Jan. 23, 1968 L. C. PRICE, JR 3,364,849

ROLLING-CONTACT PRINTING MEMBER WITH ADJUSTABLE ROLLER INKER

Filed March 24, 1965 2 Sheets-Sheet 1

FIG. 1

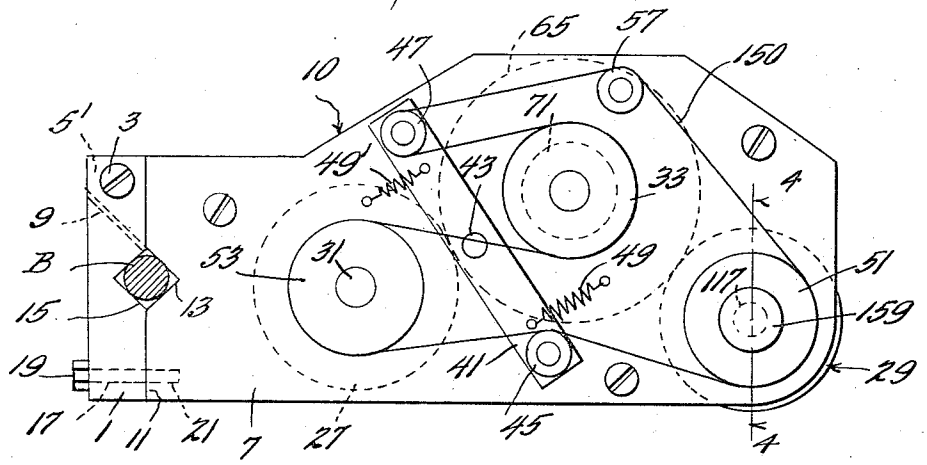
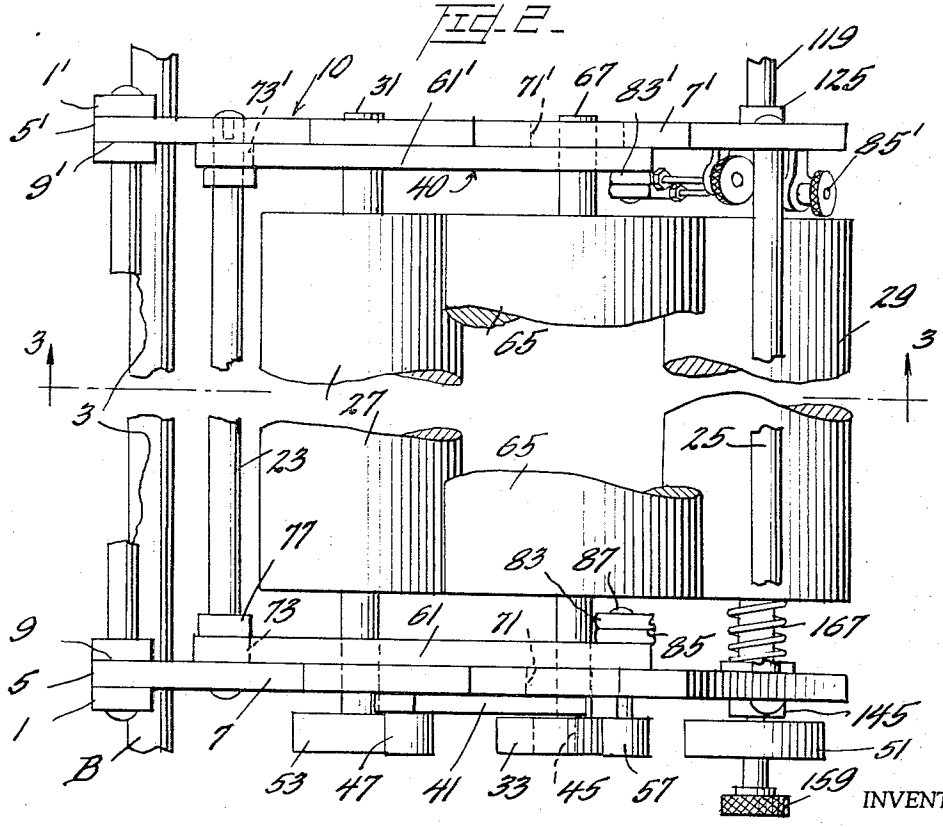


FIG. 2



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ROLLING-CONTACT PRINTING MEMBER WITH ADJUSTABLE ROLLER INKER

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FIG. 3.

