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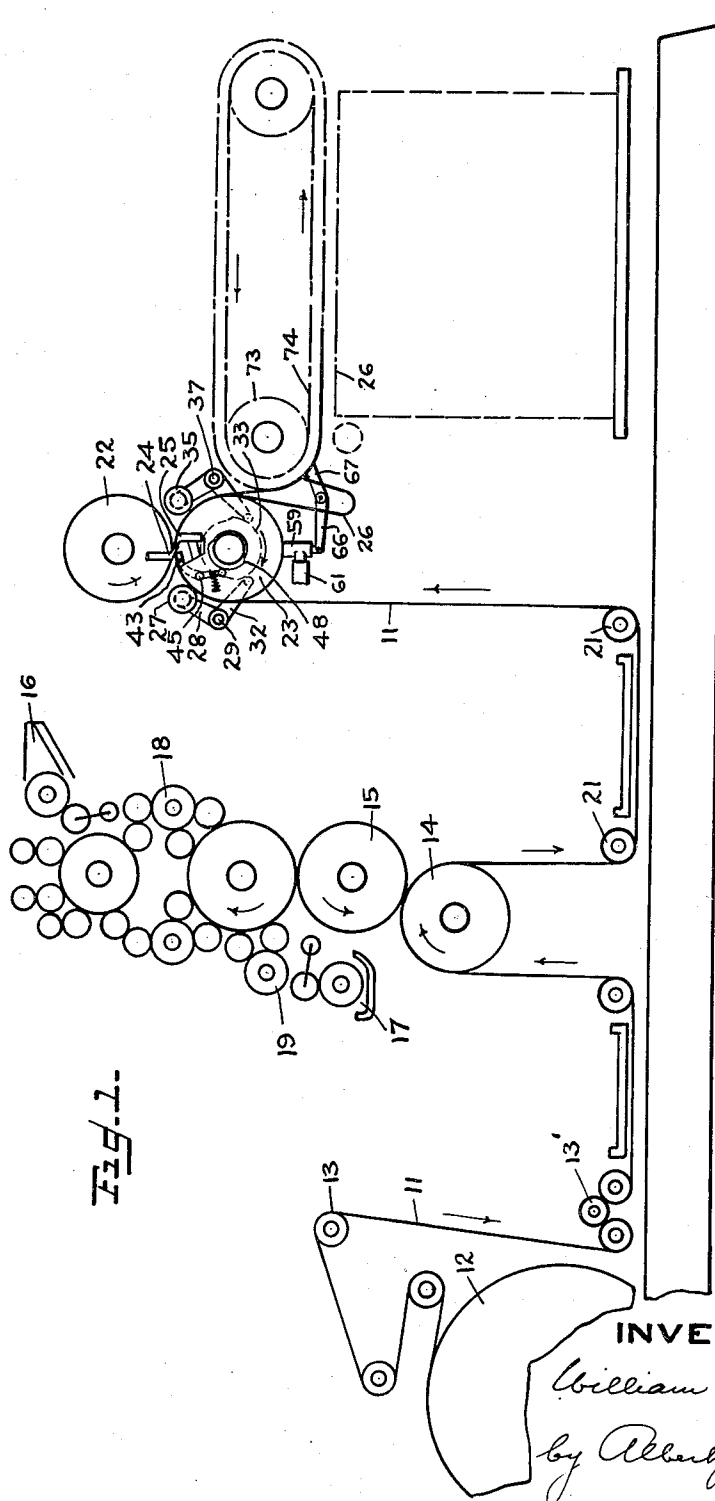
W. F. HUCK

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MECHANISM FOR CUTTING AND DELIVERING SHEETS FROM A WEB

Filed Dec. 23, 1936

3 Sheets-Sheet 1



Nov. 29, 1938.

