Feb. 16, 1954 D. L. GORBATENKO 2,669,453

WEB FEED MECHANISM FOR ADJUSTABLE ROTARY IMPRINTERS

Filed March 10, 1951 2 Sheets-Sheet 1

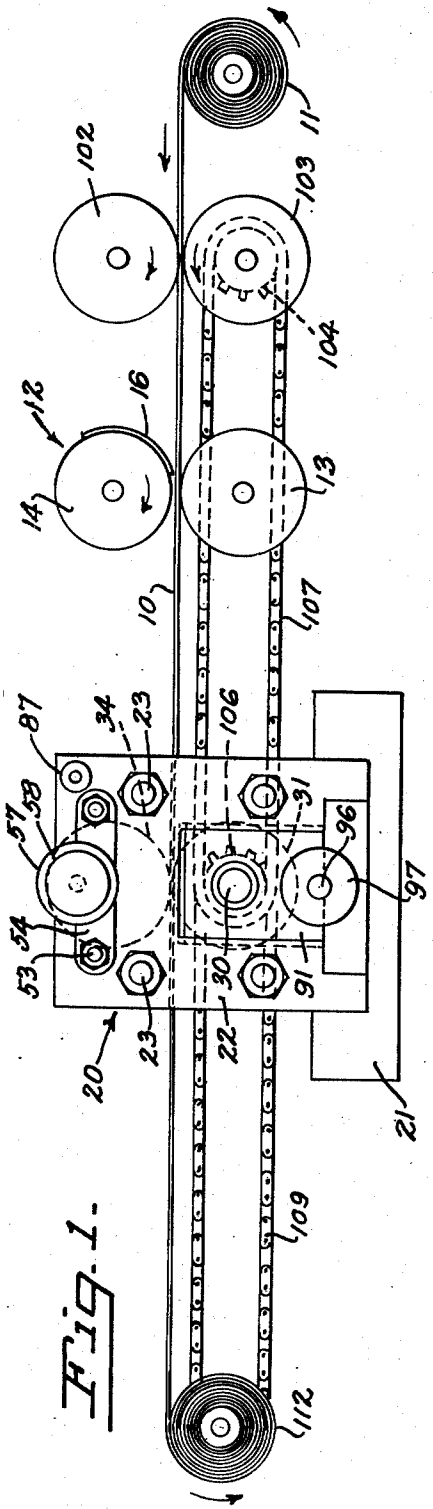


Fig. 1.

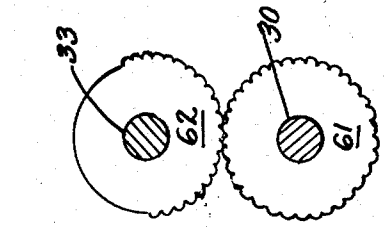


Fig. 10.

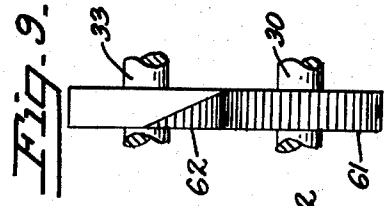


Fig. 9.

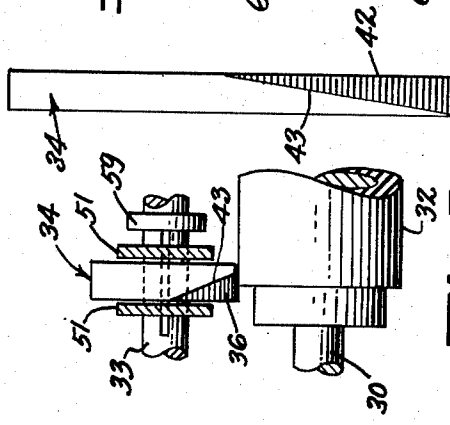


Fig. 8.

Fig. 7.