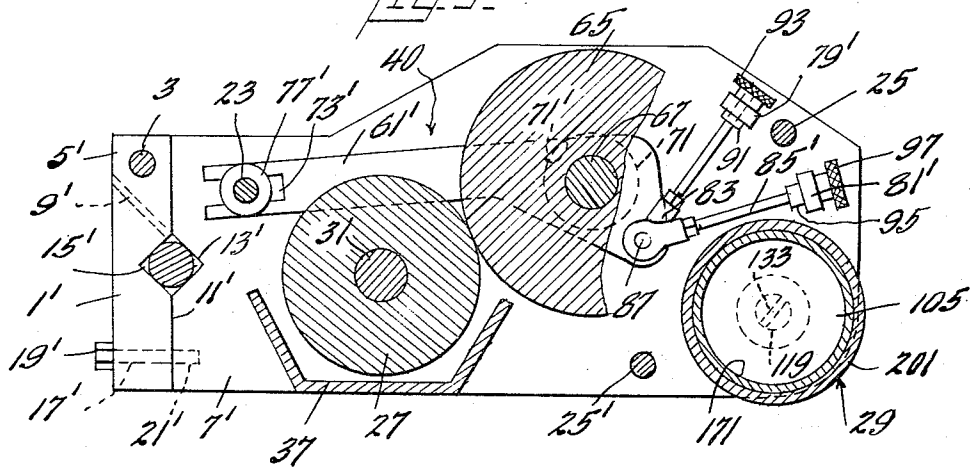
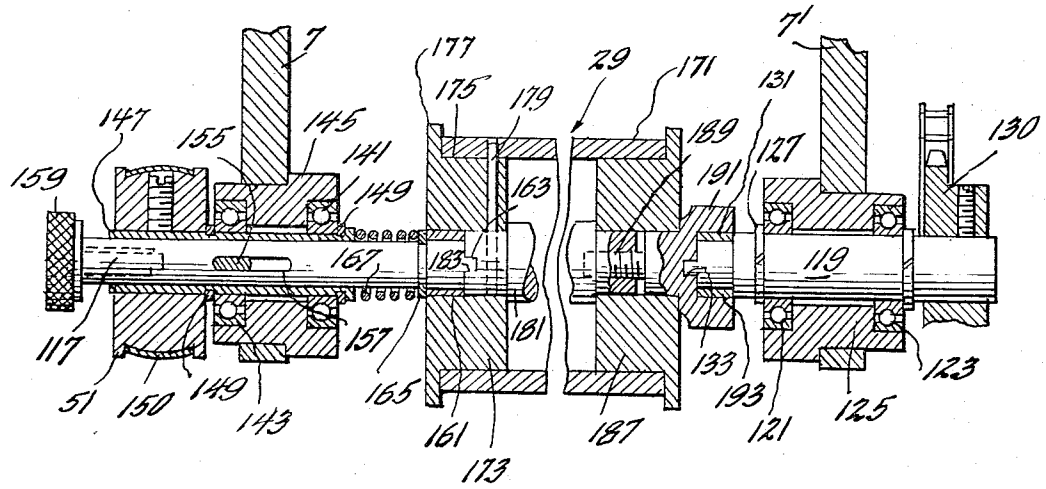


FIG. 4.



