

July 28, 1970

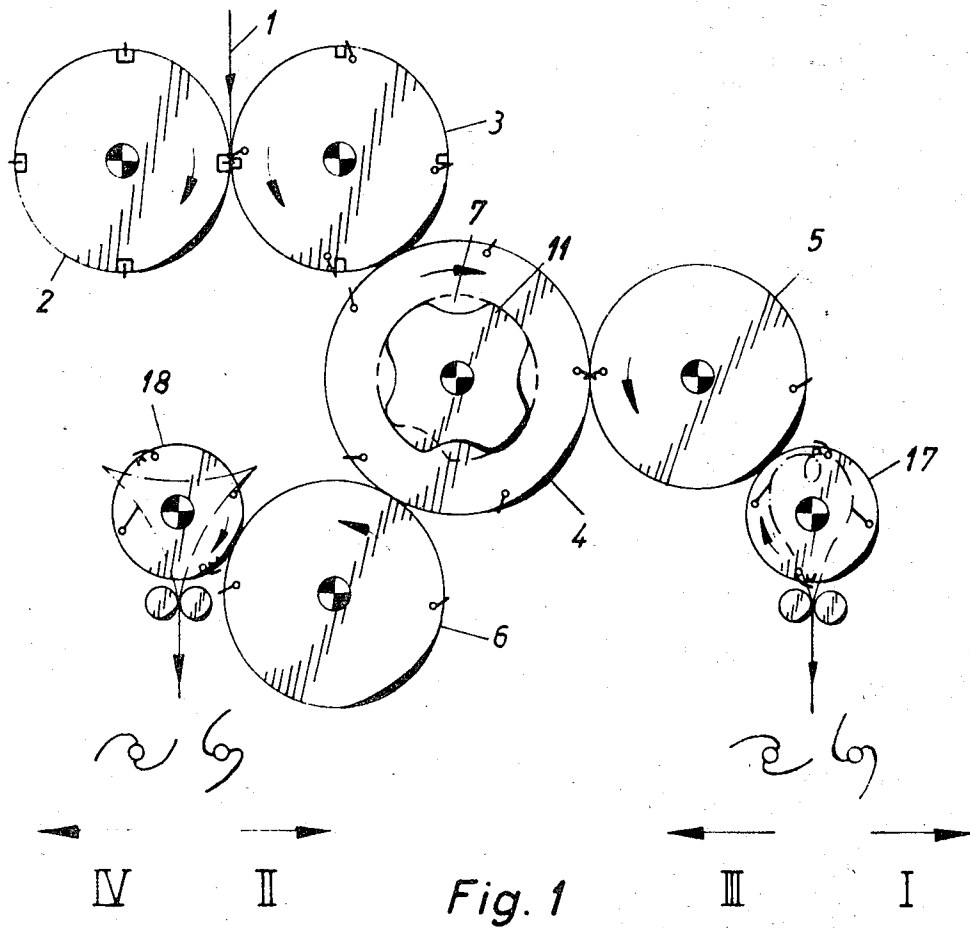
H. B. BOLZA SCHÜNEMANN

3,521,878

FOLDING MECHANISM FOR ROTARY PRINTING PRESSES

Filed Oct. 4, 1968

5 Sheets-Sheet 1



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FOLDING MECHANISM FOR ROTARY PRINTING PRESSES

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5 Sheets-Sheet 2