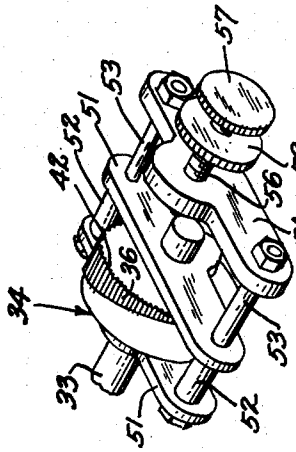


Fig. 6.

INVENTOR
DIMITRI L. GORBATENKO
BY
Julian Caplan
ATTORNEY

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Fig. 2.

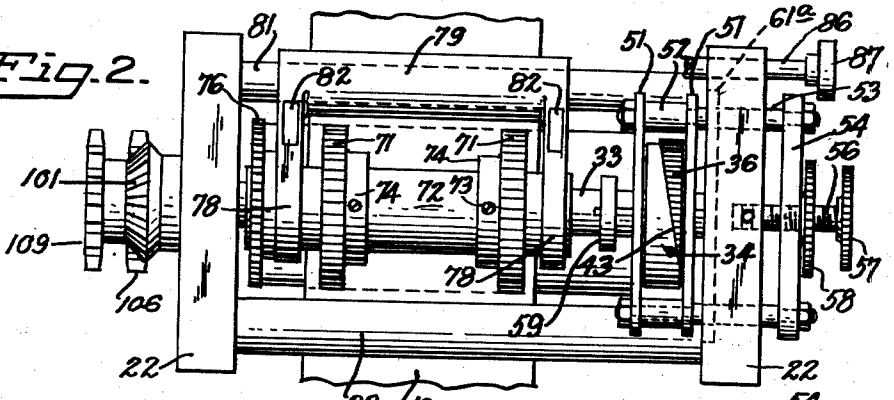


Fig. 3.

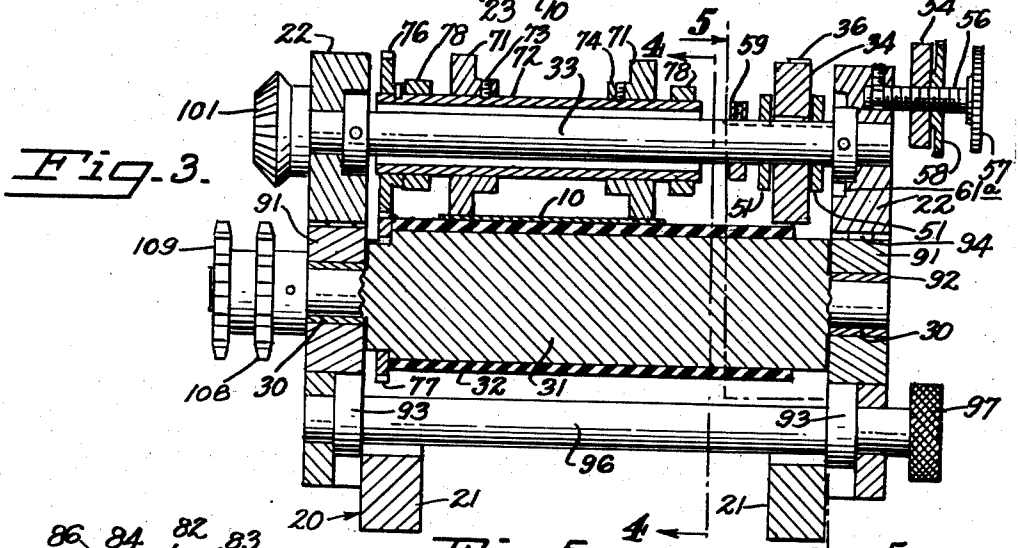


Fig. 4.