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3,364,849

ROLLING-CONTACT PRINTING MEMBER WITH ADJUSTABLE ROLLER INKER

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Filed Mar. 24, 1965, Ser. No. 442,355
7 Claims. (Cl. 101—35)

ABSTRACT OF THE DISCLOSURE

Printing apparatus to print on top or bottom surfaces of containers or a web whose lengths may be varied including a main frame supporting pulley-driven inking and printing rolls, a pivoted sub-frame carrying a pulley-driven metering roll, one of the pulleys being removable for replacement by a differently diametered pulley, all pulleys being driven by a common belt and all rolls having the same peripheral speed and commonly pivoted diverging adjustment members for adjusting the position of the pivoted sub-frame.

This invention is concerned with printing apparatus. More particularly the invention is concerned with an apparatus adapted to print the top or bottom surfaces of a series of containers or on a web to be formed into pouch or envelope packages wherein the length of the containers may be varied from time to time and wherein the printing apparatus is driven and may be quickly changed to accommodate articles or packages of different length.

One example of the use for which the present apparatus is intended is in connection with package forming machines of the pouch or envelope type. Such machines continuously form packages comprised of envelopes or pouches filled with the packaged product, the envelopes or pouches being formed from a continuous web and wherein the envelopes or pouches are sealed by heat sealing means acting periodically on the web transversely of its length. The heat sealing means thus divide the web into individual filled pouches or envelopes joined together. Subsequently the individual pouches or envelopes are severed one from the other at the point of transverse heat sealing. Pouches or envelopes formed by such machines vary in length from, for example, one inch to several inches or more, depending on such factors as bulk, weight, portions etc., of the packaged product. Specific examples, are the much used single dosage headache remedies now marketed in pouch packages on one hand and the so called "dry" soup mixes also packaged in envelopes or pouches which are considerably larger than is the case of single dosage packages.

When these packages are formed it will be apparent that a single packaging machine must be adaptable to forming various sizes of pouch depending on the product involved. Oftentimes packaging is done by so called "contract" packagers and thus the seller of the product will wish each product code marked according to the lot packaged, the packager, the date, etc. Heretofore, code marking of such packages in fact of any packages on a single packaging line, whether box or pouch, has created a problem in that no printing device used for code marking could be accommodated to various length packages without extensive revision of both the drive means therefore or the printing member thereof. Such revisions require the maintenance of multiple parts, particularly drive gears, printing cylinders etc., and inevitably a particular length package would become involved which no amount of juggling of parts or drive gears would enable proper registry of the printing on the package or boxes of peculiar size, so that code marking was impossible or, if possible, attained only by the most expensive of changes, slowing of production, etc.

The present invention, then, has for an object the development of a printing apparatus particularly adapted for use where the packaging or coveying line to which it is applied is used in connection with the packaging of various products in containers of varying sizes.

Another object of the invention is to produce a universally adaptable printing apparatus.

Still a further object of the invention is to produce a printing apparatus wherein the drive means is readily adaptable to accommodate packages of varied dimensions.

An additional object of the invention is to produce a printing apparatus having means for quickly adapting the printing cylinder to a variety of conditions.

These and other objects of the invention not specifically set forth but inherent therein and readily apparent to the skilled in the art are accomplished by means of a printing apparatus including a main frame adapted for fixed mounting on a suitable support, said main frame carrying a source of ink supply and a printing cylinder rotatable therein; a sub frame fixed within and adjustable with respect to said main frame; a metering roll carried by and adjustable with the sub frame and interposed in rolling contact with both the source of ink and said printing cylinder; and drive means comprised of a series of pulleys affixed, one each, to each of said rolls with the remainder carried by the main frame, the pulley driving said printing cylinder being readily removable so as to permit various diameters of pulleys to drive the cylinder, said cylinder including means whereby the effective peripheral speed of the printing member may be varied along with variations in drive speed so as to accommodate articles of different length to produce a printed character at a selected repetitive position on each package irrespective of its length.

Having set forth broadly the objects and means for attaining same which define the present invention, consideration of the following description and the drawings associated therewith will enable those skilled in the art to fully comprehend the inventive concepts herein involved.