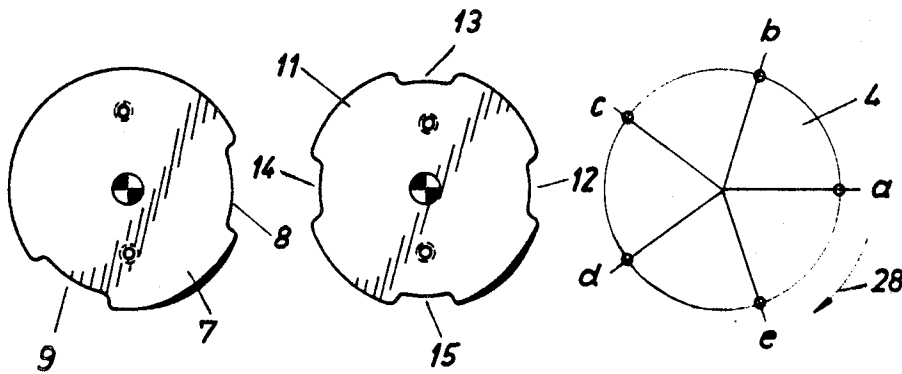


Fig. 2a

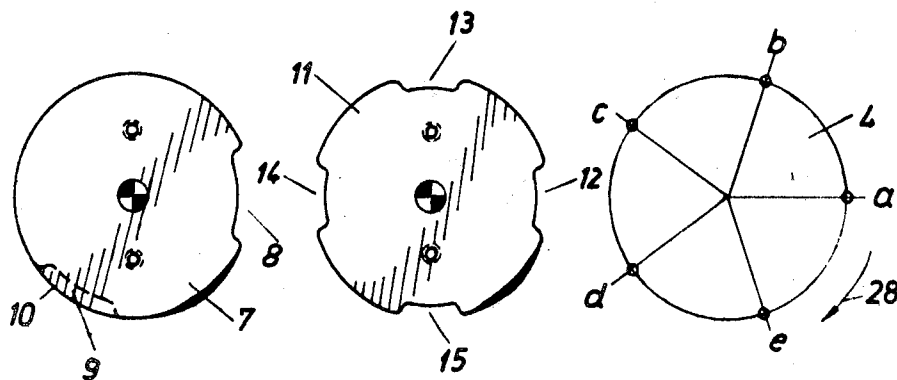


Fig. 2b

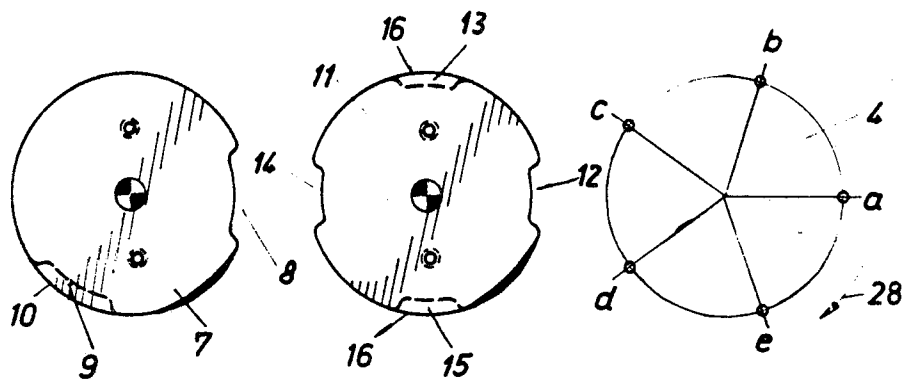


Fig. 2c

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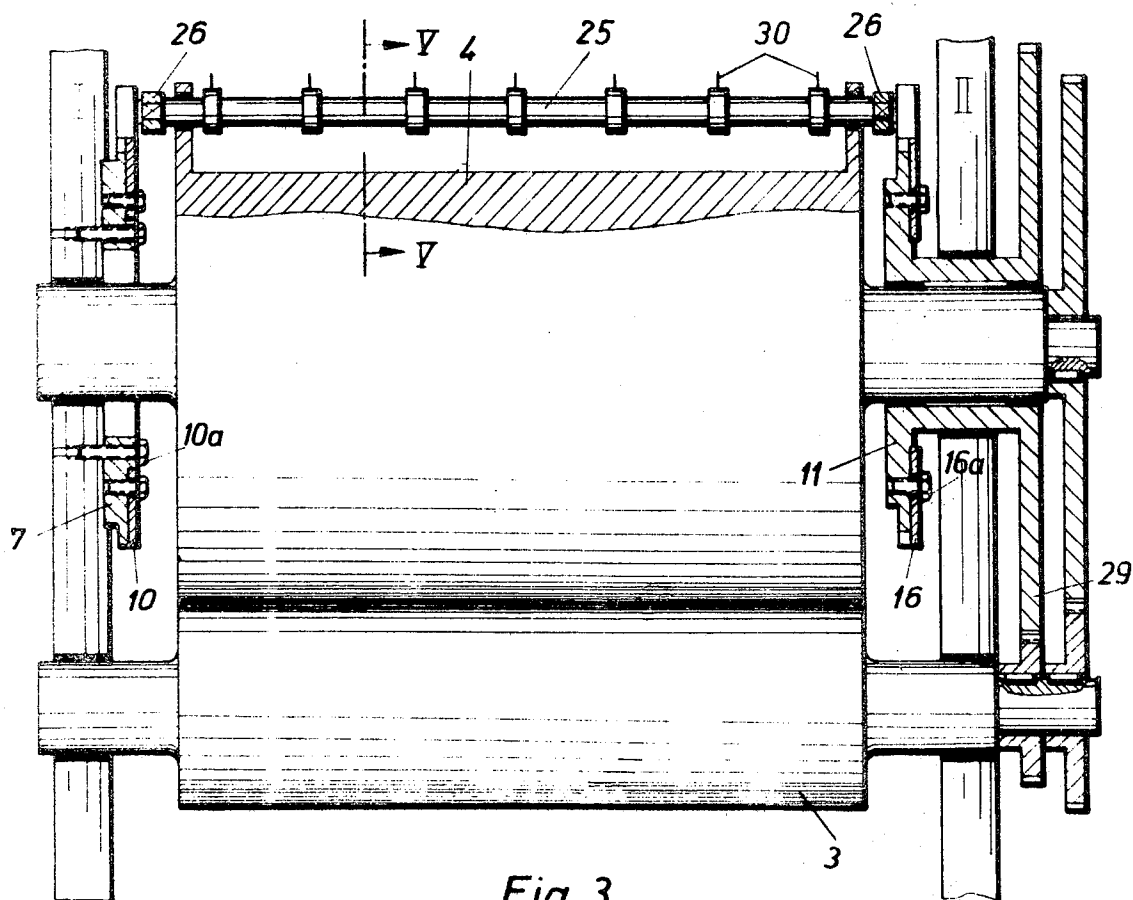
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5 Sheets-Sheet 1