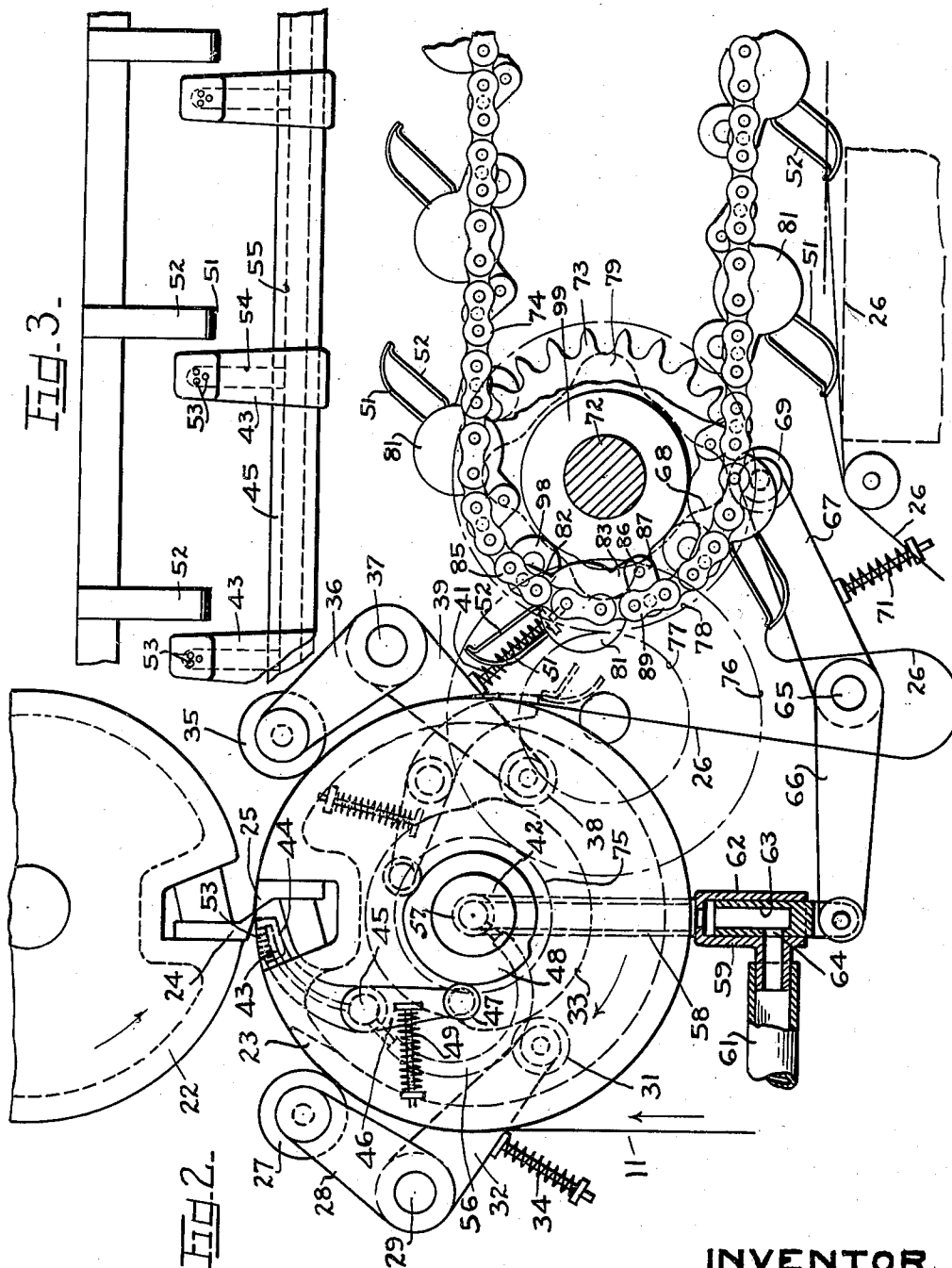
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MECHANISM FOR CUTTING AND DELIVERING SHEETS FROM A WEB