Accordingly—

FIG. 1 is a side elevational view of the printing device,

FIG. 2 is a top view of the device shown in FIG. 1, parts being broken or removed for clarity,

FIG. 3 is a sectional view through the device approximately at its center line, along the line 3—3 FIG. 2 showing frame and sub frame details,

FIG. 4 sectional view through the printing cylinder, taken along the line 4—4 of FIG. 1.

Turning initially to FIGS. 1, 2 and 3 it may be seen that the apparatus is comprised of a main or support frame assembly **10** and a sub frame or transfer frame **40**. The main frame assembly **10** includes side members **7, 7'**. The mounting or left hand end of main frame members **7, 7'** are provided with clamp bars **1, 1'** pivoted on tie rod **3** to rearwardly projecting ears **5, 5'** formed as an integral part of the side member **7, 7'**, the clamp bars being bifurcated at the areas **9, 9'** to receive the ears **5, 5'**. The lower and swingable portion of each clamp bar is in abutment with the end edges **11, 11'** of the side members **7, 7'**. Midway of the vertical height of each clamp bar **1** and frame edge **11** each element is provided with a V shaped notch **13, 15, 13', 15'** respectively, opening toward each other to define a clamping diamond for the member B. Member B is mounted on a packaging machine frame and thus forms a means whereby the apparatus may be fixed to the ma-

chine. In order to firmly clamp main frame **10** on the member B the clamp bars **1,1'** are apertured at **17, 17'** to receive bolts **19, 19'** which are threadedly engaged in a suitable threaded opening **21, 21'** in frame member **7, 7'**.

The side members **7, 7'** of main frame assembly **10** are identical and are laced together by transverse tie bars **3, 23, 25, 25'** among others, which maintain the two side members **7, 7'** in aligned and rigidly interconnected relation.

As shown in the drawing, frame assembly **10** carries first an ink roll **27** and a printing cylinder assembly **29**. These rotary elements are provided with central shafts **31, 117** the latter to be described in detail, which are journaled by suitable bearings in each side frame member **7, 7'** with the peripheral surface of the printing cylinder extending below and beyond the end of side members **7, 7'** as clearly shown in FIG. 1. At least one end of shafts **31** and **117** extend through and project outwardly beyond the side, frame members **7**, or, **7'** for reasons that will subsequently be described.

Roll **27** may be a typical fountain roll having an internal ink supply which is fed to its outer surface by capillary action and/or centrifugal force as is conventional in the art. Alternatively, it may comprise a pick-up roll operating to transfer ink from a pan **37** which extends between and is fixed to the side members **7, 7'** of main frame **10** as shown in FIG. 3.

Mounted externally, that is, on the outer face of the side member **7** of main frame assembly **10** for pivotal movement is a tension lever **41** journaled at its midpoint on a stub shaft **43** suitably affixed to side member **7**. The terminal ends of lever **41** are provided with tension pulleys **45, 47** which are rotatably affixed thereto by any suitable mounting means.

The tension lever may be rocked clockwise or counterclockwise and may either be spring biased for rocking motion in one direction as illustrated in FIG. 1, springs **49, 49'** being connected to the respective terminal ends and side member **7** to bias the tension lever in a counterclockwise direction. Alternatively rather than being spring biased, the tension lever **41** may be lockable against swinging at any given position in which case stub shaft **43** would be provided with a suitable lock nut (not shown) whereby it may be tightened to hold tension lever **41** in any given position.

The outer face of the side member **7** of main frame **10** is also provided with an idler pulley **57** suitably mounted thereon, said idler pulley **57** being disposed above the axes of rotation of either printing cylinder assembly **29** or ink roll **27**, also as shown in FIG. 1.

The projecting ends of both shafts **31** and **117** are also provided with drive pulleys **51, 53**, each being keyed or fixed to the respective shafts **31** and **117**. The connection between shaft **117** and roller assembly **29** being readily broken as and for the purpose as will be subsequently described.