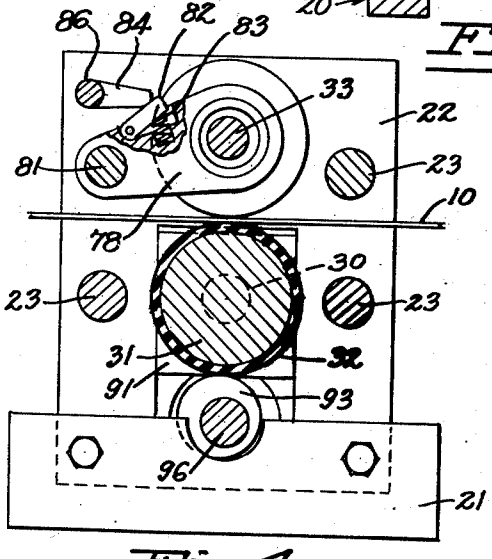
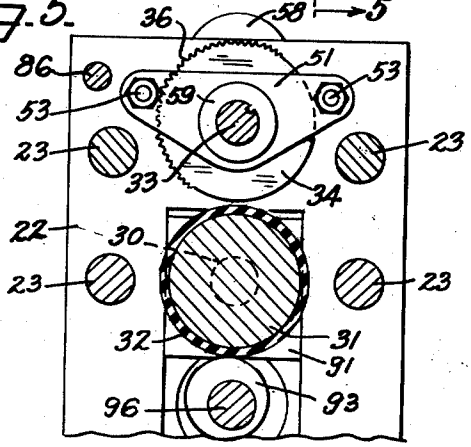


Fig. 5.



INVENTOR
DIMITRI L. GORBATENKO
BY Julian Caplan
ATTORNEY

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WEB FEED MECHANISM FOR ADJUSTABLE ROTARY IMPRINTERS

Dimitri L. Gorbatenko, San Francisco, Calif.

Application March 10, 1951, Serial No. 214,879

8 Claims. (Cl. 271—2.4)

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This invention relates to new and useful improvements in web feed mechanism for adjustable rotary imprinters. Reference is made to my co-pending application Serial No. 137,439, filed January 7, 1950, for Adjustable Rotary Imprinters. One improvement hereinafter set forth relates to an improved means whereby the linear feed of the web per revolution of the printing cylinder may be adjusted, particularly in that the adjustment may be made even while the machine is in operation.

The present invention is used to imprint or overprint symbols on a web of stock, and has particular application where a large quantity of labels or the like are printed at one time and subsequently imprinted in smaller quantities with symbols indicating price, ingredients and the like. The term "label" is used herein to include other similar printed units of relatively short length.

The present invention results in greater flexibility of the imprinter in that the mechanism which advances the web is accurately adjustable so that the distance which the web is advanced for each revolution of the drive shaft of the machine may be equalized with the exact length of the individual labels.

An object of the present invention is an improved means whereby the adjustment of the web pull mechanism may be performed even while the machine is in operation.

Still another object of the invention is the employment of rotatable tension rollers driven in synchronism with the web pull cylinder, the web being caused to pass between said rollers and said cylinder; the force with which said rollers bear against said web pull cylinder being adjustable. The importance of this feature resides in the fact that especially when the web is caused to advance intermittently it is important that the inertia of the web movement be overcome or at least accurately controlled and hence a constant engagement between the web and the web pull cylinder is desirable.

A further object of the invention is the provision of novel mechanism whereby intermittent rotary motion is imparted to one member from another rotary member, the relative angular motion of the first member with respect to the second member being adjustable even while one or both members is in operation.

Other and further objects and advantages of the present invention will become apparent from reading the following specification of the invention, in which reference is made to the accompanying drawings in which:

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Fig. 1 is a schematic side elevation of an imprinter showing the relative locations of various parts of the imprinter;

Fig. 2 is a top plan of the web feed mechanism;

Fig. 3 is a transverse vertical section taken along the line axis of the principal rotatable members of Fig. 2;

Fig. 4 is a longitudinal vertical section taken substantially along the line 4—4 of Fig. 3;

Fig. 5 is a longitudinal vertical section taken substantially along the line 5—5 of Fig. 3;

Fig. 6 is a perspective of the cam which regulates relative movement of the driven member and associated mechanism for adjusting the position thereof;

Fig. 7 is a side elevation of the cam and cylinder with which it engages, together with associated mechanism;

Fig. 8 is a geometric development of the cam periphery in a flat plane;

Fig. 9 is a side elevation of a modified structure for regulating relative intermittent movement of the driven member from the driving member; and

Fig. 10 is an end elevation of the structure of Fig. 9.

