Nov. 25, 1952 F. LEMBO 2,619,033

CYLINDER DRIVE AND ADJUSTING MEANS FOR ROTARY PRINTING MACHINES

Filed Dec. 10, 1949 2 SHEETS—SHEET 1

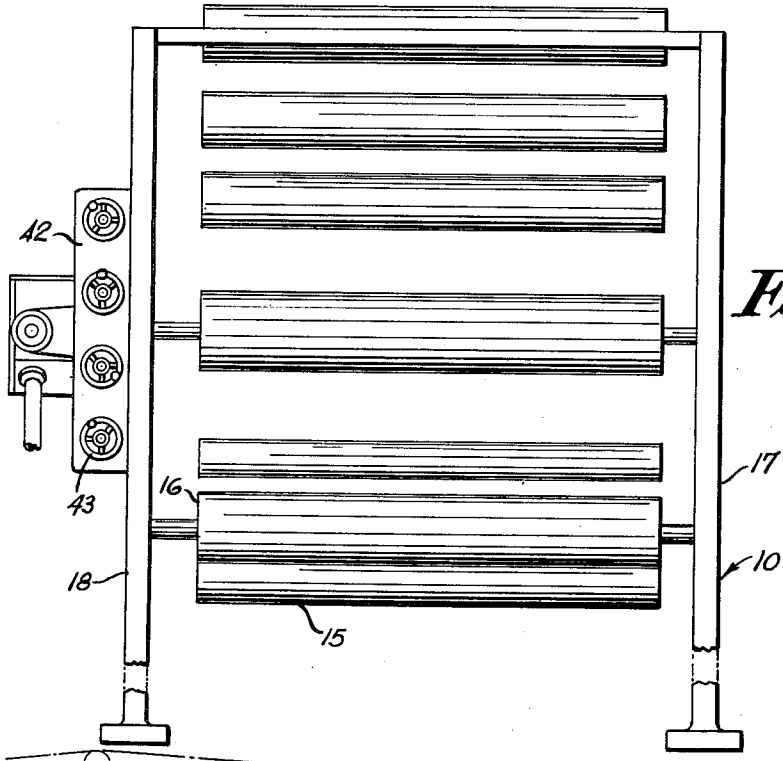


Fig. 1

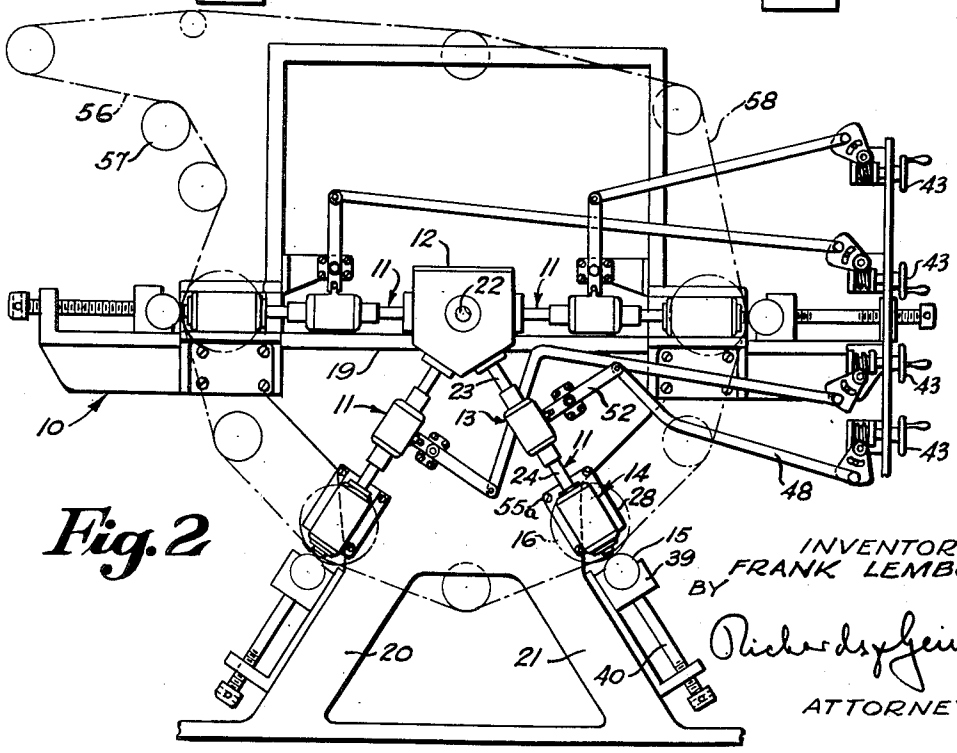


Fig. 2

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Fig. 3

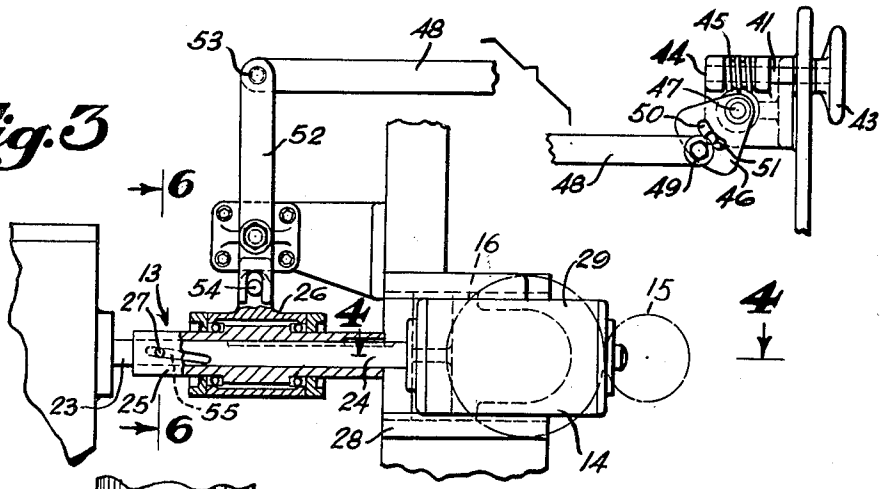


Fig. 4

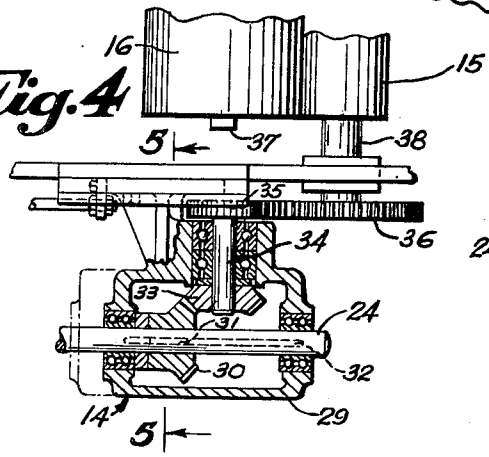
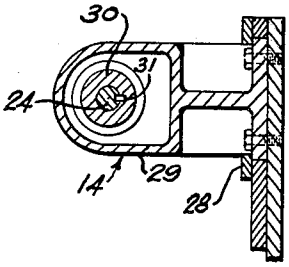


Fig. 5



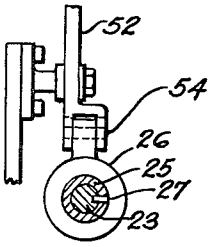


Fig. 6

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CYLINDER DRIVE AND ADJUSTING MEANS FOR ROTARY PRINTING MACHINES

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6 Claims. (Cl. 101—181)

1

This invention relates to a rotary printing machine for intaglio and surface printing and more particularly to a machine for printing multi-color patterns on vinyl plastic film of any gauge or width.

It is an object of the instant invention to provide a multi-color printing machine in which the pattern is maintained in proper registry from one point and more accurately than heretofore possible.

A further object is the creation of a rotary printing machine that is substantially less expensive to build and less hazardous to operate than known types.

Another object is to provide a rotary printing machine in which the driving gears are always in proper mechanical engagement.