Turning now to FIGS. 2 and 3, in particular, it will be seen that disposed against the inside faces of the side members **7, 7'** of main frame assembly **10** is the transfer frame or subframe **40**, comprised of adjustable carrier members **61, 61'** and a transfer or metering roll **65** having a central shaft **67** suitably journaled, intermediate their ends, in the carrier members **61, 61'** by means of conventional anti-friction bearings (not shown). At least one terminal end of shaft **67** (as shown in FIG. 2 the lower end) projects outwardly beyond the carrier member **61** and side member **7** of main frame **10** through an enlarged aperture **71** whereby the shaft may be moved in its relative position with respect to side member **7** and or **7'** of the main frame assembly **10** without interference from the side members. This outwardly projecting end of shaft **67** is also provided with a pulley **33** as seen in FIG. 1.

As seen in FIG. 2, the rear terminal ends of carrier members **61, 61'** are slotted at **73, 73'** and rest on the tie bar **3** being retained against lateral movement thereon by suitable stop collars **77, 77'**. Thus the carrier members **61, 61'** are both pivotally and longitudinally movable with respect to main frame **10** and its side members **7, 7'**.

The opposite of forward ends of carrier members **61, 61'** are connected to main frame assembly **10** by means of adjustable connectors comprising self centering rod ends **79', 81'** (only two shown in FIG. 3) through which pass threaded turnbuckle-like connectors **83, 85, 83', 85'** connected by any suitable means **87, 87'** to the terminal ends of the carrier members **61, 61'**. Suitable nuts **91, 93, 95, 97**, abut against opposite sides of the rod end bearings, the nuts **93** and **97** being in the form of adjustment knobs whereby rotation thereof will serve to move the turnbuckle-like connectors **83, 85, 83', 85'**, longitudinally of their respective lengths in either direction. The nuts **91** and **95** serve as locking elements to clamp the connectors **83, 85**, etc., in their selected position of adjustment.

It will be noted in FIG. 3, that the longitudinal axes of the turnbuckle-like connectors **83', 85'** (also **83, 85**) are disposed in a generally common vertical plane, but that these axes diverge relative to one another at an angle of approximately 45° or more. Because of this arrangement the carrier arms **61, 61'** are moved both longitudinally and vertically when either or both of the adjustment nuts **93, 97** are rotated. Thus the position of metering or transfer roll **65** may be adjusted so as to vary its peripheral contact with both ink roll **27** and printing cylinder assembly **29**. This important feature permits of accurate regulation of the ink supply to the printing cylinder **65** to suit varying conditions to which the device may be used.

Turning now in particular to FIG. 4, a novel printing cylinder arrangement is shown and will be described in detail. While in the previous descriptive material, the printing cylinder **29** has been shown as a simple roll, for convenience, an inspection of FIG. 4 will reveal that, in fact printing cylinder **29** is an assembly which is so designed as to permit easy removal of same from the device. Thus, as shown, a pair of co-axial shafts **117** and **119** are journaled in each of the side frame members **7, 7'** respectively, of support frame assembly **10**.

Considering first shaft **119** it will be seen that a pair of anti-friction bearing elements **121, 123** are pressed into a bearing carrier **125** in turn press fit into frame member **7'**. Shaft **119** in turn is journaled in the bearings **121, 123** and locked in place by suitable lock rings **127** as shown. The outer end of shaft **119** carries a sprocket **130** keyed in place, whereby, if sprocket **130** is driven by conventional chain drive from a convenient point on the packaging machine or the conveyor drive, rotation will be imported to shaft **119**. For the purposes to become apparent, the inner end, left hand end as shown, of shaft **119**, is provided with a bronze bushing **131** and a diametrically disposed key **133**.

Shaft **117** is journaled in side frame member **7** by suitable bearings and carrier **141, 143** and **145** respectively; the carrier being press fit into member **7**. Rather than being directly engaged by the bearings **141, 143**, shaft **117** is surrounded by a sleeve **147** locked in place within the bearings **141, 143** by lock rings **149**. The sleeve **147** in turn carries the drive pulley **51** (shown in FIG. 1) this pulley being locked on the sleeve by means of a set screw **153**.