The present invention is used to imprint or overprint labels or the like which have been previously printed on a web 10 of paper stock or the like wound on roll 11, each label being in very close proximity to the adjacent label. It is further understood that each label in web 10 will ordinarily be of exactly the same length as every other label in the web and that the space, if any, between labels will not vary, but that occasionally the dimensions of labels will vary gradually as the result of various factors. Labels of various lengths may be imprinted with the instant invention, and the feed of the web through the imprinter is adjustable for different lengths of labels without interchange of the various printing and feeding cylinders employed.

Although not described in detail herein, it will be understood that the web is caused to pass through printing mechanism 12 of generally conventional construction, passing between rotary impression cylinder 13 and plate cylinder 14. Plate cylinder 14 carries rubber type plate 16 attached to the periphery thereof by adhesive material and hence removable therefrom, and the words, figures or other symbols of said plate 16 may be changed as desired. Type plate 16 does not ordinarily extend circumferentially around plate cylinder 14 but only partially thereabout. It is desirable, although not essential

that the circumferential length of plate 16 be equal to the length of the individual labels on web 10, or multiples thereof. Cylinder 14 is power driven and rotates continuously at uniform speed. During each revolution of plate cylinder 14, plate 16 contacts web 10 as it is drawn over impression cylinder 13 and thereby imprints the desired symbols on the label in the exact location desired. When labels of different lengths are to be imprinted, the circumferential length of plate 16 is varied accordingly. The upper limit of the length of plate 16 is the circumference of cylinder 14, but it will be understood that plates of considerably shorter length may be used without interchanging cylinder 14 for a cylinder of different diameter. The radius from the central axis of cylinder 14 to the periphery of plate 16 is greater than the radius from said axis to the periphery of cylinder 14. Hence when that portion of cylinder 14 which is not covered by plate 16 is over impression cylinder 13, there is no contact with web 10, said web being kept tight against the surface of cylinder 13 by various tension means (not shown).

It is the function of the web feed mechanism 20, hereinafter described, that web 10 be fed a distance equal to the length of one label (or multiple) while plate 16 is passing over impression cylinder 13 and then be held stationary while the portion of plate cylinder 14 which is not covered by plate 16 is passing over the impression cylinder 13. In this way, any label having a length less than the circumference of cylinder 14 may be imprinted and labels may be consecutively arranged on web 10 without any gap between consecutive labels. Web 10 is fed intermittently a distance equal to the length of a single label (or multiple) for each revolution of plate cylinder 14 and then remains stationary when plate 16 is not in contact with web 10.

The web feeding mechanism 20 is designed to feed web 10 a distance equal to the length of a label or the exact desired distance between two identical symbols printed on the web and to so feed the web only when plate 16 is passing over impression cylinder 13 and not to feed the web during the remainder of each revolution of cylinder 14.

The web feed mechanism is supported on a carriage 21 bearing opposed side plates 22 tied together a fixed distance apart by transverse tie rods 23. Said carriage 21 may be movable longitudinally of the machine as is described in detail in my said application Serial No. 137,439.

Web 10 is caused to pass over web pull cylinder 31, which is preferably provided with a resilient or rubber roll 32 and provided with journals 30 received in plates 22. Vertically above cylinder 31 is pull shaft 33 to which cam 34 is keyed for slidable movement axially of said shaft. A portion 36 of the circumference of cam 34 is higher than the remainder thereof, as hereinafter described, and said higher portion 36 is preferably knurled, milled or otherwise roughened along its peripheral surface so that when said portion 36 contacts resilient roll 32 it bites into the resilient surface thereof and upon rotation of cam 34 roll 32 is rotated. Pull shaft 33 is positively and continuously driven off the main drive shaft of the machine in synchronism with the shaft of cylinder 14.