An additional object is to so locate the prime mover that very much less floor space is required than in known machines of similar type.

Other objects of the instant invention will become apparent in the course of the following speicfication.

In the attainment of these objectives, each pair of impression cylinders and coacting engraved rollers are rotatably supported between spaced end supports in such a manner as to be situated along the perimeter of a semi-circle. The impression cylinders are rotatably attached in a fixed position along the perimeter while the coacting engraved rollers are rotatably and adjustably attached. A prime mover is mounted between the end supports and furnishes power to the engraved rollers through driven shafts which are both longitudinally and rotatably adjustable. The longitudinal adjustment of each driven shaft permits the use of an engraved roller of any reasonable diameter equipped with any gear and reduces vibration and noise from back lash to a minimum. The rotary adjustment of each driven shaft permits bringing any engraved roller into proper registry from a central point even while the machine is running and results in greater precision of registry than heretofore possible, a substantial saving in time, and a decrease in the hazard of operation.

The invention will appear more clearly from the following detailed description when taken in conjunction with the accompanying drawings showing by way of example a preferred embodiment of the inventive idea.

In the drawings:

Figure 1 is a front elevational view of the multi-color printing machine constructed in accordance with the principles of this invention;

2

Figure 2 is a left side elevational view of the printing machine shown in Figure 1;

Figure 3 is an enlarged detail view of one of the four printing units shown in Figure 2;

Figure 4 is a sectional plan view taken on 4—4 of Figure 3;

Figure 5 is a sectional view along 5—5 of Figure 4; and

Figure 6 is a sectional view along 6—6 of Figure 3.

Referring now in greater detail to the drawings where like reference numerals indicate like parts, reference numeral 10 indicates the frame of the printing device; 11 one of the four similar longitudinally and rotatably adjustable driven shafts; 12 the central gear box for all four driven shafts 11, 13 an adjusting sleeve for each driven shaft 11; 14 a longitudinally sliding gear box for the free end of each driven shaft 11; 15 an engraved roller driven by each shaft 11; and 16 an impression cylinder coacting with each engraved roller 15.

The frame 10 is formed with two spaced parallel vertical end members 17 and 18 tied together in any known manner. In order to have the later described engraved rollers 15 and coacting impression cylinders 16 equally spaced along the periphery of a semi-circle, each end member 17 and 18 may be made with a horizontal member 19 (Fig. 2) supported near the center by the downwardly and outwardly extended members 20 and 21 and so positioned that the center lines of all the subsequently described and radially directed driven shafts 11 supported thereon in any known manner will meet in the center of a semi-circle with the included angles equal to 60° as most clearly seen in Figure 2.

The illustrations show a four-color printing machine. However, the number of radially directed supports for the driven shafts 11 will depend upon the number of colors for which the machine is designed. It should be borne in mind, that subject printing machine can be used only for the maximum or smaller number of colors for which constructed and that there is no provision for increasing the maximum number.

On one of the end members the central gear box 12 is attached as shown in Figure 2. Through the gear box 12 is a rotatably mounted drive shaft 22 perpendicular to the plane of the end members and extended inwardly for any suitable attachment to the rotary shaft of a prime mover (not shown) which is supported as desired between the end members. By this construction, the floor space required for the printing ma-

chine is materially less than that required for known similar machines. Keyed to the drive shaft 22 in the central gear box 12 is a bevel gear (not shown).

Rotatably supported on each of the radially directed members of the frame 10 is the driven shaft 11 constituted of the spaced colinear first segment 23 and second segment 24, the shaft adjusting sleeve 13, and the longitudinally slidable gear box 14.

One end of the first segment 23 (Fig. 2) is rotatably passed through the gear box 12 and on the end of which so inserted is a bevel gear (not shown) in operable engagement with the bevel gear keyed to the drive shaft 22 and previously mentioned. The opposite end of the first segment 23 is inserted through one end of the shaft adjusting sleeve 13 described in the following paragraph.

