum equal in size to and mounted for rotation adjacent said impression cylinder, grippers on said transfer drum for taking the sheets from the impression cylinder under uniform tension, an equal size slitter drum mounted for rotation adjacent said transfer drum and having grippers for taking the sheets from the transfer drum, said drums being mounted below and forward with respect to the impression cylinder, sheet slitting means including a cutting wheel arranged to coact with the cylindrical surface of the slitter drum to slit the sheets while they are carried thereby, said drums being adapted to carry the sheets in a curvilinear path whereby the impression is completed on each sheet before its leading edge engages said cutting wheel, spring means for urging the cutting wheel against said cylindrical surface, means located at one side of the press and including a member calibrated with relation to said spring means for effecting predetermined adjustments of the pressure between the cutting wheel and said surface while the press is in operation, and an endless sheet conveyor having grippers for conveying the slit sheets from the slitter drum to the delivery pile.

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