As has been stated, portion 36 of the circumference of cam 34 is higher than the remainder thereof, constituting a zone of engagement with roll 32. As shown particularly in Fig. 8, one

boundary 41 of said zone of engagement is an axial line 41 on the circumference of the cam. Another boundary is the edge 42 of said cam adjacent plate 22, the same being disposed at right angles to the axis of shaft 33. The third boundary of said zone of engagement is a three-dimensional curved line 43, preferably a portion of a helix which intersects boundary 41 and boundary 42. As seen in Fig. 8, raised portion 36 is in the form of a right triangle, but other shapes may be employed.

Cam 34 is moved axially by means of a pair of yokes 51 on opposite sides thereof, said yokes being spaced apart a distance equal to the thickness of cam 34 by spacing sleeves 52 on slidable rods 53 on which said yokes are mounted. The ends of rods 53 extend through and are horizontally supported in plate 22 and are fixed to yoke 54 outside plate 22. Screw 56 is rotatably fixed to plate 22 and in threaded engagement with yoke 54, said screw being provided with an adjustment head 57 and a lock nut 58. Thus by turning head 57, yokes 51 may be moved axially with respect to shaft 33, and since cam 34 is slidable axially on shaft 33, the position thereof may be adjusted toward and away from plate 22. Lock nut 58 may be employed to fix the position of said cam 34 once it is selected. Collar 59 fixed on shaft 33 is used to limit the inward movement of cam 34 away from plate 22. Plate 22 may be recessed as indicated by reference numeral 61a so as to permit cam 34 to be drawn close against plate 22.

The resilient cylindrical surface of roll 32 does not extend entirely across the machine, but on the contrary said resilient surface terminates a distance from side plate 22 through which rods 53 pass, said distance being about equal to the thickness of cam 34. Hence when cam 34 is drawn as closely as possible toward plate 22, zone 36 of cam 34 does not engage resilient roll 32. When in that position, although shaft 33 and cam 34 rotate continuously, roll 32 is not turned. By moving cam 34 inwardly (away from plate 22), a portion of surface 36 is brought into contact with roll 32 during each revolution of shaft 33. The farther cam 34 is moved inward, the greater the time of contact with surface 32 and thus the greater the number of degrees of revolution of cylinder 32 per revolution of shaft 33. The latter effect results from the helical or curved contour of boundary 43.

It will be seen that cam 34 may be slid axially while the machine is in operation, and hence the angular travel of cylinder 32 per revolution of shaft 33 or plate 14 may be adjusted even while the machine is in operation. The angular travel of cylinder 32 determines the linear travel of web 10. By proper adjustment of cam 34, web 10 may be advanced the exact length of one label.

The direction of rotation of cam 34 is such that boundary line 41 preferably first contacts surface 32, and the machine is preferably adjusted so that line 41 contacts surface 32 at the instant that the leading edge of plate 16 passes over impression cylinder 13; hence web 10 commences feeding at the instant that plate 16 commences printing, regardless of the length of the particular label on web 10. Theoretically, the distance from line 41 to curved line 43 measured circumferentially at right angles to shaft 33 is equal to the length on one label (or multiple). Actually, due to slippage, inertia and various other factors, this relationship is subject to variation, and such variation may be compensated by axial ad-

justment of cam 34 even while the machine is in operation.

An alternative means for intermittently driving cylinder 31 from shaft 33 is illustrated in Figs. 9 and 10. Whereas a milled surface 36 engaging resilient roll 32 has been described, a more positive drive may also be employed. For such purpose gear 61 is mounted on journal 30 and arranged to mesh with driving gear 63 axially slidable on shaft 33. The teeth of driving gear 62 do not extend continuously around the circumference of the gear, but on the contrary are cut away in a shape similar to the shape of zone 36 of cam 34. The angular rotation of cylinder 32 per revolution of shaft 33 may be adjusted by moving driving gear 62 inwardly and outwardly by the same or equivalent means used to slide cam 34. The teeth of gears 61 and 62 are preferably rounded so as to make the adjustment finer and for the same purpose the number of teeth is made large.