The shaft adjusting sleeve 13 comprises the tubular member 25 (Fig. 3) which is constricted at both ends relative to an enlarged central portion for the attachment of the housing 26 within which it rotates by virtue of a key 27 one end of which is inserted in a spiral keyway 55 formed in the end of the aforementioned segment 23 and the opposite end in a coacting longitudinal slideway formed in the inner surface of the tubular member 25.

In the opposite end of the tubular member 25 is inserted one end of the second segment 24 which is keyed therein by any known means. The free end of the second segment 24 is rotatably inserted through the longitudinally sliding gear box 14.

The longitudinally sliding gear box 14 is formed with the slideway base 28 (Fig. 3) attached to the radial support in any known manner and a housing 29 designed at the base to move longitudinally in the slideway. Within the housing 29 is a bevel gear 30 keyed to the second segment 24 by a pin 31 the top of which moves longitudinally in a keyway 32 formed in the second segment. By this construction longitudinal movement of the sliding gear box 14 is provided.

As most clearly shown in Figure 4, another bevel gear 33 is in operable engagement with the previously mentioned gear 30 and keyed to a short shaft 34 rotatably passed through the base of the housing 29 and on the free end of which the spur gear 35 is keyed for operable engagement with a spur gear 36 keyed to the shaft of the engraved roller 15 described later.

The similar impression cylinders 16 are rubber covered and of the proper diameter to afford all the necessary cushion needed in printing fine patterns and eliminate the need for costly cloth lapping used for padding and which must be changed frequently. The shaft 37 of the impression cylinder 16 is rotatably passed between corresponding radially directed members of the frame 10 at a position along the periphery of the semi-circle as previously mentioned. Around each of the impression cylinders 16 is a rubber printing blanket 58 (Fig. 2) in the form of an endless belt. Since the position of the cylinders 16 is fixed, the tension of the blanket 58 never requires adjustment and is used only to protect the neoprene rubber covered cylinders 16 from damage by the solvents used in vinyl printing and not for additional padding.

Since the engraved roller 15 may be of any reasonable diameter, it is rotatably mounted between corresponding radially directed members or supports of the frame 10 with the shaft 38 (Fig. 4) thereof extended on the side of the sliding gear box 14 (Fig. 4) for the attachment of the spur gear 36 which rotates therewith. Any suitable blocks 39 adjustable on the frame by the action of the screws 40 may be used for bringing the engraved roller 15 into frictional engagement with the coacting impression cylinder 16. The gear 36 of any diameter is brought into operable engagement with the spur gear 35 by moving the sliding gear box 14 longitudinally in the slideway 28 until the gears mesh in a proper mechanical manner. Of course, any known means may be provided for releasably securing the sliding gear box 14 in the desired position.

The proper registering of the engraved roller 15 during the printing process is accomplished by imparting a longitudinal movement to the shaft adjusting sleeve 13 from a central position in the front of the machine in the following manner: A shaft 41 (Fig. 3) is rotatably passed through a plate 42 (Fig. 1) attached to the frame 10 at the front of the machine in any known manner. On the outwardly extended portion of the shaft 41 of a wheel or handle member 43 is keyed in a known manner. At the back, the shaft 41 is rotatably supported by any suitable bearing 44 the bottom of which is attached to the frame 10 by any suitable means. Intermediate the rotary supports of the shaft 39 is a worm 45. Coacting with the worm 45 is a lever 46 attached to the frame 10 by the pivot pin 47. At the opposite end of the lever 46 is a link 48 attached thereto by any pivotal connector 49. Intermediate the pivotal points 47 and 49 is a closed slot 50 on radii having the pivotal point 47 as a center and through which the guide pin 51 is passed, one end of which is attached to the frame 10. The link 48 is attached to a second lever member 52 at the top by the pivot pin 53. The bottom of the second lever member 52 is forked as shown in Figure 3 for operable engagement with a pin 54 attached in any manner to the top of the enlarged portion of the housing 26 of the shaft adjusting sleeve 13 and previously mentioned. In this way, a movement in either direction of the wheel 43 will cause the housing 26 to move longitudinally whereupon the pin 27 with the top in a longitudinal slideway in the tubular member 25 and the bottom in the spiral keyway 55 in the first segment 23 will cause the second segment 24 to rotate relative to the first segment 23 and transfer that motion to the engraved roller 15 through the previously described shafts and gears.