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3 Sheets-Sheet 2



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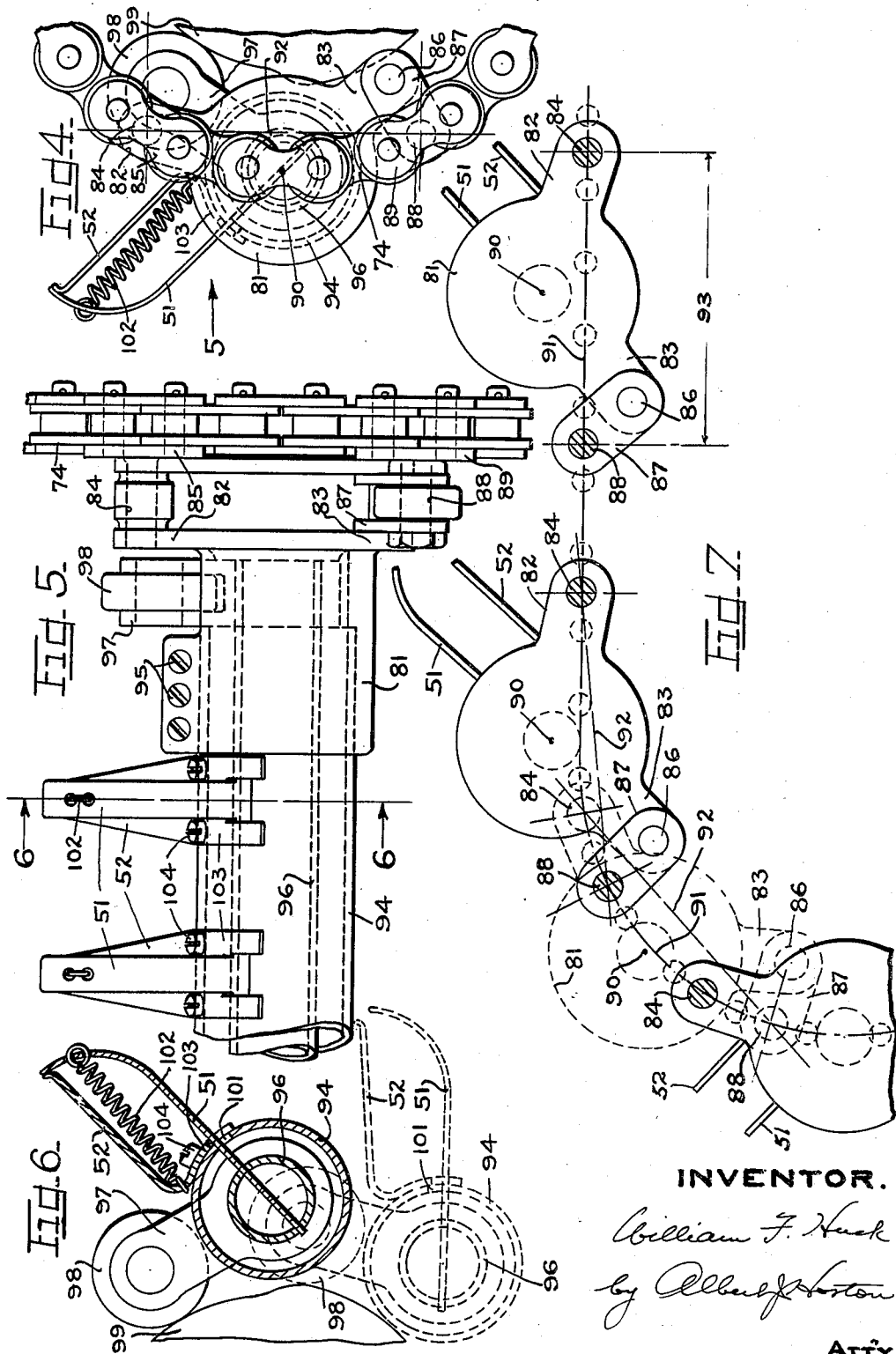
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3 Sheets-Sheet 3



UNITED STATES PATENT OFFICE

2,138,406

MECHANISM FOR CUTTING AND DELIVER-
ING SHEETS FROM A WEB

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24 Claims. (Cl. 164—68)

This invention relates to mechanism for cutting a running web of flexible material into sheets and delivering them to a pile. More particularly, the invention relates to improvements in mechanism which combines relatively high speed web cutting means and comparatively slow speed sheet delivery means.

When cutting sheets from a printed web and delivering the same at a receiving point, for instance on a pile, one sheet on top of the other, it is desirable that the sheet delivery movement be considerably slower than the speed of the web as it is being cut into sheets, which latter operation is usually run at substantially the speed of the web as it travels through the printing machine, in order that the sheets will be smoothly delivered in a neat, regular and uniform pile. It is also desirable that means be provided to retain the forward end of the material from which a sheet is cut, closely adjacent the periphery of the cutting cylinder until the same is engaged by suitable grippers provided in association with the delivery means.

One object of this invention is to provide an improved web cutting and sheet delivery mechanism for a printing or like machine operating upon a running web.

Another object is to provide controlled means for utilizing fluid pressure for retaining the forward end of the material in engagement with the cutting cylinder.

A further object is to provide cooperating material retaining and material receiving means whereby the material will be transferred from one to the other smoothly and speedily.

A still further object is to provide a web cutting and sheet delivery mechanism having cooperating means to transfer the leading end of web material moving at relatively high speed to sheet delivery mechanism moving at much slower speed and then cutting a sheet from the web while its leading end is retained by the sheet delivery means, the mechanism including an arrangement of elements whereby the transfer of the material from one means to the other means will be accomplished at speed somewhat faster than the delivery speed and which is gradually decelerated after such transfer and before delivery.

It is also an object of this invention to provide a web cutting and sheet delivery mechanism of generally improved construction, whereby the same will be simple, durable and inexpensive in construction, as well as convenient, practical, serviceable and efficient in use.

With the foregoing and other objects in view,

which will appear as the description proceeds, the invention resides in the combination and arrangement of parts, and in the details of construction hereinafter described and claimed.

The preferred embodiment of the invention is illustrated in the accompanying drawings, wherein:

Figure 1 is a side view of a printing machine having the web cutting and sheet delivery mechanism of this invention applied thereto, the several elements of the machine and mechanism being shown somewhat diagrammatically for the sake of clearness;

Figure 2 is an enlarged side view of the web cutting and sheet delivery mechanism embodying the novel features of this invention;

Figure 3 is a view showing the relative transverse positions of the web end retaining means and the material gripping means at the point of transfer from the web cutting means to the sheet delivery means;

Figure 4 is an enlarged partial view of the material receiving and gripping means;

Figure 5 is a view of the parts shown in Figure 4, looking in the direction of arrow 5 in Figure 4;

Figure 6 is a sectional view taken on line 6—6 of Figure 5; and

Figure 7 is a somewhat diagrammatic view of certain of the elements constituting the delivery means and illustrates the movements of the material grippers as they approach the transfer point.

