May 29, 1951 C. S. CRAFTS 2,555,267

ALL SIZE FOLDER

Filed Oct. 30, 1945 5 Sheets-Sheet 1

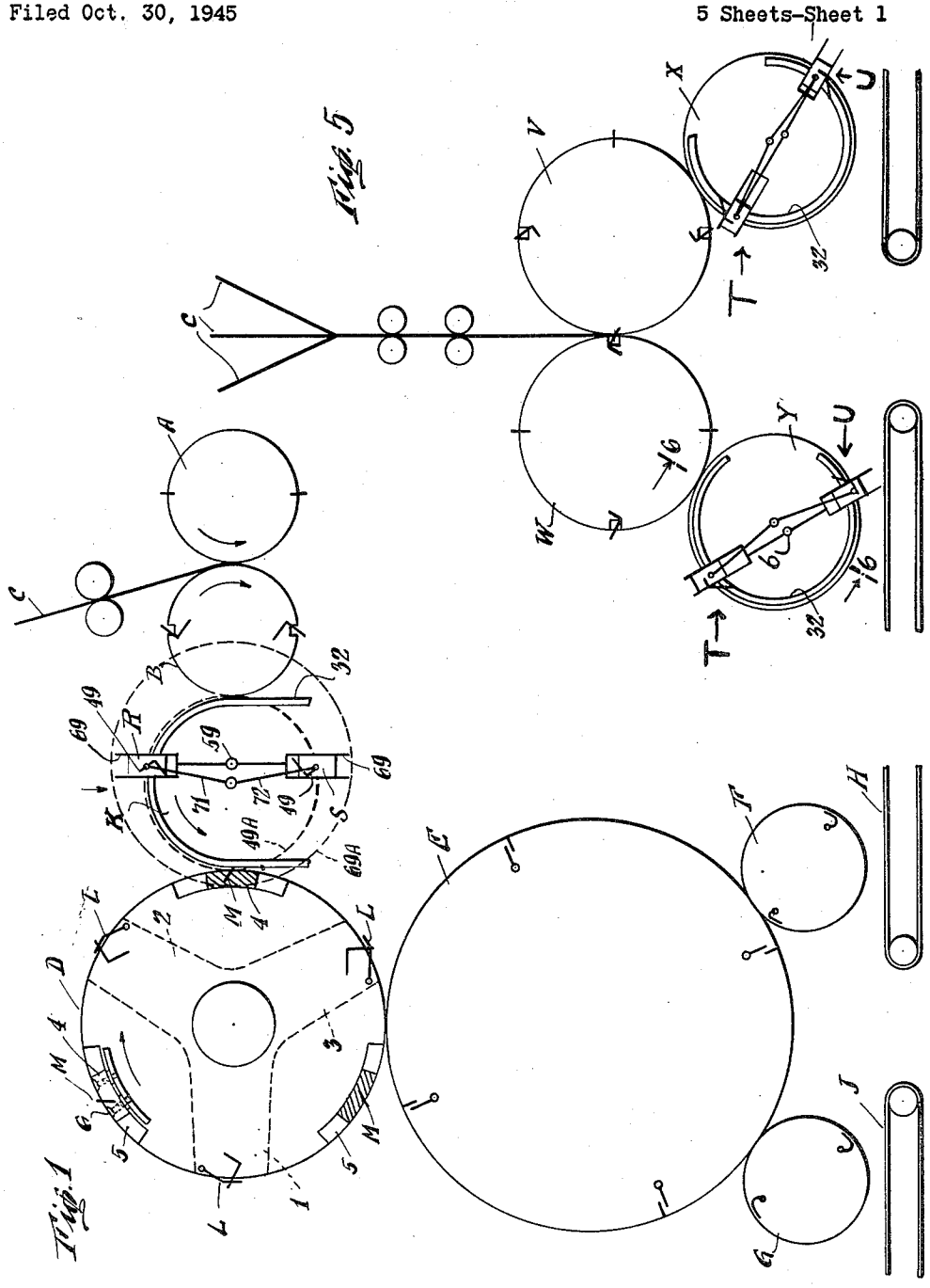


Fig. 1

Fig. 5

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May 29, 1951 C. S. CRAFTS 2,555,267