The operation with the multi-color printing machine is as follows:

Suppose it is desired to print a four-color design on vinyl or other material, the four colors being the maximum number of colors provided for in the described machine and the inking for which is applied in a known manner. The engraved rollers 15 of any reasonable diameter are prepared in the usual manner. At the top of the shaft 38 of each roller 15, a spur gear 36 is attached in such a manner as to rotate therewith. Assume, that the gear 36 is of different diameter than the similar gear used in the previous operation of the machine so that it will be necessary to move the slidable gear box 14 in order to bring the spur gear 35 thereof into proper engagement with the gear 36. After the rotatable mounting of the rollers 15 in the blocks 39 and adjustment by the screws 40 until there is frictional engagement between the engraved roller 15 and impression cylinder 16, some of the

shifting for the proper engagement of the gears may be attained by loosening the bolts and nuts 55a (Fig. 2) which attach the base of the gear box 14 to the frame 10 when the openings through the frame 10 and through which the bolts are passed have been suitably formed. The remainder of the movement of the gear box 14 is attained by sliding the same inwardly or outwardly in the slideway base until the gear 35 is in proper mechanical engagement with the gear 36. Of course, the gear box 14 may be locked in the selected position in any suitable manner. During the longitudinal shifting of the gear box 14, the second segment 24 remains unchanged in position due to the movement of the pin 31 along the longitudinal slideway 32.

With each of the engraved rollers 15 installed in a similar manner, the material (not shown) may be fed into the machine at the position 56 (Fig. 2) and over the guide roller 57 against the rubber blanket 58 and thence around the perimeter of the semi-circle and between each of the coacting engraved rollers 15 and compression cylinders 16. Whereupon, the machine is ready for printing.

However, it may be found that the engraved roller having the reference numeral 15 in Figure 2 is not registering properly and that it will be necessary to revolve that roller clockwise or counterclockwise to bring it into proper registry with the other engraved rollers. By rotating the wheel 43 in the proper direction, the link 48 actuating the lever 52 will cause the tube 25 to move forwardly or rearwardly, as the case may be, and impart a rotary motion thereto by the action of the pin 27 having one end in the spiral slideway 55 and the opposite end in the coacting longitudinal slideway in the tube. The second segment 24 being keyed to the tube 25 will also rotate and impart that rotation to the gear 36 of the engraved roller 15 in the manner previously explained until the impression picked up from the roller 15 is in proper registry with the impressions from the other rollers. Of course, all the other rollers 15 may be adjusted in the same manner from one position in front of the machine and even with the machine running at full speed.

It will be understood that the invention is not limited to the exact disclosure herein described but may lend itself to a variety of expressions within the scope of the appended claims.

What is claimed is:

1. In a multi-color rotary printing machine having an engraved roller and a coacting impression cylinder for each color; the improvements comprising spaced parallel end members, means for rotatably mounting the impression cylinders between the end members in spaced semi-circular formation, means for rotatably mounting an engraved roller between the end members in frictional engagement with each impression cylinder, a driven shaft radially disposed from the center of the semi-circular formation and extending to each engraved roller, each driven shaft comprising first and second spaced colinear segments, the first of said segments extending from said center and the second extending from said engraved roller, means between said spaced segments for connecting both said segments for conjoint rotation, said means including means for rotating the said second segment relative to said first segment, and a drive shaft for the driven shafts rotatably disposed at said center.