The web cutting and sheet delivery mechanism of this invention is particularly adapted for use with a printing machine wherein a web of flexible material is drawn from a web roll and guided by suitable rollers through feed rollers between a pair of printing cylinders, one of which has ink applied to its printing surface from an ink reservoir and water from a water reservoir by means of sets of ink and water transfer rolls respectively. The printed web is led by guide rollers to a pair of cooperating cutting cylinders and by means of cutting members mounted on the respective cylinders is then cut into sheets. In this instance, the cylinders are driven at a speed substantially equal to the speed of the machine and the cutting members are arranged to cut one sheet from the web at each revolution.

Referring particularly to Figures 2 and 3, the web material is shown being led upwardly and between the cylinders and having a sheet cut therefrom by the cutting members

24 and 25 as they meet. The web 11 is pressed against the periphery of the cylinder 23 by a roller 27 which is mounted on the end of a lever arm 28 pivoted at 29. A cam roller 31 is carried by the other arm 32 of the lever and is urged into engagement with a cam 33 by a spring 34 for actuation thereby to swing the lever and cause the roller 27 to press the web 11 firmly against the cylinder 23 so as to insure that the speed of the web 11 will be the same as that of the cylinder 23 and no slippage will occur therebetween. Another roller 35, mounted upon a lever arm 36 pivoted at 37, is likewise actuated by the cam 33 through a cam roller 38 and a lever arm 39 upon which the roller 38 is mounted to press the web against the cylinder 23 to insure that it will travel at the same speed as this cylinder and to prevent slippage therebetween. A spring 41 constantly urges the cam roller 38 against the cam 33. The cam 33 is secured upon the cylinder shaft 42 and rotates with the cylinder 23. The outer end of springs 34 and 41 abut against a stationary abutment on the machine frame not shown.

Directly following the cutting member 25 on the cylinder 23, a plurality of arms 43 are disposed in a suitable recess 44 formed in the cylinder 23 at its periphery. The arms 43 are secured upon a shaft 45 extending lengthwise of, and journaled in, the cylinder 23. The shaft 45 has one end of an arm 46 secured thereto, and a cam roller 47 is mounted upon the other end of the arm 46 and is adapted to engage a cam 48 supported upon the cylinder shaft 42 and arranged thereon to remain stationary with respect to the rotation of the cylinder 23. A spring 49 is provided to constantly urge the roller 47 against the cam 48. The outer faces of the arms 43 are maintained substantially flush with the periphery of the cylinder 23 by the cam 48 during a part of each revolution of the cylinder 23 and are adapted to be raised by the spring 49 under control of the cam 48, beyond the cylinder periphery during another part of its revolution, to raise the end of the material outwardly beyond the cylinder periphery, as shown in dotted lines in Figure 2 into the path of a plurality of pairs of material gripping fingers 51 and 52.

It will be observed that as the cylinder 23 rotates, the cam 48 acting on the roller 47 causes the arm 43 to swing with its shaft 45. The arc in which the arm 43 swings causes the sheet end, engaged by it, to move rearwardly with respect to the cylinder periphery to some extent, thereby reducing the speed of the sheet during the period in which it is swinging outward, at which time it is taken by the gripper fingers 51 and 52.

Each of the arms 43 is provided with a vacuum head having an opening or plurality of openings 53 extending from its upper surface, adjacent its end, into communication with a duct 54, formed lengthwise in the arm 43 and which is in communication with a bore 55 provided in the shaft 45. The bore of the shaft 45 is connected by a tube 56 to a suitable connection 57 rotatable with the cylinder shaft 42, from which a pipe 58 leads to a valve 59, adapted to connect the same to a pipe 61, which is in connection with an exhausting means such as an exhaust pump (not shown). The valve 59 is constituted by a cylinder 62 in which a sleeve piston 63 is adapted to slide to open and close, or, if desired, to only partially close, a port 64 leading from the cylinder 62 to the pipe 61. Actuation of the valve 59

at timed intervals, to connect the openings 53 of the vacuum head with the exhausting means will cause atmospheric pressure to be imposed upon the web end in advance of the operation of the cutting members, whereby this web end will be pressed and retained against the arms 43 and in contact with the periphery of the cylinder 23, and be carried forwardly thereby beneath and beyond the cam pressed roller 35. The arrangement may be such that the degree of pressure is only slightly reduced by partially closing the valve 59 as the web end approaches the fingers 51 and 52, whereby when it is gripped thereby, it will be stripped from the arms 43, the vacuum being then destroyed and the pressure released due to the consequent connection of the openings 53 with the atmosphere.