ALL SIZE FOLDER

Filed Oct. 30, 1945 5 Sheets-Sheet 2

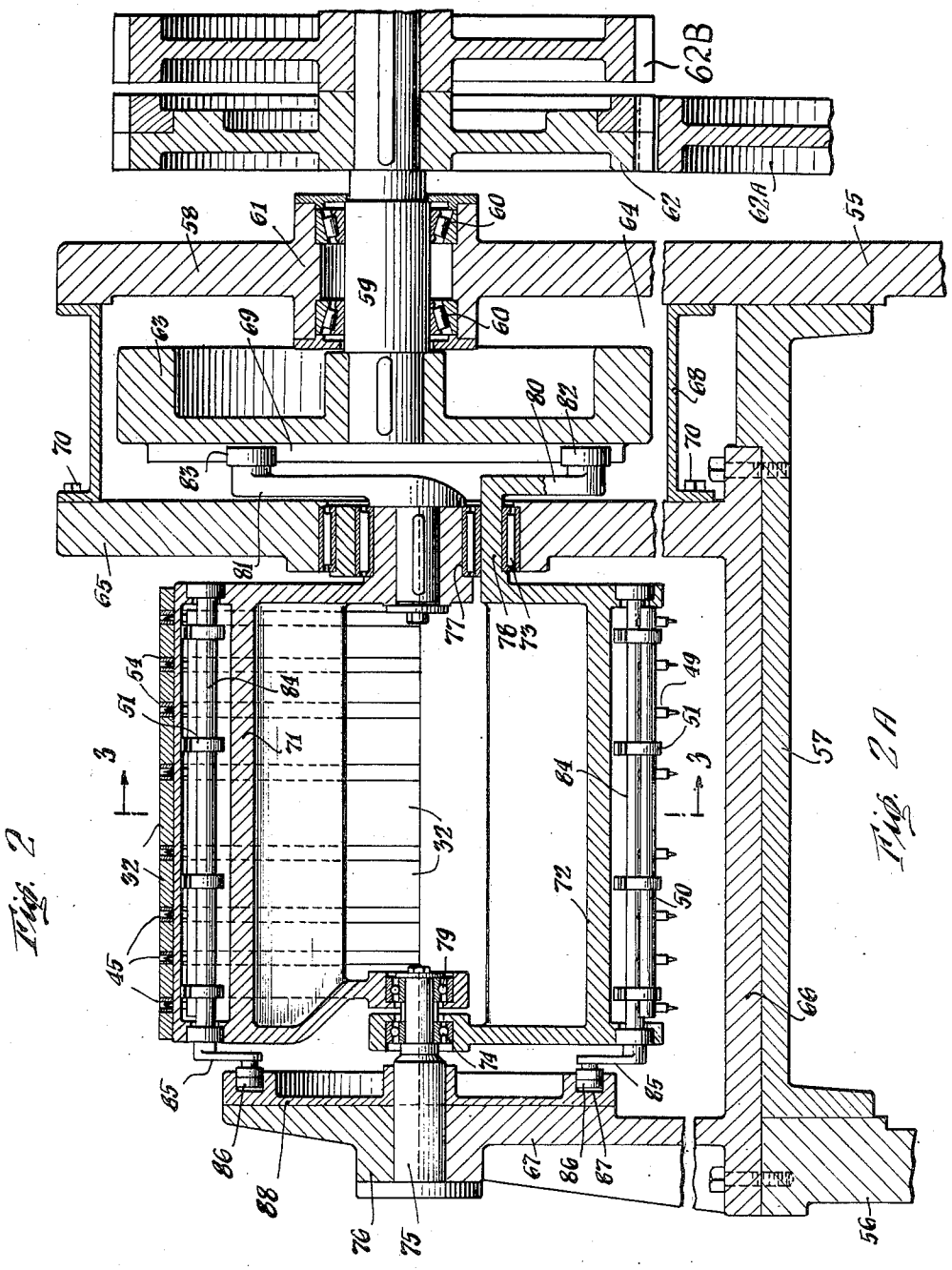


Fig. 2

Fig. 2A

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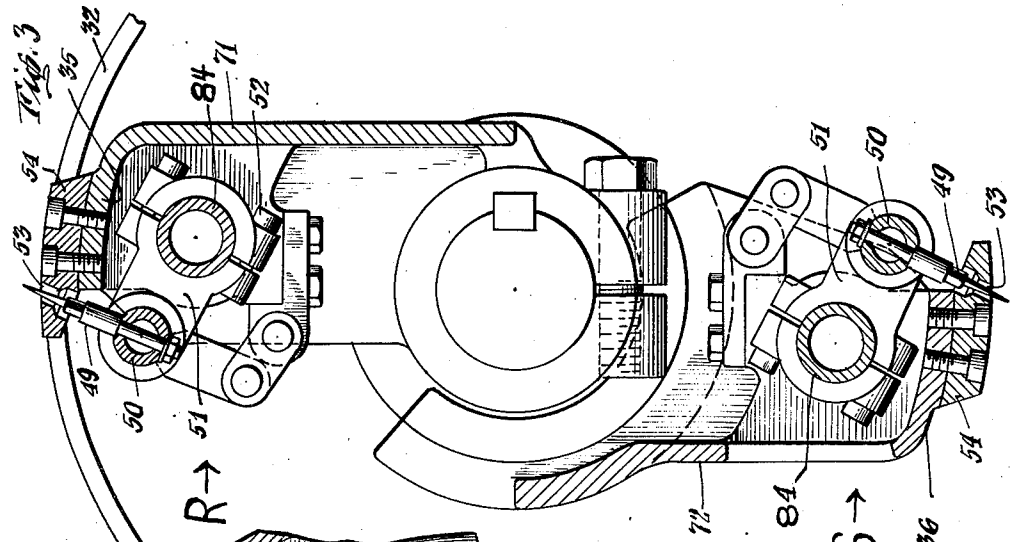
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May 29, 1951 C. S. CRAFTS 2,555,267