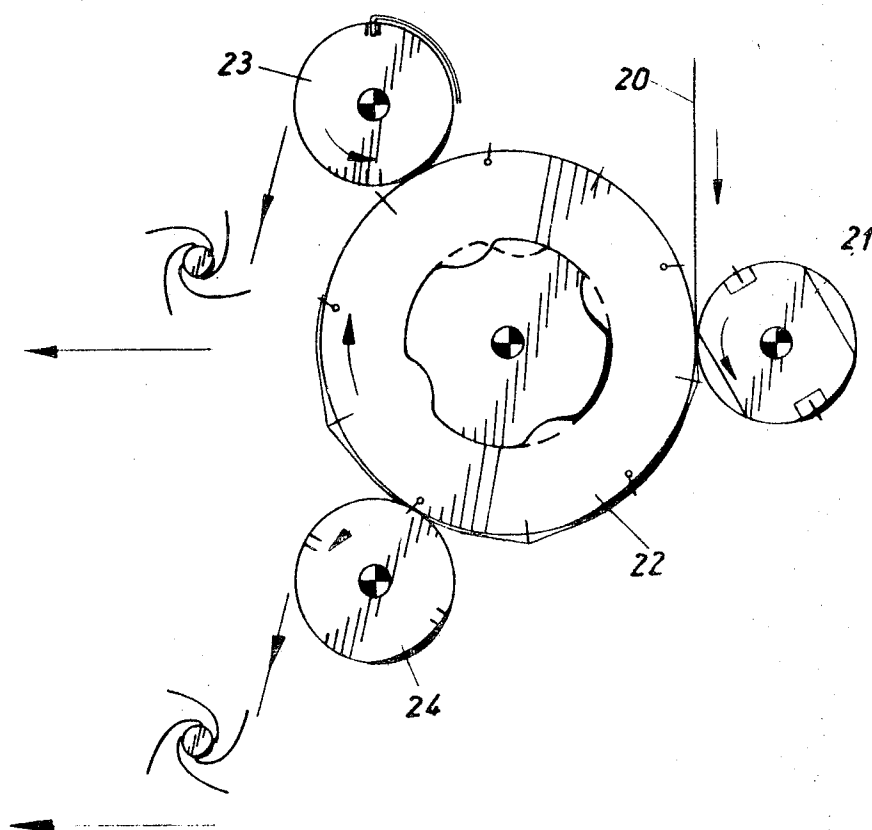


Fig. 4

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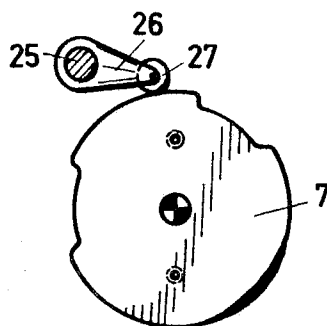