The valve 59 is actuated by a lever pivoted at 65 and has one end of one of its arms 66 connected to the slidable sleeve 63 and one end of the other arm 67 actuated by a cam 68 through a cam roller 69 adapted to be urged against the cam 68 by a spring 71 which abuts against a stationary abutment of the machine. The cam 68 is secured for rotation therewith to the shaft 72 of a sprocket 73 about which a chain 74 is led. The shaft 72 is driven from the cylinder shaft 42 by means of a set of speed reduction gears 75-78 inclusive, which are indicated in the drawings by dot and dash lines for the sake of clearness and to avoid confusion with other lines. The gear 75 is secured to, and rotates with, the cylinder shaft 42 and the gear 78 is secured to, and rotates with, the sprocket shaft 72, while the intermediate gears 76 and 77 act to drivingly connect the gears 75 and 78. The arrangement is such that, in this instance, the cylinder shaft 42 rotates in relation to the sprocket shaft 72 in the proportion of 4-1. The cam 68, therefore, is adapted to actuate the valve 59 once every revolution of the cylinder 23, being provided with four raised cam surfaces 79 for this purpose.

It is known that a member extending beyond the pitch circle of a chain and sprocket combination travels faster at its outer end, as it is moved with the chain about the sprocket, than it does when traveling in a straight line between the sprockets, the increase in speed being proportional to the amount the outer end of the member is extended beyond the pitch circle of the sprocket. Advantage is taken of this action in the mechanism of this invention, to increase the speed of the fingers 51 and 52 before they pass the point where they grip the web end held by the arms 43, so as to assist in causing the speed of the material and the fingers to be substantially the same when the transfer is made.

Were the support for the gripper fingers to be carried directly on a single link of the chain, the transition in speed of the grippers from slow speed to high speed, would be practically instantaneous as the chain passes from the tangent to the arc of the sprocket. This rapid transition is avoided in the present mechanism by connecting the support for the grippers to the chain at points somewhat separated, thus as the path of the chain changes from a tangent to an arc, in going around the sprocket, the path of the gripper fingers is changed more gradually with the result that the transition in speed from slow speed to high speed or vice versa is spread over a period beginning when the chain link to which one end of the support is connected reaches the arc, and ending when the link holding the other end of the support reaches the arc; or, as shown 75

in the drawings, the acceleration and deceleration period is the time required for four links of the chain to pass a given point. This is accomplished by supporting the fingers 51 and 52 upon carriers 81, one of which is disposed at each side of the material, and which are so connected to the adjacent chains 74 as to cause a gradual acceleration in the speed of the fingers 51 and 52 as they approach the end and a gradual deceleration in their speed as they move away therefrom, after having gripped the material.

This effect is assisted by the counterclockwise movement of the arms about the axis of the shaft 45 relatively to the clockwise rotation of the cylinder 23 at the time of transfer of the material to the gripping fingers 51, 52, referred to above. It will be noted therefore that the approximate equalization of speeds between the material carried by the arms 43 and the revolving fingers 51 and 52 is obtained by a slowing down in the angular speed of one carried, herein the arms 43, and an acceleration in the angular speed of the coacting carrier, herein the fingers 51 and 52, so that the action required for the said equalization of speeds may be said to be divided between the arm 43 carrying the vacuum head, and the material-gripping fingers 51 and 52 on the chain conveyed carriers 81.

The structure whereby the above action on the part of the fingers 51 and 52 is obtained, is constituted by mounting the carriers 81 on the chains 74, as shown in Figures 4, 5 and 7. Each of the carriers 81 is provided with lugs 82 and 83 which are disposed at each side of the carrier and extend at an obtuse angle to each other therefrom. The lug 82 is connected by a pivot pin 84 to a point on the pitch line of the chain 74 midway between the pivots of a chain link 85 thereof, herein the pin 84 being shown provided on one plate of the link 85. The other lug 83 is connected by a pin 86 to one end of a short connecting link 87, the other end of the latter being connected to a pin 88 extending from one plate of a chain link 89, and disposed midway between the pivots of the chain link 89, and on the pitch line of the chain. Herein the pins 84 and 88 are shown spaced apart along the chain the equivalent of four chain links and the axis 90 of the finger carrier 81 is disposed substantially midway between the pivoting pins 84 and 88.