ALL SIZE FOLDER

Filed Oct. 30, 1945 5 Sheets-Sheet 3



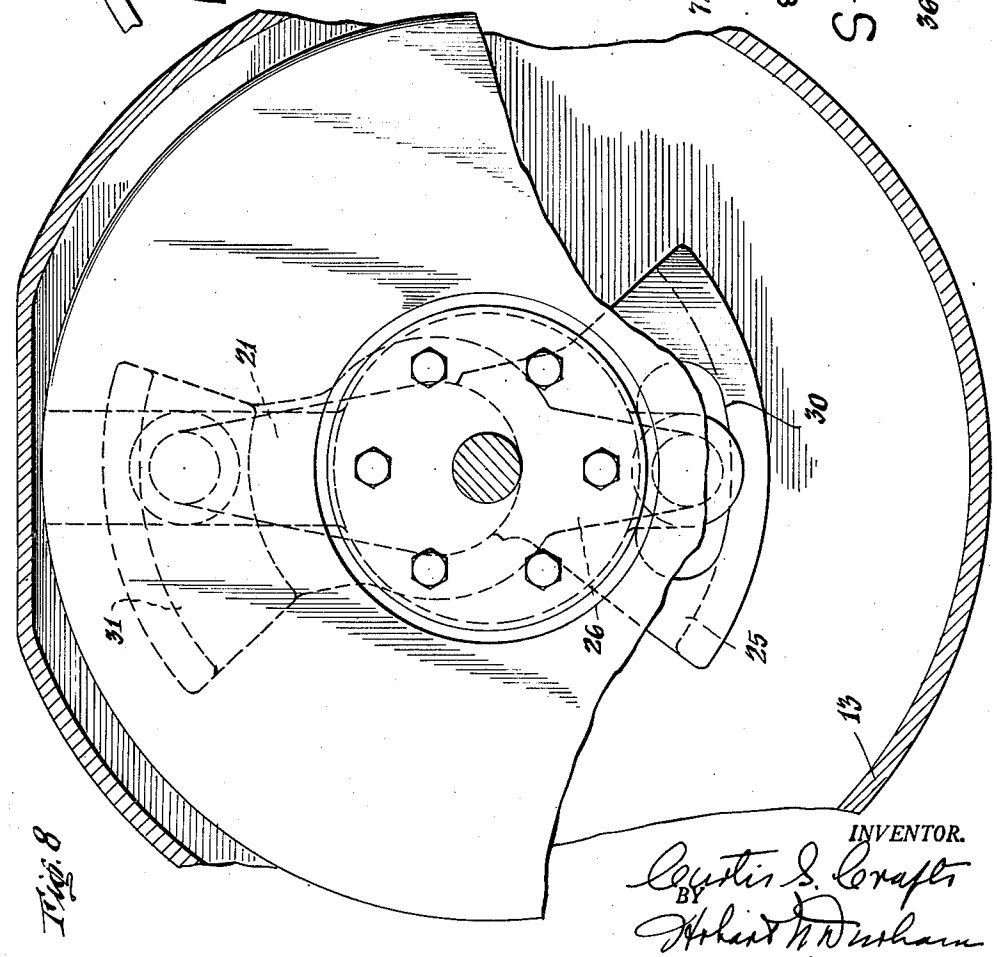


Fig. 8

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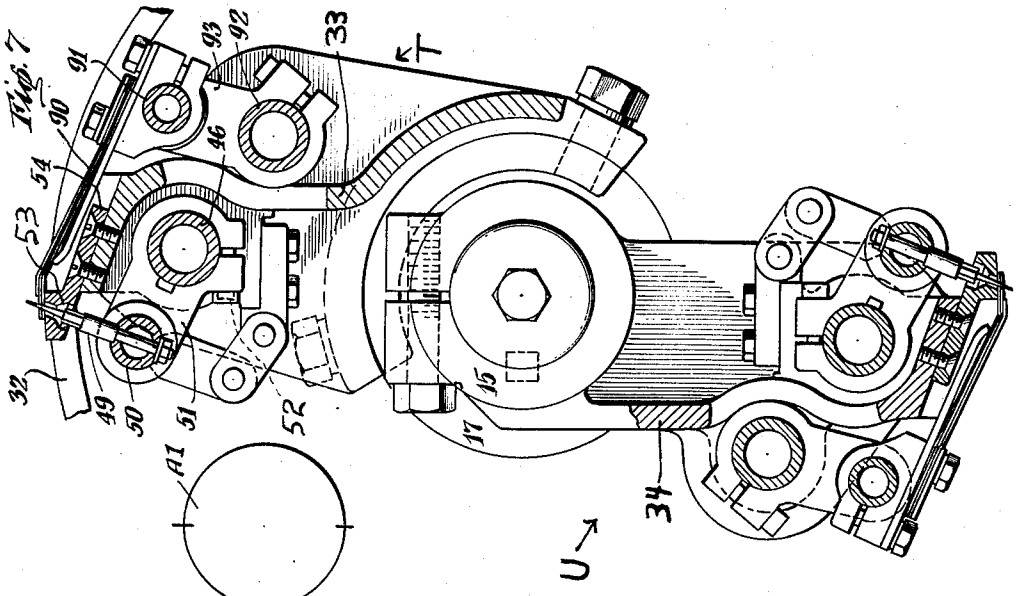
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May 29, 1951 C. S. CRAFTS 2,555,267