Fig. 5a

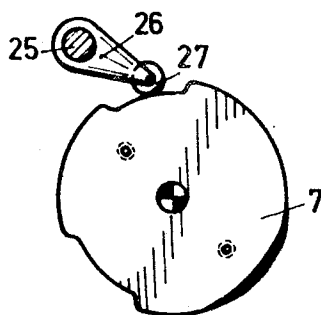


Fig. 5b

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FOLDING MECHANISM FOR ROTARY PRINTING PRESSES

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Int. Cl. B65h 45/16

U.S. Cl. 270—72

10 Claims

ABSTRACT OF THE DISCLOSURE

A grooved and cutting cylinder receive a web from a rotary printing press and feed the cut sheets to a five-section collecting cylinder. The collecting cylinder has a shaft carrying grippers and pins for each of its sections. A stationary cam having two cam recesses spaced 120° apart and an adjustably positionable disk-like cover member for covering one of the recesses is positioned at one end of the collecting cylinder. There is a lever connected to the adjacent end of each shaft having a cam follower riding on the stationary cam as the collecting cylinder rotates to actuate the pin and gripper shaft. At the other end of the collecting cylinder is a revolving cam having four cam recesses spaced 90° apart and a cover disk-like member adjustably mounted thereon so as to expose all four cam recesses or two opposite cam recesses 180° apart. There is a lever connected to the end of each pin and gripper shaft adjacent the revolving cam and a cam follower on the lever that is actuated by the revolving cam. There are two take-off or transfer cylinders positioned 120° apart as respects the collecting cylinder and cooperating therewith that each feed collected copies to respective gear folding cylinders. A modified cylinder arrangement has a five-section cylinder as a cutting die, folding blade and collecting cylinder. A 2/2 cutting cylinder with two knives cuts the paper web fed against the five-section cylinder, i.e., the 5/2 collecting cylinder. Two folding jaw cylinders, spaced 120° apart, take copies alternately from the 5/2 cylinder in double production. The pin and gripper control of the 5/2 cylinder is effected according to the firstly described collecting cylinder. It is possible to run non-collect, collect or if required double-collect production.

BACKGROUND OF THE INVENTION

The invention relates to a cam gear for the control of the pins or grippers of a collecting cylinder in folding mechanisms for reel-fed rotary printing presses.

Prior art

It has become a known fact to slow down the process of the third fold (chopper fold). For instance, an arrangement for the third fold (second length fold) can be slowed down to run at half speed as soon as collect production is run, since then each second copy will be lacking so that there will be a gap in the stream of copies, allowing for a slowed down folding process. In double production (straight run), however, the third folding arrangement has to run at full speed.

Furthermore, it has become a known fact to attach in non-collect production two third folding arrangements to which alternately one copy is fed. For this purpose, two folding jaw cylinders are associated to one 2/2 or 4/2 folding blade cylinder, whereby all odd copies in succession are fed to the first and all even

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copies are fed to the second folding jaw cylinder. Owing to this, a gap in the stream of copies at each folding jaw cylinder results in spite of double production (straight run) so that the attached third folding arrangements can again operate favorably at a reduced speed.

At any rate, it is a disadvantage that the reduced folding speed can only be obtained in the third fold and not as early as in the second fold (first cross fold). Moreover, in the first example the copies can be provided with the third fold at half speed only in collect production, but not in non-collect production. In the second example the copies can only be produced in straight run; because a collect run is not possible since the 2/2 or 4/2 folding blade cylinder does not allow for a collecting process. For collect production, for instance, a standard 3/2 cylinder would have to be used which, however, cannot take up copies on one point and deliver them again in two other points.

SUMMARY OF THE INVENTION

It is an object of the invention to obtain a non-collect (double) production having a gap in the stream of copies for a reduced folding speed if also collect production or, moreover, double collect production is demanded.

The double collect production becomes typical, if the paper is cut not as usually twice but four times in circumference, e.g. in book printing presses:

(1) All four plates, arranged one after the other in circumference, are of the same type (non-collect production, there will be no gap in the stream of copies).

(2) Two opposed plates each of the mentioned four plates in circumference are of the same type:

A simple collecting process is very suitable which collects prints of plates I to II and III to IV, or the copies will be produced in straight run on two or four delivers respectively.

(3) All four plates, arranged one after the other in circumference, are of different type.

It is very suitable to produce in straight run either on four different deliveries, i.e. to print four different sections at the same time, or to collect in double production, i.e. I to II and III to IV, so that a stack consisting of the sections I to IV is folded together and brought to one delivery as a product of quadruple thickness.

The problem of producing in a simple way non-collected as well as single-collected or even double-collected copies having a gap in the stream of copies for a reduced folding speed is solved by the fact that a cylinder with five cut-offs in circumference serves as transfer or collecting cylinder to which two take-off cylinders, staggered at 120°, and a special cam gearing for the control of the pins or grippers are associated for three different possibilities of production.