As shown in Figure 7, the axis 90 about which the fingers 51 and 52 on the carrier 81 rotate is disposed above the pitch line 91 of the chain 74 when the carrier and fingers are traveling in a straight line between the sprockets, either through their upper or lower path above or below the sprockets. As the chain with the carrier and fingers progresses and starts around the sprocket 73, the cord 92 between the pivot pins 84 and 88 becomes gradually shorter than the distance 93 these pins were spaced apart while traveling on the straight path. As soon as the pin 84 leaves the line of straight travel and starts traveling on the arc of the pitch line of the sprocket 73 the maximum speed point is reached and the axis 90 of the fingers 51 and 52 is substantially on the pitch line of the chain 74. At this point, the carrier 81 and fingers 51 and 52 are traveling substantially at the speed they would normally have traveled at had their axis 90 been directly connected to the chain 74 at its pitch line 91. After passing the maximum speed point as above described, the speed of the fingers

51 and 52 gradually decreases until they are again traveling in a straight line whereby no abrupt change in speed has been experienced, and the material is smoothly carried along at comparatively slow speed and is evenly deposited upon the pile of sheets 26, see Figures 1 and 2.

The fingers 51 and 52 are adapted to open to receive the web material by being mounted as shown in Figures 2, 4, 5 and 6. A tube 94 extends between each pair of carriers 81 with its axis in alignment with the axis 90 of the carriers and has an end thereof clamped to each carrier by clamp screws 95. Another tube 96 is disposed within the outer tube 94 and extends between the carriers, being suitably journaled (not shown) at each end to the carrier at that end. An arm 97 is secured to one end of the inner tube 96 and extends through one of the carriers 81. A cam roller 98 is mounted on the outer end of the arm 97 and is adapted to engage a cam 99 supported upon the sprocket shaft 72 but retained stationary in respect to the rotation thereof. The finger 51 is secured in the inner tube 96 and extends therefrom outwardly through an opening 101 provided in the outer tube 94. The finger 51 is curved at its outer end toward, and is normally in gripping contact with, the outer end of the finger 52. A spring 102 is provided for each pair of fingers and extends between the base 103 of the finger 52 to the outer end of the finger 51 and constantly urges the outer ends of both fingers into sheet gripping contact. The base of each of the fingers 52 is secured to the outer tube 94 by screws 104. The combined urge of all of the springs 102, acting through the fingers 51 and tube 96, maintain the cam roller 98 in contact with the cam 99. Movement of the carriers 81 about the sprocket 73 causes the cam 99 to actuate the fingers 51 to move them relatively to the fingers 52 to an open position, whereby the leading end of the web may be positioned between them by the outward movement of the arms 43 at a predetermined position of the rotating cylinder 23. Upon receipt of the material end between the fingers 51 and 52, the cam 99 then acts to permit the fingers to close together and grip the material, whereupon it is stripped from the arms 43 and carried along with the chain 74 by the fingers. The action of the opening of the fingers 51 and 52 is shown in dotted lines in Figure 6. It will be understood that a cam similar to the cam 99 is provided to open the fingers 51 and 52 when the sheet 26 severed from the web is properly disposed over the pile of sheets 26.

The combination of web cutting means including a fluid pressure device for holding the leading end of a sheet to the cutting cylinder with a web receiving and sheet delivery means of the above described form, provides an especially efficient and smooth acting web cutting and sheet delivery mechanism for a printing machine. Such a mechanism is particularly adapted for use with relatively high speed machines operating upon a web, and wherein the cut sheets are required to be deposited in a pile at the delivery end thereof, the combination disclosed above permitting the efficient transfer of the material from a fast moving cutting cylinder to relatively slow moving material gripping and receiving fingers.

It is obvious that if desired a second chain conveyor having sets of sheet gripping fingers mounted thereon may be provided to receive

sheets from the first conveyor and deliver them to the pile of sheets 26 in order to further slow down the delivery speed in relation to the cutting speed, whereby the speed relation between that of the actual delivery and the cutting cylinder 23 may be further reduced.

It will be understood that the invention may be embodied in other specific forms without departing from the spirit or essential attributes thereof, and it is therefore desired that the present embodiment be considered in all respects as illustrative and not restrictive, and it will be further understood that each and every novel feature and combination present in or possessed by the mechanism herein disclosed forms a part of the invention included in this application.

What I claim is:

1. In a mechanism for cutting and delivering sheets from a web of flexible material, a cylinder having a cutting device, a sheet holding device adapted to utilize fluid pressure for holding the material on the cylinder adjacent the cutting device, and means to actuate said sheet holding device to raise the sheet held thereby above the periphery of the cylinder.

2. In a mechanism for cutting and delivering sheets from a web of flexible material, a cylinder driven at a relatively high speed and having a cutting device, means adapted to utilize fluid pressure to hold the material on the cylinder adjacent the cutting device, a sheet conveyor moving at a relatively slow speed, and gripping members on the conveyor arranged to move at a higher speed than the conveyor when taking material which the cutting cylinder cuts.