ALL SIZE FOLDER

Filed Oct. 30, 1945 5 Sheets-Sheet 4



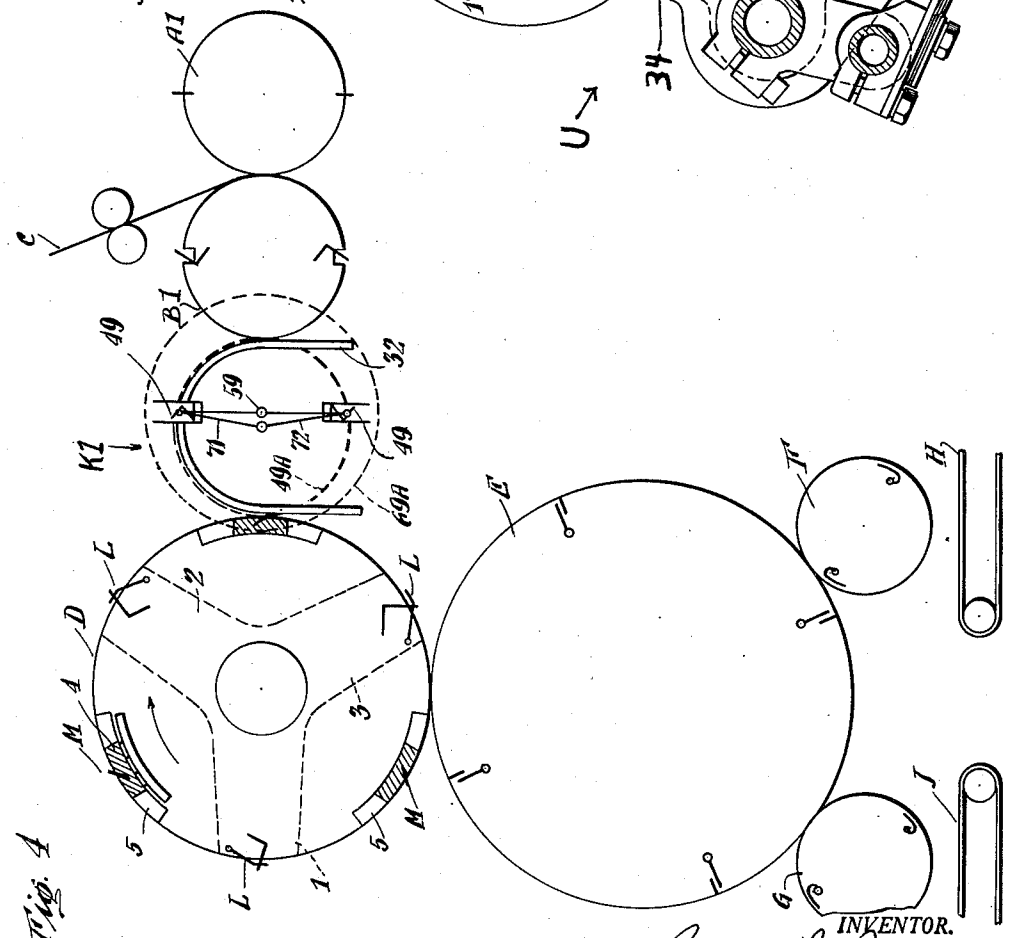


Fig. 4

May 29, 1951 C. S. CRAFTS 2,555,267

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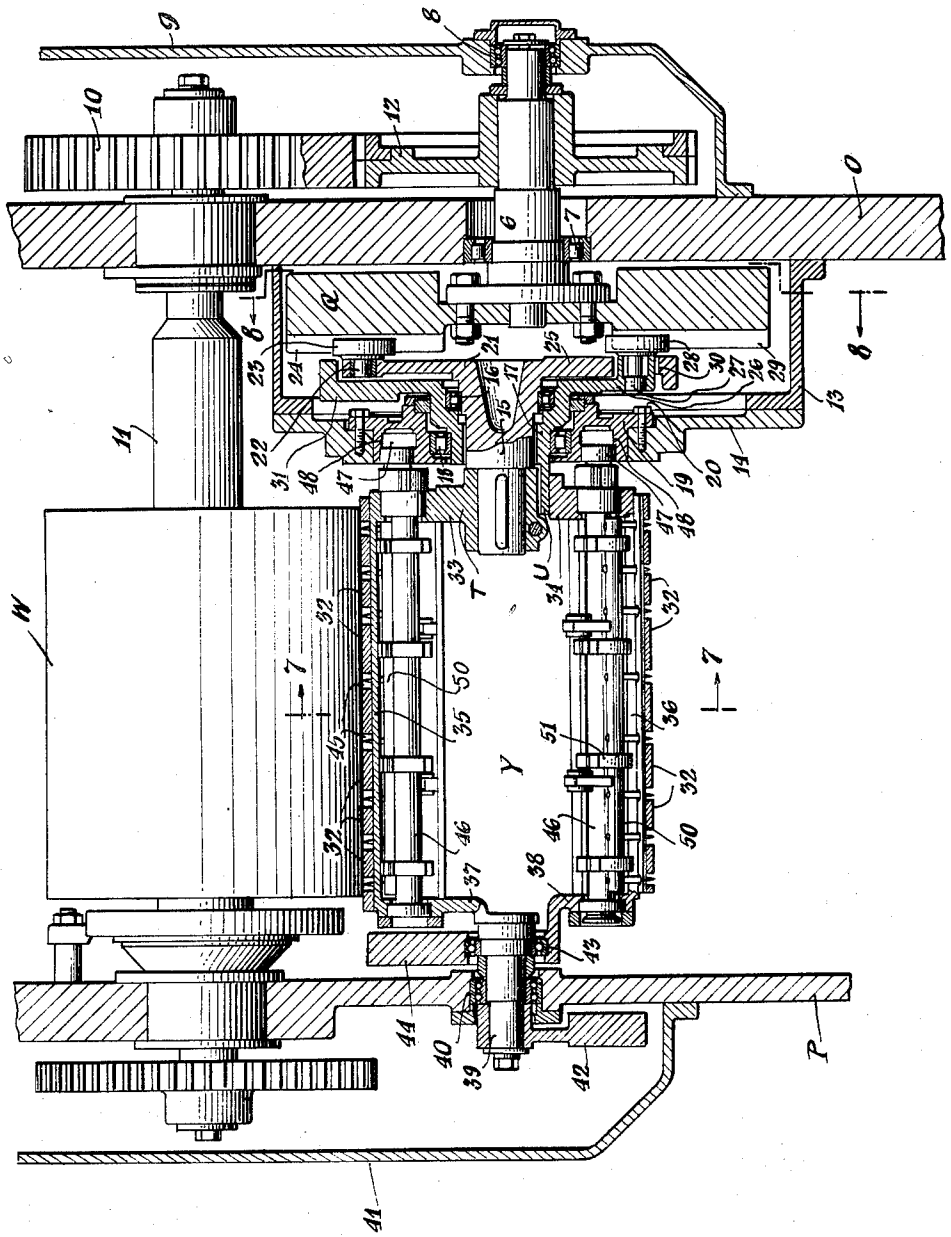


Fig. 6

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Patented May 29, 1951 2,555,267

UNITED STATES PATENT OFFICE

2,555,267

ALL SIZE FOLDER

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Application October 30, 1945, Serial No. 625,627

12 Claims. (Cl. 270—72)

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The present invention relates to a sheet handling mechanism but more particularly and specifically to a variable speed transfer mechanism the nature and operation of which is such that sheets can be taken at one speed and delivered at an increased speed or can be delivered at a lesser speed than the speed at which they are taken by the mechanism.