In order to transmit rotation in unision between shaft **117** and sleeve **147**, also pulley **51**, while at the same time permitting axial movement of shaft **117**, the sleeve is provided with diametrically opposed apertures (not shown) which in turn receive key **155** which extends diametrically across the hollow interior of the sleeve. The shaft **117** is provided with an axially elongated slot **157** through which the key **155** passes. Thus rotation of shaft **117**, as will be described, will transmit rotation to sleeve **147** and pulley **51**.

The outer end of shaft **117** is provided with a cylinder release knob **159** while the inner end of the shaft is pro-

vided with a bronze bushing **161** and a further diametrically disposed projection **163** defining a further releasable, driving connection. Closely adjacent bushing **161** is a lock ring **165** against which abuts one end of a coil spring **167** surrounding shaft **117** and having its opposite end in engagement with the end of sleeve **147**. Thus spring **167** acts against lock ring **165** to bias shaft **117** inwardly toward the center of the apparatus while at the same time manual pulling of knob **159** may cause the shaft **117** to move axially outwardly against the bias of spring **167** without disturbing the driving relation of the shaft with respect to pulley **51**.

Continuing further, it will be seen that the printing cylinder, per se, is comprised of a cylindrical hollow shell **171**. Shell **171** in turn is engaged at end with an end cap **173** having an annular land **175** and an annular peripheral lip **177** which extends diametrically outwardly beyond the exterior surface of shell **171**. End cap **173** is connected by a pin **179** with a central shaft **181**, this shaft being provided at this end with a diametrically extending slot **163** which engages the key **183** on the end of shaft **117**. The opposite, or right hand end of shell **171** is also supported on a further end cap **187** which is centrally apertured to receive the opposite end of shaft **181** and which has a cross sectional configuration substantially identical to that of end cap **173**. The shaft **181** is provided at this end with a central axially extending threaded aperture **189** into which is threaded the left hand portion of a drive coupling **191**. The drive coupling **191** is itself provided with a central recess **193** which bottoms in a slotted wall **195** the recess and wall being adapted to receive and form a driving engagement with the inner end of shaft **119** with its diametric key **133**.

From the above description, it will be seen that with shaft **117** retracted to the right the entire cylinder assembly **29** can be readily inserted and/or removed from its position between shafts **119**, **117** while at the same time, when locked in place, the cylinder will be driven from sprocket **130** via shaft **119**, keyed connection **133**, **195** shaft **181**, pin **179** and in turn will drive pulley **51** via connection **163**, **183** shaft **117**, key **155**, sleeve **147** and set screw **153**. Shell **179** is driven concurrently with shaft **181** via the pin **179**.

As has been stated the end cap **187** is mounted on shaft **181** and in turn engages shell **171** being retained in place by the coupling **191** threadedly and removably engaged with shaft **181**. Thus with cylinder assembly **29** removed from shafts **117** and **119**, the coupling member **191** may be manually unscrewed and thus end cap **187** removed from the end of shell **171**. Thus the free end of the shell can receive a plurality of cylindrical spacer and type holding rings **201**, **205** respectively in any suitable arrangement of width and spacing thereon. When the spacer and type holding rings are properly and selectively arranged, the end cap **187** is reengaged with sleeve **171** the coupling member **191** threaded into shaft **181** thus bearing against the end cap so that the type rings **205** and spacer rings **20** are firmly and non rotatably clamped in place on shell **171**. By this arrangement an infinite variation in the information, position, etc., of the subject matter to be printed can be obtained.

In order to provide for different spacing of the point at which printing takes place on the item to be printed the thickness of the spaces **201** and the base of each type holding ring can be increased to provide for an effective increase in the diameter of the cylinder assembly **29** same being clamped by the axial pressure exerted between end cap **173** and **187** as affected by the coupling member **19**. Thus for a constant drive speed from the machine to which the present invention is attached the differences in spacing obtained between imprints on the article or articles being printed becomes a function of roll diameter or effective diameter of the roll assembly **29**. Of course, suitable shim members (not shown) may be used between caps **173**, **187** spacers **201** and rings **205**, where desired, to obtain the proper spacing of same and proper tightening of same on the shell **171**. Also in some instances the diameter of shell **171** may also be changed to accommodate different diameters of spacers **201** and rings **205** where the print spacing change is of such a nature as to require same. Thus, changes from a most minute nature to a rather substantial nature can be affected by various combinations of shell diameters and type ring or space diameters.