According to the invention, said control consists of the interaction of a stationary cam with optionally two or one recess and a slowly rotating cam with optionally two or four recesses at an unchanged transmission relation to the five-section cylinder for all three production methods.

In the case of a folding mechanism according to the invention one or two of the three production possibilities can also be dispensed with.

Owing to this, the cams can correspondingly be designed simpler.

Since also in non-collect production there will be a gap in the stream of copies, it is possible to obtain a reduced folding speed. It is accomplished by reduced numbers of revolutions or cylinder circumferences of the arrangements concerned and is only mentioned as a matter of course.

BRIEF DESCRIPTION OF THE DRAWINGS

An embodiment of the invention is hereinafter described by way of example with reference to the accompanying drawings but it is clearly to be understood that the invention is by no means restricted to the details of this embodiment.

FIG. 1 shows a front view of the cylinder arrangement of a folding mechanism.

FIGS. 2a-c explain the possible cam positions for three different productions, non-collect, single-collect or double-collect.

FIG. 3 shows a cross section through a rotating control arrangement.

FIG. 4 shows another cylinder arrangement.

FIGS. 5a and b show the interaction of the control shaft and the control cam and are viewed along the line V-V in FIG. 3.

DESCRIPTION OF THE PREFERRED EMBODIMENT

FIG. 1 shows a folding mechanism, according to the invention, for a reel-fed rotary printing press with four different pages on the circumference of each plate cylinder. The folding mechanism cuts the web 1 four times per plate cylinder revolution, using a cutting cylinder 2 and a grooved cylinder 3 with a $4/4$ circumference. By means of pins the cut sheets are transferred to a $5/4$ collecting cylinder 4. There are two cylinders 5 and 6 to take off the sheets from the collecting cylinder 4. According to the production desired, the pins of the collecting cylinder 4 are controlled in such a way that

(a) Each cut sheet (or each sheet stack) is distributed alternately to the cylinders 5 and 6 (non-collect production);

(b) Each sheet with an odd number of succession is running once around the $5/4$ collecting cylinder 4 and joined with the subsequent pertinent sheet with an even number of succession so that respectively I is collected to II and III to IV and transferred to only one of the two cylinders 5 and 6 (single collect run);

(c) Some sheets are running several times around the collecting cylinder 4 according to their number of position so that only completely collected stacks (I-II-III-IV) are delivered to one of the two cylinders 5, 6 (double collect run).

The complicated problem, namely the splitting of the stream of copies in non-collect production, and the simultaneous possibility of the single and so-called double collect run is solved by the fact that the collecting cylinder measures five sections in circumference so that five sets of pins or grippers are symmetrically distributed on the circumference of the collecting cylinder and that the two take-off cylinders 5 and 6 are separated by 120° , as measured on the collecting cylinder. With regard to the control of the pins or grippers it is supposed that the cam follower for releasing the sheets is dipping into a recess of the cam while being guided to the stop-position of the sheets on a circular path central to the cylinder shaft.

For the transfer by pins to the cylinders 5, 6 two recesses 8 and 9, staggered by 120° , are provided in the stationary cam 7. By means of a covering disk 10 a recess can be optionally closed and the cam 7 can be used to complete a circular path. After the basic setting the covering disk 10 remains also stationary.

If the basic setting at the cam 7 leaves the recesses 8 and 9 open, the pins or grippers at both transfer cylinders 5, 6 can open and transfer sheets which is periodically prevented however by the further control described below. The basic setting with two operative (open) recesses 8 and 9 signifies non-collect production and brings about alternate deliveries at the cylinders 5 or 6.

The basic setting with only one recess (second recess covered) brings about a single- or double-collect production and the sheets are only transferred to one cylinder

5 or 6 the pertinent recess of which is open at the in-operative cam 7.

The pins or grippers 30 are controlled not only by the cam 7 and the covering disk 10 but additionally by a second revolving cam 11. For instance, the stationary cam 7 is mounted on the frame at the one face of the collecting cylinder 4 and the revolving cam 11 at the other face. The pin or gripper shaft 25 carries on both cylinder ends a roller arm 26 with a roller 27. Only if on both ends one recess each in the respective cams 7 and 11 is brought to coincidence, shaft 25 can revolve and release the seized sheet. FIG. 5 shows the interaction of the roller arms 26 of the control shaft 25 with the cams 7 or 11 respectively. By means of a spring (not shown) the roller 27 on the roller arm 26 is pressed onto the cam 7 or 11 with which it is associated. In the position as per FIG. 5a the shaft 25 is controlled so that the respective gripper or pins 30 are in a position of action. In the position as per FIG. 5b the pins are withdrawn.