A mechanism embodying the present invention concept can be used advantageously for the handling of material in many different arts but is particularly suitable for use in the printing art in combination with printing presses and their associated mechanisms such as web cutters, sheet collectors, sheet folders and the like.

Objects and advantages of the invention will be in part recited hereinafter but in part will be obvious to those skilled in the art and may be ascertained by use of the invention in combination with the numerous mechanisms and devices with which it can be associated and used.

The accompanying drawings serve in combination with the following description to explain the principles of the invention and specifically illustrate several specific constructional embodiments of the invention and specific uses to which it may be put.

In the drawings:

Figure 1 is a schematic view illustrating an all-size folder in which the present inventive concept is utilized;

Figure 2 is a partial central horizontal section through the transfer cylinder K and mounting shown in Figure 1;

Figure 2A is a partial sectional view of the same, on the central vertical plane of the shaft 59 thereof;

Figure 3 is a section on the line 3—3 of Figure 2;

Figure 4 is a schematic view of the all-size folder set up to handle a larger size sheet;

Figure 5 is a schematic view of the variable speed mechanism of the present invention embodied in a slow-down delivery of sheets;

Figure 6 is a sectional view of the slow-down delivery, taken on the line 6—6 of Figure 5;

Figure 7 is a sectional view taken on the line 7—7 of Figure 6; and

Figure 8 is a sectional view taken on the line 8—8 of Figure 6.

The inventive concept constituting the present invention is capable of providing either a speed-up or a slow-down sheet transfer mechanism and can be embodied in a mechanism suitable for use in combination with many different devices which handle and operate upon webs and sheets.

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The invention is particularly well suited for use in the printing art and particularly in the provision or production of a high speed all-size folder such as a magazine folder and such embodiment of the invention is illustrated in the drawings, from which when read in the light of the following description it will be seen that the speed-up characteristics of the invention are utilized.

The slow-down characteristics of the invention can be equally well advantageously utilized and an illustration of a mechanism using this attribute of the invention concept appears in the drawings and will be hereinafter described.

The invention is not to be limted to the specific uses illustrated and described nor the specific constructional arrangement illustrated in the drawings but is to be limited only within the scope of the hereinafter following and appended claims.

Describing in general terms the embodiment of the invention in an all size folder and having reference to Figure 1 of the drawings, A and B designate male and female cutting cylinders respectively to which are fed a web or webs C upon which have been printed or impressed the reading matter, pictures and the like which are to constitute a magazine or similar piece of reading matter. The web or webs have passed through a printing press, not shown, and the cutting cylinders are rotated at the proper speed to receive the web at the press speed, that is, the speed at which the web passes through the press.

A three-part collecting cylinder D folds off onto a four-part jaw cylinder E from which printed and folded product is delivered at each side by delivery cylinders F and G. Preferably but not necessarily the product is delivered onto conveyors H and J.

Intermediate the female cutting cylinder B and collection cylinder D a speed-up transfer device, designated as an entirety as K is provided. This device in broad terminology comprises a pair of oppositely disposed rotatable sheet transfer arms or brackets which are so mounted, constructed and operated as to pick up from the female cylinder B the sheets at the speed at which they are discharged from that cutting cylinder and transfer these sheets at an increased speed to the collecting cylinder D the surface speed of which is greater than the surface speed of the cutting cylinders.

In a device such as thus far described the cylinders of the press, the cutting and the printing cylinders are all geared together to keep them in register. The centers of rotation of the cutting and collecting cylinders are preferably all in the same plane.

As will hereinafter be pointed out, a change from one size of sheet to another and different size is accomplished by replacing the male and female cutting cylinders and the transfer cylinder, that is, different cylinders are substituted when a change in sheet size is made. The collection, jaw and delivery cylinders, however, are retained and remain as fixed elements in the folder construction.

As will hereinafter appear, the construction is such as to simplify and facilitate the change of the cutting and transfer cylinders for handling a different size sheet and provision is made, through quickly adjustable means, to enable the collecting cylinder to properly handle the sheets when the size thereof has been changed.

When the sheet size is changed the distance between the pin and grippers L and the folding blades M must be changed in accordance with the sheet or product being handled. This distance can be altered either by shifting the pin and gripper assemblies or by shifting the folding blade assemblies. The pin and gripper assemblies are located on the spider arms 1, 2 and 3 of the collecting cylinder. The folding blade assemblies are mounted in blocks 4 which are circumferentially adjustable in the cylinder by longitudinal movement in the elongated block receiving seats 5. These assemblies are secured in their desired adjusted positions by screw bolts 6. Should it for any reason be preferable adjustability of the pin and gripper assemblies could be provided rather than to provide the adjustability to the folder blade assemblies.

In Figure 4 of the drawings a construction identical to that illustrated in Figure 1 is illustrated with the exception that a different set of cutting cylinders A1, B1 and a different transfer mechanism K1 have been substituted for the handling of a sheet of a larger size and additionally the folding blade assemblies of the collecting cylinder have been moved and properly adjusted to accommodate a sheet of a larger size. In the specific description to follow the construction enabling the rapid and convenient substitution of cutting cylinders and sheet transfer mechanism will be given.

The cylinders K, B and A of Figure 1 are carried in a removable frame in proper spaced relation one to the other, so that the substitution of three other cylinders for them as illustrated in Figure 4 is accomplished by substituting therefor a new frame portion carrying the new cylinders.

Describing in detail the construction appearing in Figures 2 and 2A, 55 and 56 are the spaced side frames of the main folder and are spanned by a cross head 57. The frame 55 has an extension 58 above the cross head 57. A shaft 59 is rotatably supported in anti-friction bearings 60 carried in a hub-like portion 61 provided in the frame extension 58. Exteriorly of frame 55 the shaft 59 is provided with a gear 62 which is driven through gear 62A of the collecting cylinder. The gear 62B on shaft 59 is one of a set of changeable gears, the others not being illustrated, each set being adapted to drive a pair of cutting cylinders A, B, A1, B1, etc. in a 1–1 ratio of revolution with shaft 59. Suitable oiltight housing not shown encloses the above mentioned gears.