As previously stated it is the usual practice to drive printing devices of the type disclosed herein from some point on the packaging equipment. Thus, in this case, drive of the present device will be obtained by a chain and sprocket drive, the sprocket being carried on driven shaft **119**. It is important for proper operation that an apparatus of the type described essentially a flexographic press, all of the rolls, printing cylinder, transfer roll and inking roll will be driven at the same peripheral speed. Thus while changes in diameter of the printing cylinder assembly **29** as described above, may not produce a major change, of peripheral speed, a drastic change, as by changing shells **171**, will produce a change in peripheral speed of cylinder assembly **29** relative to transfer cylinder **65**. Thus means must be provided whereby the drive ratio provided from pulley **51** to pulleys **33** and **53** can be varied to meet these changing conditions. This is accomplished by changing the diameter of pulley **51** (utilizing different diameter pulleys) so that differences in the peripheral speeds of transfer roll **65** and ink roll **27** can be met by driving the pulley **33** and **53** in a ratio to accommodate such changes. Since pulley **51** drives the pulleys **33** and **53** by means of a belt **150** it can be seen that an infinite ratio of drive speeds may be transferred to rolls **65** and **27** assuming that the diameter ratio between pulley **33** and transfer roll **65** and pulley **53** and fountain roll **27** remain a constant. It should be noted that the belt drive arrangement accomplishes a result which cannot be obtained easily by gear or chain and sprocket drives where additional factors such as tooth count etc., are interjected into the computations, and wherein in many cases all pulleys would have to be changed, to effect the desired drive and driven ratios to produce equal peripheral speeds of the printing cylinder **29**, transfer roll **65** and inking roll **27**. Also, it is a relatively simple matter to take up or release the tension in belt **150** to accommodate various diameters of pulley **51** via the tension adjustment rolls **45**, **47** and lever **41**. With the described arrangement, for example, one machine utilizing the unique drive and print roll structure herein described may print on webs at any dimension between 9 inches and 13½ inches with the exact synchronization being obtained between all rolls by the use of only one interchangeable pulley **51**.

A second machine, identical in design but having different sizes of pulleys can operate in the 6" to 9" range whereby the whole range from 6 to 13½ inches can be covered.

Having thus described my invention in detail, it will become apparent to those skilled in the art that various changes and modifications may be made, such being within the purview of the appended claims, wherein, what is claimed is:

1. A printing apparatus comprising a frame assembly; means for mounting said frame assembly on a packaging machine or the like; a plurality of rolls carried by said frame assembly, at least one of said rolls being movably mounted with respect to said frame assembly; means for mounting said last-mentioned roll on the frame assembly, said means comprising a sub-frame pivotally and slidably connected to the first mentioned frame assembly at one end having its opposite free end adjustable with respect to said first mentioned frame assembly and means for adjusting the free end of the sub-frame comprising connector elements each having an adjustable length and each having one of its ends pivotally connected separately to said first-mentioned frame at the other end of said sub-

frame and the other ends of said connector elements pivotally connected at a common point to said other end of said sub-frame respectively, the axes of said connector elements diverging from said common point of connection on said sub-frame to said separate pivotal connections on said first-mentioned frame.

2. The apparatus as defined in claim 1 wherein said apparatus includes an ink roll, a transfer roll and a printing roll, the first and last mentioned rolls being fixed to the first mentioned frame assembly, the second mentioned roll being mounted on said sub-frame.