The revolving circular cam 11 moves in direction of the cylinder revolution (see arrow 28) at a 0.625-fold ($\frac{5}{8}$ fold) speed of the collecting cylinder 4 and has at the circumference four recesses 12 to 15, staggered by 90° . The cam 11 has another covering disk 16 which can cover two opposing recesses and thereby make them effective as a circular arc.

According to the setting, the slowly revolving cam 11 has consequently either four recesses, staggered by 90° , for non-collect and single-collect production or only two recesses, staggered by 180° , for double-collect production.

The speed of the revolving cam 11 is always constant and for all three different productions is always the 0.625-fold ($\frac{5}{8}$ -fold) speed of the collecting cylinder. This is effected by the gearing 29.

FIG. 2a shows the cam positions for non-collect production, whereby the central revolving cam 11 with four recesses is mounted on the shaft of the left stationary cam 7. Hence it follows that the pins *a* of the collecting cylinder 4, illustratively shown at the right, are withdrawing, because the recesses 8 and 12 of the cams 7 and 11 are coinciding with position *a*. There are also further copies at the pins *b* and *e*. Since the recess 9 is positioned by 120° behind the recess 8 and, on the other hand, the pins *e* precede the pins *a* by 72° , the pins *e* have still to cover an angle range of $120-72=48^\circ$ for the next chance to withdraw respectively the pins or to open the grippers. In this angle of rotation of the collecting cylinder 4 of 48° the cam 11 continues to turn by $\frac{5}{8} \times 48 = 30^\circ$. Consequently, the recess 15 which is positioned 90° before the present recess 12 for the pins *a*, is away from *a* at an angle of rotation of $90+30=120^\circ$. The recess 15 of the revolving cam 11 coincides then with the recess 9 of the stationary cam 7 in that moment when the pin or gripper *e* have reached the position of the recess 9.

It can also be recognized that the pins *b* pass the recess 8. When the collecting cylinder continues to rotate by 72° as shown against the position, the cam 11 precedes by $\frac{5}{8} \times 72 = 45^\circ$ and covers thereby the recess of the stationary cam.

The interaction of four slowly revolving recesses 12 to 15 of the cam 11 with two stationary recesses 8 and 9, staggered by 120° , of the cam 7 effects thus the constantly alternating withdrawal of the pins at the recesses 8 and 9.

FIG. 2b shows the single-collect production. On the stationary cam 7 the recess 9 is closed by the covering disk 10. The pins or grippers can only be withdrawn or opened respectively at the recess 8 if this is allowed by the revolving cam 11. The cam 11 makes only a revolution of $\frac{5}{8} \times 72 = 45^\circ$ at a revolution of 72° of the collecting cylinder 4. Since their recesses are staggered to each other by 90° , a copy can be transferred only every 144° , i.e. only at each second pin. Because of the odd number five of the existing pins, the revolving copy is not joined to the same, but the subsequent copy so that it is a matter of a single-collect process.

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FIG. 2c explains the double-collect process. At the stationary cam 7 only the recess 8 is open; the recess 9 is closed by the covering disk 10. Consequently, the pins can only withdraw at the recess 8. At the revolving cam 11 only the two recesses 12 and 14, staggered by 180°, are open whereas the recesses 13 and 15 are kept constantly closed by the revolving covering disk 16. If the pins *a* are transferring sheets because the recesses 8 and 12 are just being brought to coincidence, then the next coincidence with the recess 8 of the stationary cam 7 will not occur until a turn of 180° of the revolving cam 11 with its recess 14. Owing to the circumferential ratio of $\frac{5}{8}$ the angle of 180° at the collecting cylinder 4 means a turn of $\frac{5}{8} \times 180 = 288^\circ$ or $4 \times 72^\circ$. Thus only every fourth passing section of the collecting cylinder 4 releases a collected copy 10 so that owing to the continuous displacement of the five-part collecting cylinder 4 with four different sections, all four sections will be collected in the proper sequence and be transferred.

FIG. 3 shows how the revolving cam 11 is secured together with the covering disk 16. The covering disk 16 is provided with slots through which securing screws 16a extend into cam 11. The disk 16 can be adjustably rotated against the cam 11 in such a way that only two recesses, staggered by 180°, will operate the cam follower of the pins or grippers instead of the four recesses.

Instead of the control of the withdrawal or opening process of the pins or grippers by recesses in circular cams into which the cam followers are pressed by spring pressure, it is, on the other hand, also possible to use elevations without making an essential change in the principle of the control.