3. In a mechanism for cutting and delivering sheets from a web of flexible material, a cylinder driven at a relatively high speed and having a cutting device, means adapted to utilize fluid pressure to hold the material on the cylinder adjacent the cutting device, and a sheet conveyor moving at a relatively slow speed, gripping members on the conveyor arranged to move at a higher speed than the conveyor when taking material from the said holding means.

4. In a mechanism for cutting and delivering sheets from a web of flexible material, means for holding the leading end of the material to the peripheral surface of a cylinder by fluid pressure, means to actuate said material holding means to raise the said leading end above the cylinder surface, cooperating material receiving and delivery means mounted to move past the point at which the leading edge of the material is raised from the cylinder, and means to gradually accelerate and decelerate said material-receiving and delivery means to move them at higher speed while they pass the said point.

5. In a mechanism for cutting and delivering sheets from a web of flexible material, a cylinder having means to cut a sheet from a web of material running over the cylinder, means to hold the leading end of the material upon the cylinder and subsequently raise it therefrom, material receiving and delivery means mounted to move past the point at which the leading end of the material is raised from the cylinder, and means to move said material receiving and delivery means at successively gradually accelerated and decelerated speed past the said point.

6. In a mechanism for cutting and delivering sheets from a web of flexible material, a rotating cylinder having means thereon cooperating with means on another cylinder to cut a running web of material into sheets, a member carried by

said rotating cylinder connected to an exhausting device and adapted to hold the leading end of the material to the surface of the cylinder by atmospheric pressure, said member being mounted for movement to raise the leading end of the material from the surface of the cylinder, and means to actuate said member in timed relation with the rotation of said cylinder.

7. In a mechanism for cutting and delivering sheets from a web of flexible material, a rotating cylinder having means thereon cooperating with means on another cylinder to cut a running web of material into sheets, a member carried by said rotating cylinder connected to an exhausting device and adapted to hold the leading end of the material to the surface of the cylinder by atmospheric pressure, said member being mounted for movement to raise the leading end of the material from the surface of the cylinder, means to actuate said member in timed relation with the rotation of said cylinder, and means to engage the leading end of the material as it is raised from the cylinder and strip it from said member.

8. In a mechanism for cutting and delivering sheets from a web of flexible material, a rotating cylinder having means thereon cooperating with means on another cylinder to cut a running web of material into sheets, a member carried by said rotating cylinder connected to an exhausting device and adapted to hold the leading end of the material to the surface of the cylinder by atmospheric pressure, said member being mounted for movement to raise the leading end of the material from the surface of the cylinder, means to actuate said member in timed relation with the rotation of said cylinder, means to engage the edge of the leading end of the material as it is raised from the cylinder and strip it from said member, and means to move said engaging means past the point at which the leading end of the material is raised at a slower speed than the speed the said material is moving.

9. In a mechanism for cutting and delivering sheets from a web of flexible material, a rotating cylinder having means thereon cooperating with means on another cylinder to cut a running web of material into sheets, a member carried by said rotating cylinder connected to an exhausting device and adapted to hold the leading end of the material to the surface of the cylinder by atmospheric pressure, said member being mounted for movement to raise the leading end from the surface of the cylinder, means to actuate said member in timed relation with the rotation of said cylinder, means to engage the leading end of the material as it is raised from the cylinder and strip it from said member, rotating means to move said end-engaging means past the point at which said holding means raises the said end, and means rotating with said rotating means to control the degree of pressure applied to the end by said end engaging member.

10. In a mechanism for cutting and delivering sheets from a web of flexible material, a pair of cooperating cylinders having means thereon to cut sheets from a web of material passed therebetween, a swingable arm pivoted to one of said cylinders, said arm being connected to an exhausting device and having its free end disposed adjacent to the peripheral surface of said cylinder, said arm being adapted to hold the leading end of the material being cut upon said cylinder, and means to swing said arm to raise the held leading end away from the surface of said cylinder.

der at a timed interval during the rotation of said cylinder.

11. In a mechanism for cutting and delivering sheets from a web of flexible material, means to cut a running web of material into sheets, means to receive the material that is cut by the cutting means including a pair of separable fingers, a member carrying said fingers, and a rotating part over which said carrying member moves, and means to gradually accelerate the speed of said fingers over a portion of said rotating part and then decelerate their speed.

12. In a mechanism for cutting and delivering sheets from a web of flexible material, means to cut a running web of material into sheets, means to receive the material that is cut, said cutting means including a pair of separable fingers, a chain, a sprocket over which the chain runs, means to connect said fingers to said chain including mechanism to cause a gradual acceleration of the speed of said fingers about a portion of said sprocket and to subsequently decelerate the speed thereof about the remaining portion of the sprocket.