3. In an apparatus for printing on moving objects and including a printing cylinder, an inking roll and means for transferring ink from said inking roll to said printing cylinder, a common support for said inking roll and said cylinder, said last mentioned means comprising a pair of frame members, a transfer roll mounted therebetween means for mounting said frame members on said common support for swinging movement relative to said printing roll; adjustment means whereby said transfer roll may be adjusted, said adjustment means comprising a pair of manually-operable connectors each having an adjustable length and each having one of its ends pivotally connected separately to said common support and the other ends of said connector elements pivotally connected at a common point to said frame members, the axes of said connector elements diverging from said common point of connection on said frame members to said separate pivotal connections on said common support.

4. An apparatus for printing on moving webs comprising a main frame assembly, an inking roll carried by said frame assembly, a transfer frame carried by said main frame assembly, said transfer frame including spaced side members each having one end adjustably connected to said main frame assembly and a movable end, an ink transfer roll carried on said transfer frame, means for adjusting each movable end, a printing cylinder assembly including a printing cylinder carried by the main frame assembly, said last-mentioned cylinder being readily removable therefrom, drive means including a pulley associated with each of said printing cylinder, said inking roll and said ink transfer roll, belt means trained over said pulleys and means for driving said printing cylinder whereby rotational movement imparted to said printing cylinder is also imparted to said ink transfer roll and said inking roll such that all of them rotate at the same peripheral speed, said means for adjusting said transfer frame comprising a pair of axially adjustable connectors one end of each of which is pivotally connected to a common point on the transfer frame, the opposite ends being adjustably connected at separated ends to the main frame with the axes of the connectors in diverging relation.

5. An apparatus as defined in claim 4 further including tension control means mounted on said main frame and acting on said belt means.

6. An apparatus as defined in claim 4 wherein said printing cylinder assembly comprises a pair of spaced coaxial shafts supported in said main frame, at least one of said shafts being axially movable toward and away from the opposite shaft, means at the opposing end of each shaft defining a releasable rotation imparting coupling, a central shaft disposed between said spaced shafts and releasably, rotatably coupled thereto, type carrying means fixed to said central shaft and comprising a cylindrical shell and means surrounding said shell for locking type in place thereon.

7. A printing apparatus comprising a main frame assembly including spaced side frame members, an inking roll and a printing roll spaced apart and carried by said side frame members for rotation on generally parallel axes, an intermediately located metering roll disposed between and in contact with the peripheries of said inking and printing rolls, means for driving at least one of said rolls, each of said rolls including shaft means extending outwardly beyond one side frame member, pulley means carried by each of said outwardly extending shaft means, belt means trained over said pulley means whereby the driven roll drives the remainder of the rollers, the ratios of pulley diameters to roll diameters being fixed so that all of said rolls rotate at the same peripheral speed, said driven roll comprising a printing cylinder assembly removably carried by said spaced side frame members and being disengageable from its driving pulley means, said assembly including a pair of spaced coaxial shafts at least one of which is biased and movable axially, a further shaft to which opposing ends of said coaxial shaft are connected in rotatively driving relation, a plurality of end cap members carried by and rotatively engaged with said further shaft and a cylindrical shell disposed between said members, and printing means carried by said shell, the axially movable shaft comprises a central shaft member and a fixed sleeve surrounding said central shaft member, the latter having an axial slot, a key fixed to said sleeve in register with said slot so that the axially movable shaft is axially displaceably relative to said sleeve but rotatably fixed thereto, a spring, one end of which is in abutment with said sleeve surrounding one end of said last-named shaft and the other end of said spring in abutment with locking means on said last-named shaft adjacent printing cylinder assembly, the pulley means of said printing cylinder assembly being fixed to said sleeve.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,364,849 January 23, 1968

Lewis C. Price, Jr.

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

In the heading to the printed specification, lines 4 to 6, for "assignor to Control Print Machinery Manufacturers Corporation, a corporation of New York" read -- assignor, by mesne assignments, to Control Print Corporation, a corporation of New Jersey --; column 4, line 4, for "of", first occurrence, read -- or --; column 6, line 8, for "space" read -- spacer --.

Signed and sealed this 1st day of April 1969.

(SEAL)

Attest:

Edward M. Fletcher, Jr.
Attesting Officer

EDWARD J. BRENNER
Commissioner of Patents