The splitting of the non-collected production by means of the described control may serve for different purposes. For instance, as shown in FIG. 1 the control may concern the pins of a pure collecting cylinder to which two take-off cylinders 5 and 6, staggered by 120°, are associated. By splitting the stream of copies the respective subsequent copy will be missing at the cylinders 5 and 6. Thus, despite non-collect production, a gap will be produced which allows the following gear folding cylinders 17 and 18 to produce the cross fold at a reduced circumferential speed. When running collect or all the more when running double-collect, there is always a gap in the stream of copies so that even one of the two cross-folding cylinders can be thrown out of gear and nevertheless the cross fold can be produced at a considerably reduced speed.

The described cam control leaves all odd and even copy numbers separated despite the odd subdivision of the collecting cylinder. If one split delivery is available for each cross-folding cylinder when having four plates in circumference and four sections (copies), the following productions will result owing to the cam control according to the invention:

(a) Non-collect production: the copies I and III run via the first take-off cylinder 5; the copies II and IV run via the take-off cylinder 6 staggered by 120°. The deliveries I, III, II, IV are in operation.

(b) Single-collect production: the first take-off cylinder 5 is thrown out of gear. The deliveries I, III will be dispensed with. The corresponding copies are collected at II and IV; the delivery II supplies the single-collected copies I+II; the delivery IV supplies the single-collected copies III+IV.

(c) Double-collect production: the first take-off cylinder 5 is not in operation. The split delivery of the second take-off cylinder 6 will not be used since the copy III has not yet been taken off by the double-collect process even in the third travel. Quadruple copies, consisting of the layers I+II+III+IV, will only appear on the delivery.

According to FIG. 4 it is possible to use a five-section cylinder as cutting die, folding blade and collecting cylinder. A $\frac{2}{2}$ cutting cylinder 21 with two knives cuts the paper web 20 against the $\frac{5}{2}$ collecting cylinder 22. Two folding jaw cylinders 23, 24, staggered by 120°, take the

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copies alternately from the $\frac{5}{2}$ cylinder in double production. The pin control on the $\frac{5}{2}$ cylinder 22 is effected according to FIGS. 2a, 2b and 2c as described. It is possible to run non-collect, collect or if required, also double-collect production.

The cam control according to the invention is not restricted to the described cases of applicability. It can likewise be used for the splitting with the possibility for collect run at the third fold or second length fold.

What is claimed is:

1. Folding mechanism for web-feed rotary presses comprising,

a five-part collecting cylinder having pin or gripper means for handling five copy lengths in circumference,

a stationary cam adjacent the collecting cylinder and having two actuating means spaced 120° apart for controlling the pin or gripper means,

a rotating cam adjacent the collecting cylinder having four 90° spaced apart actuating means for controlling the pin or gripper means,

means for rotating the rotating cam with $\frac{5}{8}$ fold speed in relation to the five-part collecting cylinder and in the same direction,

two transfer cylinders positioned for working with said collecting cylinder,

means for disabling one of the actuating means of the stationary cam for a collect run, and

means for disabling each second actuating means of the rotating cam for a double-collect run,

whereas all actuating means of the cams are operative for a straight run.

2. Folding mechanism according to claim 1 wherein the means for disabling one of the actuating means of the stationary cam is a disk positioned adjacent the cam for covering one of its actuating means thereon and wherein the means for disabling each second actuating means of the rotating cam is a disc positioned adjacent the cam and rotating therewith for covering each second actuating means thereon.

3. Folding mechanism for web-fed rotary printing machines for collect and non-collect production having

a collecting cylinder with five sections in circumference to which sheets are fed,

pin and gripper means on said collecting cylinder, take-off cylinder means cooperating with said collecting cylinder and being arranged 120° apart about said five-section collecting cylinder,

said pin and gripper means having control means for operating the same, including means therein for selectively operating the pin and gripper means in collect as well as non-collect production that at least one subsequent copy is skipped at the take-off points so that there will be a gap which allows subsequent cross or length fold at a reduced speed,

said control means for operating said pin and gripper means including a revolving cam mounted adjacent an end of said collecting cylinder having arcuate recesses and raised arcuate portions thereon for actuating said pin and gripper means, said revolving cam having means driving it at a 0.625-fold speed in relation to the collecting cylinder and a means consisting of a disk-like member associated therewith for disabling said actuating means thereon.