In order to provide constant tension on web 10 and overcome inertia effects of the moving web and various moving parts, two or more tension rollers 71 are provided disposed vertically above cylinder 32, the surface of said tension rollers being knurled or otherwise roughened so as to grip web 10. The diameter of rollers 71 may equal that of cylinder 32. Said rollers 71 are slidably mounted on sleeve 72, and are adjustably held in position by set screws 73 passing through collars 74 and gripping sleeve 72 so that their position may be adjusted axially with respect to sleeve 72 depending upon the width of web 10 and other factors. To one end of sleeve 72 is fixed gear 76 which meshes with gear 77 fixed for rotation with cylinder 32. Sleeve 72 fits around but is not fixed on shaft 33, and the internal diameter of said sleeve 72 is sufficiently greater than the diameter of said shaft 33 so that sleeve 72 may be adjusted vertically to permit insertion of web 10 between tension rollers 71 and cylinder 32 and also to permit adjustment of the pressure of rollers 71 against roll 32 as hereinafter described. Thus shaft 33 turns continuously, but sleeve 72, and with it tension rollers 71, move intermittently in synchronism with cylinder 32.

Rotatably mounted on sleeve 72 is a pair of arms 78 extending out from sleeve 79 which is pivotally mounted on transverse shaft 81 journalled in plates 22. Pivotal movement of arms 78 adjusts the pressure on tension rollers 71 and upon web 10. Each of said arms 78 bears a pressure lever 82, one end of which is pivoted in arm 78 and the opposite end of which is biased upwardly by spring 83 disposed within a bore in said arm 78. Fork 84 pivoted on transverse shaft 86, also journalled in plates 22, is positioned to engage levers 82. By twisting knob 87 on shaft 86 the force of the tines of fork 84 against levers 82 may be varied and this in turn varies the pressure exerted on tension rollers 71.

The pressure of cylinder 32 against cam 34 may be adjusted by vertical movement of said cylinder. Each end of shaft 30 of cylinder 32 is journalled in a bearing block 91 located at each side of the machine with bushings 92 interposed, and said blocks 91 are vertically slidable in ways in side plates 22. Cams 93 located bearing against the lower ends of blocks 91 may be employed to raise said blocks 91 in their ways and with the blocks cylinder 32 against the pressure of springs 94 interposed between the tops

of blocks 91 and plates 22. Cams 93 are eccentric and are mounted on rotatable shaft 96 journalled in side plates 22 and carrying a knob 97 at one end. Manipulation of knob 97 causes rotation of shaft 96 and this rotates cams 93. Further details of the adjustment mechanism are set forth in greater detail in my said application Serial No. 137,439.

Shaft 33 is driven by means of skew bevel gear 101 from the main drive shaft (not shown) of the machine, which said main drive shaft is also arranged to drive the shaft of printing roll 14 in synchronism.

In order to feed web 10 through the printing mechanism without danger of tearing, a pair of rolls 102 and 103 is positioned between roll 11 and printing mechanism 12, said rolls 102 and 103 being of the same diameter as roller 32. The shaft of roll 103 is connected to shaft 30 of cylinder 31 by sprockets 104 and 106 and chain 107 so that rolls 102 and 103 feed web 11 simultaneously with and a distance equal to the feed imparted to web 11 by cylinder 32.

Another sprocket 108 is connected to shaft 30 and by chain 109 to rewind roll 112 so that the web may be rewound after imprinting. Alternatively a cut-off mechanism may be employed to sever labels from the web.

Operation

It will be assumed that labels of a given length have been printed on web 10 wound on roll 11 in a previous operation and that it is desired to imprint or overprint a symbol on said labels. Said symbol is set in type on plate 16 which is fixed to cylinder 14. Preliminary adjustment of the position of cam 34 is made so that the distance from boundary 41 of zone 36 measured circumferentially and at right angles to the axis of rotation of cam 34 to the point where boundary 43 last touches roll 32 as said cam is rotated equals the distance between consecutive identical symbols to be imprinted. Cam 93 is adjusted so that cam 34 bears against roll 32 with the proper amount of pressure for accurate driving of said roll 32.