2. A multi-color rotary printing machine comprising two upright end members in spaced parallel arrangement, a plurality of engraved rollers rotatably mounted intermediate the end members in spaced horizontal arrangement around circular arcs, an impression roller in frictional engagement with each engraved roller rotatably mounted intermediate the end members, a drive shaft rotatably disposed intermediate the centers of the circular arcs, a driven shaft radially disposed from one end of the drive shaft to each engraved roller, each driven shaft comprising first and second spaced colinear segments, one of said segments extending from one end of the drive shaft and the second of said segments from said engraved roller, gear means intermediate the drive shaft and the driven shafts for the simultaneous rotation of said driven shafts, a gear train slidably disposed on each second segment in operable engagement with the engraved roller, and means intermediate the first and second segments for the conjoint rotation of said segments and for the rotation of the second segment relative to the first segment.

3. A multi-color rotary printing machine comprising in combination two vertically spaced end members, an engraved roller for each color, an impression cylinder coacting with each engraved roller, a shaft for each roller and cylinder, means for rotatably supporting the shafts of each pair of coacting rollers and cylinders in the end members in horizontal planes and in spaced arrangement around the arcs of a circle, the shafts of the engraved rollers protruding through one of the end members, and a gear keyed to the protruding end of each shaft, a drive shaft rotatably disposed intermediate the end members at the centers of the arcs, one end of the drive shaft protruding through the end member on the side of the protruding ends of the shafts of the engraved rollers, and means for rotating the drive shaft; the machine further comprising a driven shaft radially disposed from and in operable engagement with the protruding end of the drive shaft and extending to each engraved roller, each driven shaft comprising first and second spaced colinear segments, the first segment extending from the protruding end of the drive shaft and the second of said segments extending from the engraved roller, means intermediate the spaced segments for the conjoint rotation of each of said segments and for rotating each second segment relative to the first segment and a gear train slidably disposed on each second segment, said gear train being adapted to be brought into operable engagement with the gear of the engraved roller.

4. A multi-color rotary printing machine according to claim 3 in which the gear train slidably disposed on each second segment, comprises a bevel gear longitudinally slidable along the second segment and rotating therewith, a housing disposed around the bevel gear with the second segment rotatable therein, the housing having a slide formed along the bottom surface thereof, means for adjustably attaching the slide to the end member with the center lines of the slide and the first and second segments parallel, a second bevel gear for the housing in operable engagement with the first mentioned bevel gear, a short shaft for the second mentioned bevel gear rotatably disposed through the housing parallel to the shaft of the engraved roller and spaced therefrom, means for keying the second mentioned bevel gear to the short shaft, the short shaft protruding through the housing on the side

of the gear of the engraved roller, and a spur gear keyed to the protruding end of the short shaft in operable engagement with the gear of the engraved roller.

5. A multi-color rotary printing machine according to claim 3 in which the means intermediate the spaced segments for the conjoint rotation of each of said segments and for rotating each second segment relative to the first segment comprises a shaft adjusting sleeve for the spaced ends of the segments, the sleeve comprising a tubular member constricted at both ends to define an enlarged central portion, the spaced end of the first segment being fitted into one end of the tubular member, said first segment having a spiral keyway formed therein and the inner surface of the tubular member having a coacting longitudinal keyway formed therein, a key coacting with the keyways, means for keying the spaced end of the second segment in the free end of the tubular member, a housing for the tubular member and coacting with the enlarged central portion thereof, and means for the longitudinal movement of the housing from a central point, said means comprising a shaft rotatably disposed on the machine, a handle member keyed to one end of the shaft, the opposite end of the shaft having a worm gear formed thereon, a lever pivotally disposed on the machine, one end of said lever being in operable engagement with the worm, a second lever pivotally disposed intermediate the ends thereof on the machine, means for pivotally securing one end of the second lever to the housing of the tubular member, and a link pivotally disposed intermediate the free ends of the first and second mentioned levers.

6. A multi-color rotary printing machine according to claim 3 in which the means perpendicular to the plane of the end member on the side of the gears of the inner segments and adjacent the common center for imparting rotary motion simultaneously in the same direction to said gear comprises a drive shaft rotatably disposed intermediate the end members and perpendicular thereto at the common centers, one end of the drive shaft protruding beyond the end member on the side of the gears on the inner segments of the driven shafts, a gear keyed to the drive shaft in operable engagement with the gears of the driven shafts, and means for rotating the drive shaft.

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