4. Folding mechanism for web-fed rotary printing machines for collect and non-collect production having

a collecting cylinder with five sections in circumference to which sheets are fed,

pin and gripper means on said collecting cylinder, take-off cylinder means cooperating with said collecting cylinder and being arranged 120° apart about said five-section collecting cylinder,

said pin and gripper means having control means for operating the same, including means therein for selectively operating the pin and gripper means in col-

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lect as well as non-collect production that at least one subsequent copy is skipped at the take-off points so that there will be a gap which allows subsequent cross or length fold at a reduced speed,

said control means for said pin and gripper means includes a stationary cam adjacent an end of said collecting cylinder for actuating said pin and gripper means, said stationary cam having actuating means thereon consisting of recesses and raised portions against which a cam follower of the control means rides for actuating said pin and gripper means and means associated therewith for selectively bringing into and out of action said cam actuating means thereon,

said control means for operating said pin and gripper means also including a revolving cam mounted adjacent an end of said collecting cylinder having arcuate recesses and raised arcuate portions thereon for actuating said pin and gripper means, said revolving cam having means driving it at a 0.625-fold speed in relation to the collecting cylinder and a means consisting of a disk-like member associated therewith for disabling said actuating means thereon.

5. Folding mechanism for web-fed rotary printing machines for collect and non-collect production having a collecting cylinder with five sections in circumference to which sheets are fed,

pin and gripper means on said collecting cylinder, take-off cylinder means cooperating with said collecting cylinder and being arranged 120° apart about said five section collecting cylinder,

said pin and gripper means having control means for operating the same, including means therein for selectively operating the pin and gripper means in collect as well as non-collect production that at least one subsequent copy is skipped at the take-off points so that there will be a gap which allows subsequent cross or length fold at a reduced speed,

said control means for operating said pin and gripper means includes a revolving cam rotating in the same direction at a 0.625-fold speed in relation to the collecting cylinder, said revolving cam having four cam recesses spaced 90° apart and a disk-like member associated with the revolving cam rotatable relative thereto to optionally expose said four cam recesses and two recesses thereof spaced 180° apart.

6. Folding mechanism for web-fed rotary printing machines for collect and non-collect production having a collecting cylinder with five sections in circumference to which sheets are fed,

pin and gripper means on said collecting cylinder, take-off cylinder means cooperating with said collecting cylinder and being arranged 120° apart about said five-section collecting cylinder,

said pin and gripper means having control means for operating the same, including means therein for selectively operating the pin and gripper means in collect as well as non-collect production that at least one subsequent copy is skipped at the take-off points so that

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there will be a gap which allows subsequent cross or length fold at a reduced speed.

said control means for said pin and gripper means includes a stationary cam adjacent an end of said collecting cylinder for actuating said pin and gripper means, said stationary cam having cam actuating means thereon consisting of recesses and raised portions against which a cam follower of the control means rides for actuating said pin and gripper means and means associated therewith for selectively bringing into and out of action said cam actuating means thereon,

said control means for operating said pin and gripper means also includes a revolving cam in the same direction at a 0.625-fold speed in relation to the collecting cylinder, said revolving cam having four cam recesses spaced 90° apart and a disk-like member associated with the revolving cam rotatable thereto to optionally expose said four cam recesses and two recesses thereof spaced 180° apart.

7. Folding mechanism according to claims 3 and 4 or 5 and 6 wherein the stationary cam and the revolving cam with their respective covering disk-like members are positioned relatively close and side by side at the same end of the collecting cylinder and there are shafts extending axially in said collecting cylinder adjacent each section of the five-sections therein that mounting thereon said grippers and pins, said shafts having follower means thereon extending for cooperative action by the respective cams.

8. Folding mechanism according to claims 7 or 3 and 4 or 5 and 6 wherein the revolving cam is operating with four cam recesses spaced 90° apart, and the stationary cam with two recesses spaced 120° apart, for non-collect production and alternative delivery at two positions as respects the collecting cylinder.

9. Folding mechanism according to claims 3 and 4 or 5 and 6 wherein the revolving cam is operating with four cam recesses, spaced 90° apart, and the stationary cam is operating with a single cam recess for single-collect production and delivery at one position as respects the collecting cylinder.

10. Folding mechanism according to claims 3 and 4 or 5 and 6 wherein the revolving cam is operating with two cam recesses, spaced 180° apart, and the stationary cam is operating with one cam recess for double-collect production and delivery at one position as respects the collecting cylinder.

References Cited

UNITED STATES PATENTS

2,842,360	7/1958	Crafts	270—72 X
2,941,798	6/1960	Harless	270—72

EUGENE R. CAPOZIO, Primary Examiner

P. V. WILLIAMS, Assistant Examiner

U.S. Cl. X.R.

270—76