Web 10 is threaded through the machine, passing between the various cooperating feed rolls, including the space between rolls 102 and 103, between cylinders 13 and 14, and between tension rollers 71 and roll 32. The end of web 10 is attached to rewind roll 112 or passed through a cut-off mechanism, as required.

Operation of the machine causes intermittent rotation of roll 32 and tension rollers 71 and of rolls 102 and 103, which feeds web 10 through cylinders 13 and 14 a distance equal to that between consecutive labels (or multiples) for each revolution of the machine. If said distance has been inaccurately set initially, or if conditions change as the machine operates, cam 34 is adjusted to compensate for error. The tension of rollers 71 against web 10 is also adjusted for proper feeding.

Although the invention has been described in considerable detail by way of illustration and example, it will be understood that changes in structure may be made within the scope of the appended claims.

What is claimed is:

1. In an adjustable, intermittent web feed mechanism, a shaft arranged to be rotated continuously, a web feed cylinder, a pressure roll biasing said web into contact with said web feed cylinder, said web feed cylinder and pressure

roll cooperating, upon rotation of said web feed cylinder, to feed said web, first means rotatable with said shaft, second means intermittently engageable by said first means and rotatable with said cylinder, one of said means being slidable axially with respect to its axis of rotation and having a continuous zone of engagement and a zone of disengagement, said zone of engagement and said zone of disengagement being discrete, the boundary between which being a continuous line oblique to the axis of rotation of said means, said zone of engagement being completely radially elevated relative to said zone of disengagement to rotatably engage the other of said first two means, said zone of engagement being disposed and arranged so that axial movement of said slidable means adjusts the angular travel of said cylinder per revolution of said shaft, and third means controlling axial movement of said slidable means.

2. A web feed mechanism according to claim 1, in which the configuration of said elevated zone developed in a plane is in the shape of an integral wedge.

3. A web feed mechanism according to claim 1, in which said first means is a cam, said elevated zone is the high dwell of said cam and is roughened, and said second means is a resilient roll into which said elevated zone bites.

4. A web feed mechanism according to claim 1, in which said first means is a gear having teeth the configuration of which developed in a plane is in the shape of a wedge, and said second means is a gear having meshing teeth around its entire circumference.

5. A web feed mechanism according to claim 1, in which side plates are provided in which the rotating members are journalled, in which said third means comprises a screw mounted in one of said plates, a pair of yokes on opposite sides of said slidable means, and fourth means in threaded engagement with said screw and arranged to move said pair of yokes, whereby upon manual adjustment of said screw the position of said slidable means may be axially adjusted.

6. Mechanism for transmitting intermittent rotary motion from a first rotatable member to a second rotatable member, comprising first means rotatable with one of said members, second means rotatable by the other of said

members and intermittently engageable with said first means, one of said means being axially slidable relative to the other of said means in a direction parallel to its axis of rotation and being provided with a peripheral surface divided into a continuous zone of engagement and a zone of disengagement of a radius of curvature less than that of said zone of engagement, said zone of engagement being completely elevated radially relative to said zone of disengagement, said two zones being discrete and separated by a continuous line oblique to the axis of rotation of said first means, the configuration and arrangement of said zone of engagement being such that, as said slidable means is slid relative to the other of said means, the angular travel of one of said means per revolution of the other of said means is adjusted, the amount of adjustment being continuously variable as said slidable means is slid, and third means adjusting axial movement of said slidable means.

7. Mechanism according to claim 6, in which said zone of engagement is the high dwell of a roughened cam surface on one of said first two means, said zone of engagement having a boundary oblique to the axis of rotation of said first means, and in which the other of said means is provided with a resilient surface into which said roughened surface bites.

8. Mechanism according to claim 6 in which said zone of engagement is provided with gear teeth, said zone when developed in a flat plane having at least three boundaries oblique to each other and in which the other of said means is provided with teeth continuous circumferentially therearound and arranged to mesh with the teeth of said zone of engagement.

DIMITRI L. GORBATENKO.

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