At its inner end the shaft 59 carries the driver or fly wheel 63 which is rotatable in a lubricant carrying housing 64 the rear wall of which is the folder frame extension 58 and the front wall of which is the vertical leg 65 of the removable frame which includes a base 66 and a second vertically extending leg 67. A ring 68 completes the housing 64. On its inner face the fly wheel 63 is provided with a radially extending groove 69.

The base 66 of the frame is removably supported upon the cross head 57 of the main folder frame and it is contemplated that suitable quick detaching means such as bolts 70 be provided between the frame leg 65 and the housing side wall 68 to permit the frame to be readily placed in position upon and removed from the main folder supporting frame. All of the sheet transfer mechanism or assembly, with the exception of the fly wheel, can accordingly be quickly removed from the folder as will now hereinafter appear.

The transfer mechanism, referred to above as cylinder K, comprises oppositely arranged brackets 71 and 72. The bracket 72 is rotatably mounted on anti-friction bearings 73 in the arm 65 and similar bearings 74 surrounding a stub-shaft 75 supported against rotation in the enlargement or hub 76 in the arm 67. The sheet transfer arm 71 is at one end rotatably supported on anti-friction bearings 77 mounted and enclosed in the hub-like portion 78 of the sheet transfer arm 72 while its opposite end has an anti-friction bearing support 79 on the aforementioned stub shaft 75.

The sheet transfer arms 71 and 72 have their centers of rotation eccentrically arranged to the center of rotation of the fly wheel 63. A drive connection between the sheet transfer arms and the fly wheel is provided and comprises arms 80 and 81 extending respectively from the sheet transfer arms or brackets 72 and 71. The arms 80 and 81 extend in opposite directions and in their ends pivotally carry driving blocks 82 and 83 which engage, diametrically opposite one another, in the fly wheel slot 69.

Each of the sheet transfer brackets rotatably supports a pin shaft 84. At their ends these shafts are provided with a crank arm 85 carrying a cam 86 movably in a camway 87 of a cam plate 88 mounted on the inner face of the bracket arm 67. As a result of this construction the pin shafts 84 are oscillated as the sheet transfer brackets 71 and 72 are rotated. The shaft 50 is supported by rocker arms 51 from the shaft 84. The shaft 50 carries the plurality of pins 49 operating through the blocks 54 which are loosely disposed in the spaces 45 between the arcuate shoes 32. The upper or outer faces of these blocks are in a plane slightly above the top faces of the shoes to prevent rubbing of the sheet or products upon the shoes as they are transferred from the cutting cylinders to the collecting cylinder.

It is to be understood that the cooperation between the cams 86 and their camway 87 is such as to project and retract the pins in proper timing to engage and pick up the sheets from the cutting cylinders and disengage the sheets as they are delivered to the collecting cylinder.

The orbit of the pins 49 is indicated in Figures 1 and 4 by the dotted line 49A, while the circle described by the extremities of the member carrying the slot 69 is indicated by the broken line 69A. While in the above description such member is described as the flywheel 63, it is evident that any member capable of being provided with a slot 69 could be used as an eccentric drive for the brackets 71, 72.

Referring to Figure 1 it will be seen that this sheet transfer mechanism is positioned between the female cutting cylinder and the collection

cylinder. The space between these cylinders is spanned by a plurality of fixed arcuate shaped shoes 32 arranged in spaced parallel relationship across, but in spaced relationship to, the faces of the female cutting cylinder and collection cylinder. The sheets or products pass over these shoes as they are transferred from the cutting cylinder to the collection cylinder.

The sheet transfer mechanism or unit has the characteristic that the transfer arms thereof increase and decrease their speeds of travel relative to one another. As the rotative travel of one of the arms is speeded up that of the other arm is slowed down. The invention as thus far described utilizes the speed up portion of the cycle of movement of the sheet transfer arms but the slow down cycle of movement of these arms can be equally well utilized in numerous arts and machines and one such use is illustrated in the drawings and will now be described.

Referring to Figure 5 of the drawings, V and W are cutting cylinders to which a web or webs C are fed for severance into sheets. A delivery cylinder X is associated with the cutting cylinder V and a delivery cylinder Y with the cutting cylinder W to receive sheets from the cutting cylinders.

The slow down characteristics of the present sheet transfer mechanism is utilized with each of these delivery cylinders by utilizing the slow down portion of the cycle of movement of the sheet handling arms or brackets which are designated as entireties by the letters T and U. These sheet receiving and transferring arms or brackets receive the sheets from the cutting cylinders V and W at web speed, which is greater than that at which it is desired to deliver them from the delivery cylinders X and Y. The slow down of the delivery of the sheets from the delivery cylinders results because of the eccentricity of the centers of rotation of the sheet handling arms and brackets and the center of rotation of the driver or flywheel as has been previously pointed out.

The construction and mode of operation of the sheet handling arms or brackets is similar to that which has been specifically hereinbefore described with the exception that in this instance the sheet handling or receiving arms or brackets embody a sheet gripper in addition to the sheet impaling pins, and each arm carries counterbalancing members.

Referring to Figure 6, a driver Q is suitably secured to and rotatable with a shaft 6 rotatable in a bearing 7 in the folder main frame O. The outer end of this shaft is rotatably supported as at 8 in the wall of a housing 9 which encases a gear 10 carried by and rotatable with the shaft 11 of the cutting cylinder W and the meshing gear 12 of the driver shaft 6. The gears 10 and 12 cause rotation to the drive Q when the press and folder are in operation.