13. In a mechanism for cutting and delivering sheets from a web of flexible material, means to cut a running web into sheets, means to receive the cut sheets from said cutting means including a pair of separable fingers, a member carrying said fingers, and a rotating part over which said carrying member moves, means to gradually accelerate the speed of said fingers over a portion of said rotating part and then decelerate their speed, and means to separate said fingers at a point said member is moving at its maximum speed.

14. In a mechanism for cutting and delivering sheets from a web of flexible material, means to cut a running web into sheets, means to receive the cut sheets from said cutting means including a pair of separable fingers, a chain, a sprocket over which the chain runs, means to connect said fingers to said chain including mechanism to cause a gradual acceleration of the speed of said fingers about a portion of said sprocket and to subsequently decelerate the speed thereof about the remaining portion of the sprocket, and means to move one of said fingers away from the other to separate them at a point they are moving about said sprocket at a maximum speed.

15. In a mechanism for cutting and delivering sheets from a web of flexible material, a pair of cooperating cylinders having means thereon to cut sheets from a web passed therebetween, a swingable arm pivoted to one of said cylinders, said arm being connected to an exhausting device and having its free end disposed adjacent to the peripheral surface of said cylinder, said arm being adapted to hold the leading end of the material being cut upon said cylinder by atmospheric pressure, means to swing said arm to raise the held leading end away from the surface of said cylinder at a timed interval during the rotation of said cylinder, means to receive the material from said arm including a pair of separable fingers, a chain, a sprocket over which the chain runs, and means to connect said fingers to said chain including mechanism to cause a gradual acceleration of the speed of said fingers about a portion of said sprocket and to subsequently decelerate the speed thereof about the remaining portion of the sprocket.

16. In a mechanism for cutting and delivering sheets from a web of flexible material, a pair of cooperating cylinders having means thereon to

cut sheets from the material passed therebetween, a swingable arm pivoted to one of said cylinders, said arm being connected to an exhausting device and having its free end disposed adjacent to the peripheral surface of said cylinder, said arm being adapted to hold the leading end of the material being cut upon said cylinder by atmospheric pressure, means to swing said arm to raise the held leading end away from the surface of said cylinder at a timed interval during the rotation of said cylinder, means to receive the material from said arm including a pair of separable fingers, a chain, a sprocket over which the chain runs, means to connect said fingers to said chain including mechanism to cause a gradual acceleration of the speed of said fingers about a portion of said sprocket and to subsequently decelerate the speed thereof about the remaining portion of the sprocket, and means to move one of said fingers away from the other to separate them substantially at the point they are moving about said sprocket at maximum speed and to move them together upon the edge of the material as it is raised by said arm from the surface of said cylinder.

17. In combination with a cylinder arranged to receive web material, a movable device carried by the cylinder and adapted to utilize air pressure for holding the material on the cylinder, and means to move said device to raise the material above the periphery of the cylinder.

18. In combination with a cylinder arranged to receive web material, a movable device carried by the cylinder and adapted to utilize air pressure for holding the material on the cylinder, means to move said device to raise the material above the periphery of the cylinder, and means to engage the material when so raised and remove it from the cylinder.

19. In combination with a cylinder arranged to receive web material, a movable device carried by the cylinder and adapted to utilize air pressure for holding the material on the cylinder, means to move said device to raise the material above the periphery of the cylinder, means to engage the material when so raised and remove it from the cylinder, and means to move said material engaging means at successively gradually accelerated and decelerated speed past the point of engagement.

20. In mechanism for receiving and carrying web material away from a movable member, a material engaging device, an endless member carrying said material engaging device, a rotatable part over which said endless member runs to carry said material engaging part over said rotatable part, and means to cause said material engaging device to successively gradually accelerate and decelerate its speed as it is carried over said rotatable part by said endless member.

21. In material carrying mechanism, and endless member, a rotatable part over which said endless member runs, a material engaging member connected to and carried by said endless member, means connecting said material engaging member to said endless member including a pivoted connection between said members at one side of said material engaging member and a link at the other side of said material engaging member having its ends pivotally connected respectively to each member.

22. In material carrying mechanism, an endless member, a rotatable part over which said endless member runs, a material engaging member, and means to connect said members together

including a pivot pin connecting said members on one side of said material engaging member, a link having one of its ends connected to the material engaging member at the other side thereof, and a pivot pin connecting the other link end to said endless member.

23. In material carrying mechanism, an endless chain, a sprocket over which said chain runs, a material engaging device carried by said chain, means to connect said device to said chain including a carrier having spaced apart arms, one of said carrier arms being connected to said chain, and a link connecting the other carrier arm to said chain.

24. In material carrying mechanism, an endless chain, a sprocket over which said chain runs, a material engaging device carried by said chain, and including a carrier and material gripping fingers carried by said carrier, means to connect said carrier to said chain including spaced apart arms on said carrier, one of said arms being pivotally connected to said chain, and a link having its ends pivotally connected respectively to the other carrier arm and to the chain.

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