The housing 9 is at the outer side of the folder frame O while at the inner side there is provided a second housing made up of a ring 13 and a face plate 14. This housing at its inner side abuts and is suitably secured to the inner face of the frame element O and encloses the drive Q as well as parts of the sheet transfer mechanism as will immediately hereinafter clearly appear.

The sheet transfer mechanism comprises two arms or brackets designated as an entirety as T and U which are concentrically mounted for rotation on an axis which is eccentric to the axis of the shaft 6 of the driver Q.

The sheet transfer arm T comprises a hub 15 carrying a roller bearing 16 upon which is rotatably mounted the hub 17 of the sheet transfer arm U. These concentrically arranged hubs are rotatably supported upon a roller bearing 18 carried by a ring 19 which is removably secured as at 20 to the face plate 14.

The hub of the arm T at its inner end and within the housing encasing the driver Q is provided with a leg 21 in the end of which is pivotally mounted as at 22 a driving block 23 having drive connection with a slot 24 in the face of the driver or fly wheel Q. The hub 15 of this arm is oppositely provided with a leg which constitutes a counter-weight 25.

The sheet transfer arm U is similarly provided with a drive leg and a counter-weight. The drive leg 26 of this element similarly pivotally carries in its end as at 27 a drive block 28 having drive connection with a slot 29 in the driver or fly wheel. The driving slots 24 and 29 diametrically oppose one another. The driving block of the arm S passes through a slot 30 in the counterweight 25 of the sheet transfer arm R. The sheet transfer arm S is provided with a leg constituting a counter-weight 31.

The hubs 15 and 17 are provided with oppositely radially extending legs 33 and 34 upon the outer ends of which extend at right angles and beneath the shoes 32 brackets 35 and 36. These brackets are of an aggregate width to extend entirely across the faces of the cutting cylinder and the collection cylinder and at their ends remote to the hubs 15 and 17 carry inwardly extending legs 37 and 38. The leg 37 of the sheet transfer arm R at its innermost end is attached to or provided with a shaft 39 rotatably mounted in a bearing 40 in the folder frame element P and at its outer end and within a housing 41 is provided with a counter-weight 42. The leg 38 of the sheet transfer arm S at its inner end is rotatably supported on the aforementioned shaft 39 as indicated at 32 and is provided with a counter-weight 44.

From the construction thus far described it will be seen that as the driver or fly wheel Q is rotated the sheet transfer arms T and U are rotated thus rotating the brackets 35 and 36 beneath or within the shoes 32.

The means for actually engaging the sheets as they come from the cutting cylinder and transferring them to the collecting cylinder comprises a plurality of pins which are, in proper timing, projected and retracted through the spaces 45 between the shoes 32.

The specific construction for supporting and operating these sheet or product engaging pins is illustrated in Figures 6 and 7 of the drawings to which reference should be made in respect to the immediately hereinafter following description.

A pin shaft 46 is rotatably mounted in the legs 33 and 37 of the sheet transfer arm T and at one end is provided with a cam 47 disposed in a camway 48 in the stationary ring 19. As the sheet transfer arms are rotated this cam will cause the pin shaft 46 to rotate. A plurality of pins 49 are mounted in a shaft 50 supported in the outer ends of a plurality of rocker arms 51 which are attached as at 52 for support by and movement with the pin shaft. The precise construction of the sheet engaging pins and grippers is illustrated in Figure 7 of the drawings and

needs no further description other than to say that the points of the pins operate through openings 53 in blocks or segments 54 carried by the bracket of the sheet transfer arm. These blocks are disposed in the spaces 45 between the shoes and the upper faces of the blocks are slightly above the outer faces of the shoes so that no rubbing action takes place as the sheets or products are moved over the shoes from the cutting roll to the collection cylinder. The shoes 32 protect the transfer cylinder in case there is a "jam up."

Figure 7 of the drawings makes it clear that the sheet transfer arm or bracket U is provided with sheet engaging pins and grippers and an operating arrangement therefor which is identical to that described in respect to the sheet transfer arm T. It will be understood that the pin shaft 46 of the arm U is operated by a cam 47 running in a camway 48 in the ring 19, as has been described in respect to the arm T.

The driving slots 24 and 29 in the face of the flywheel or driver Q are diametrically opposite each other. The degree of eccentricity between the centers of rotation of the driver or flywheel and the transfer arms or brackets R and S determine the amount of slowdown of the transfer arms from their product pickup positions to their product delivery positions. The driver or flywheel has a capacity great enough to absorb the unbalanced load resulting in the difference between the acceleration and deceleration of the two transfer arms and their associated parts. Additionally each transfer arm and its assembly or associated part is statically and dynamically balanced by the use of the described counterweights. Each of the transfer arms is rotatably mounted in the before-referred to anti-friction bearings and preferably the transfer arms and their associated parts are made of a light material such as a high-grade aluminum alloy. Additionally each of the transfer arms has a freedom of 30° of rotation relative to the other to provide for their varying angular velocity during each of their cycles of movement. The housings 9 and 41 make it possible for the driving parts of mechanisms of the sheet transfer device to run in an oil bath.

Additionally there is a sheet gripper 90 supported on a shaft 91 which is in turn connected to an oscillating shaft 92 by suitable links or rocker arms 93. Sheet grippers are so well known in the art as to need no further detailed description.

The combined pin and gripper assembly is constructed in the lightest possible manner to assure a minimum amount of thrust or inertia to be absorbed by the driver or flywheel as a result of the difference in speed between the accelerating and decelerating speeds of the two sheet handling arms of each of the sheet receiving and transferring arms.

From the foregoing description it will be seen that irrespective of whether only a sheet impaling pin assembly is used or whether a combined pin and sheet gripper assembly is used and also irrespective of whether the speed up or slow down characteristics of the invention are utilized the speed up and slow down is controlled by the off-center relationship of the rotation centers of the driver or flywheel and the sheet handling arms or brackets.

It is to be further recognized that the construction is such that as one sheet transfer or handling arm or bracket is being slowed down the other arm or bracket is being speeded up and that any unbalanced load which results is absorbed by the flywheel and counter-weights. Where a transfer mechanism embodying two oppositely disposed sheet transfer arms is utilized one arm will take power while speeding up and the other arm will feed power as it is slowing down with the result that practically a balanced condition is obtained. It is any difference between the acceleration and deceleration forces which is absorbed by the flywheel and counter-weights.

The invention provides an efficient mechanism for receiving sheets at one speed of travel and delivering said sheets at a different speed of travel irrespective of whether the speed of delivery of the sheets be greater or less than the speed of travel of the sheets at the time they are received by the mechanism.

I claim:

1. In an all-size folder, a pair of rotary cutting cylinders for cutting sheets from a web, a rotary collection and sheet folding cylinder, a rotary driver, all of said cylinders and said driver having their centers of rotation parallel and in the same plane, the collection and folding cylinder having a greater surface speed of rotation than that of the cutting cylinders, a sheet transfer device for picking up sheets from the cutter and delivering them at an accelerated speed to the collection and folding cylinder, said sheet transfer device comprising a pair of oppositely disposed arms rotatably mounted about a common axis and having each an individual positive driving connection with said driver, and the axis of rotation of said arms being eccentrically disposed in respect to the center line of rotation of said driver, whereby each of said arms throughout a portion of its cycle of rotation is given an accelerated speed to provide for the accelerated delivery of the sheets to the collecting and folding cylinder.

2. A sheet transfer device comprising, a rotatably mounted driver and means for rotating the same, a pair of oppositely disposed brackets rotatably mounted about a common center which center is eccentrically disposed in respect to the center of rotation of the driver, driving pins carried by the rotatably mounted elements and forming a connection between said brackets and said driver, and means carried by said brackets for engaging a sheet and transferring the same for delivery from the brackets at a predetermined point in the rotative travel thereof.

3. A construction as defined in claim 2 wherein, the driver is in the form of a fly wheel-like element adapted to absorb the unbalanced thrust resulting from the rotation of said brackets.

4. A construction as defined in claim 2 wherein, the driver is in the form of a fly wheel-like element and the brackets are provided with counterbalances, said driver and counter-balances acting to balance the device and absorb the unbalanced thrust developed by the rotation of the brackets.

5. In an all-size folder, a pair of rotatably mounted cutting cylinders adapted to receive between them a web and to cut sheets therefrom, a rotatably mounted collecting and folding cylinder disposed in parallel spaced relation to said cutting cylinders, a rotatable driver, the axes of rotation of said cylinders and driver being in parallelism, the center of rotation of the driver being in the space between the cutting cylinders and the collection and folding cylinder, the collection and folding cylinder having a greater surface speed of rotation than that of the cutting

cylinders, a sheet transfer device arranged in the space between the cutting cylinders and the folding and collecting cylinder, said sheet transfer device having a pair of oppositely disposed brackets extending parallel to the recited cylinders and being rotatably mounted about a common center which is eccentrically positioned in respect to the center line of rotation of the driver, pins between the driver and brackets and mounted on one or the other and forming a drive connection between each of said brackets and the driver, said bracket arrangement giving to each of said brackets in each of its cycles of revolution an accelerating speed followed by a decelerated speed of travel, each of said brackets provided with means for engaging and picking up a sheet from the cutting cylinders and delivering it to the collecting and folding cylinder, and the delivery of the sheet to the collecting and folding cylinder occurring when the bracket has reached a speed of travel substantially the same as the surface speed of rotation of the collecting and folding cylinder.

6. A construction as defined in claim 5 wherein, a plurality of fixed spaced parallel arcuate shaped shoes are disposed in the space between the cutting cylinders and the collecting and folding cylinder, said brackets rotating beneath said shoes, and the sheet pick-up means of said brackets projecting through the spaces between said shoes and to a point beyond the shoes for engagement with the sheets.

7. A device for handling and transferring products such as sheets or the like comprising, a pair of oppositely disposed brackets rotatably mounted about a common axis, a rotatable driver element, the axis of rotation of said brackets being eccentric to that of the driver element, said driver element having a face with a radially extending slot therein, each of said brackets provided with an arm in which is pivotally mounted a driver block, the driver blocks of said arms being in engagement with the slot of said driver, said blocks being oppositely disposed in said slot at opposite sides of the center of rotation of the driver, said arrangement giving to said brackets in each of their cycles of revolution an accelerating speed of rotary travel followed by a decelerated speed of travel, and said brackets provided with means for engaging and transferring a product and delivering the product at an accelerated or decelerated speed in accordance with the point in the cycle of revolution of the brackets that the product is delivered from the brackets.

8. A rotary sheet transfer means for taking a sheet at one point and delivering it at another point including a pair of sheet taking means angularly movable relatively to each other about a center of rotation, a common driving means operative on each sheet taking means for rotating them and for accelerating the movement of one sheet taking means as the other sheet taking means is decelerated, said driving means comprising a diametrally slotted rotary flywheel, the slot of which engages crank pins individually connected to the sheet taking means whereby the sheets may be delivered at a speed different from the speed at which they are taken.

9. A rotary sheet transfer means as claimed in claim 8 in which the driving means is a rotary member eccentric with respect to the center of rotation of the sheet taking means.

10. A rotary sheet transfer means as claimed in claim 9 in which the sheet transfer means are dynamically balanced by counterweights.

11. A rotary sheet transfer means as claimed in claim 8 in which each of the pair of sheet taking means comprises retractable pins for impaling a sheet to be transferred.

12. A rotary sheet transfer means as claimed in claim 9 in which the sheet transfer means are each provided with a radially extending arm at one end of the transfer means, and the driving means comprises a rotary member having a diametral slot drivingly engaging the arms.

CURTIS S. CRAFTS.

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