

June 20, 1939.

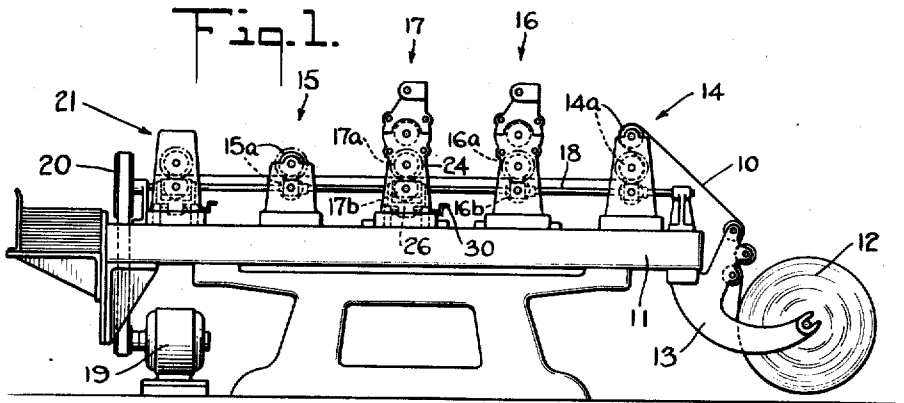
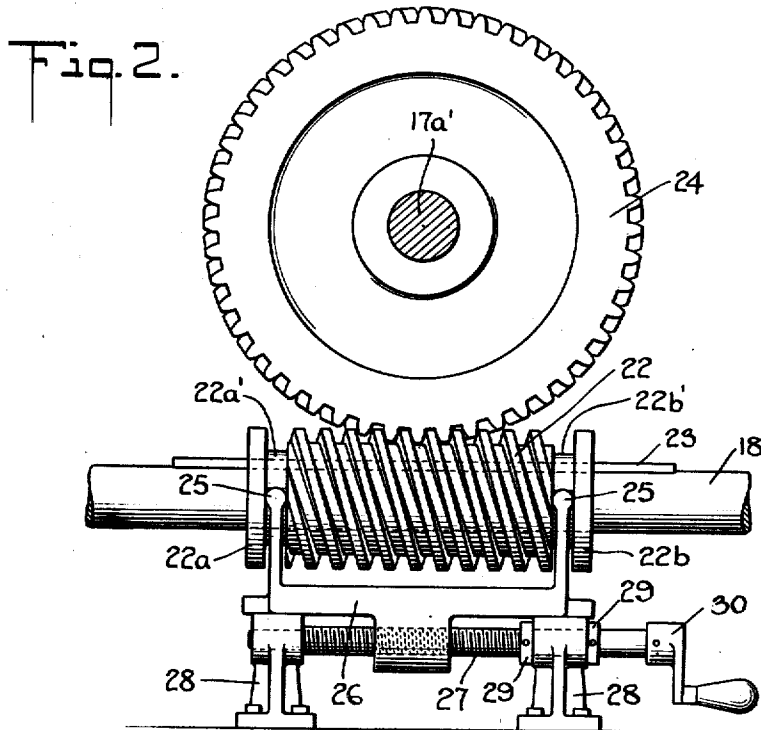
W. F. GRUPE

2,163,035

APPARATUS FOR EFFECTING REGISTER OF MULTIPLE OPERATIONS

Filed July 7, 1936

2 Sheets-Sheet 1



INVENTOR,

William F. Grupe

BY *Henry J. Lucke*
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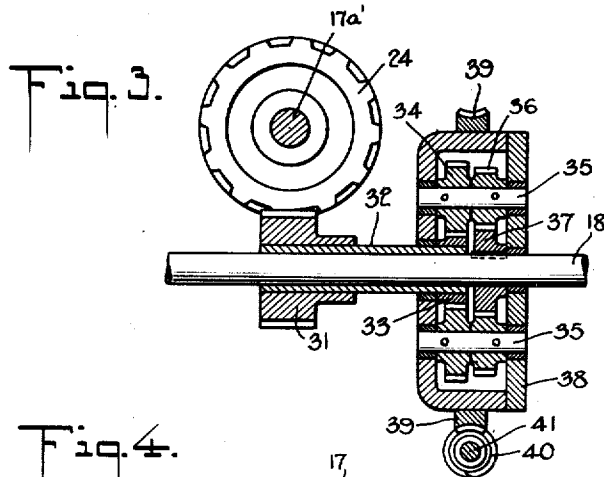
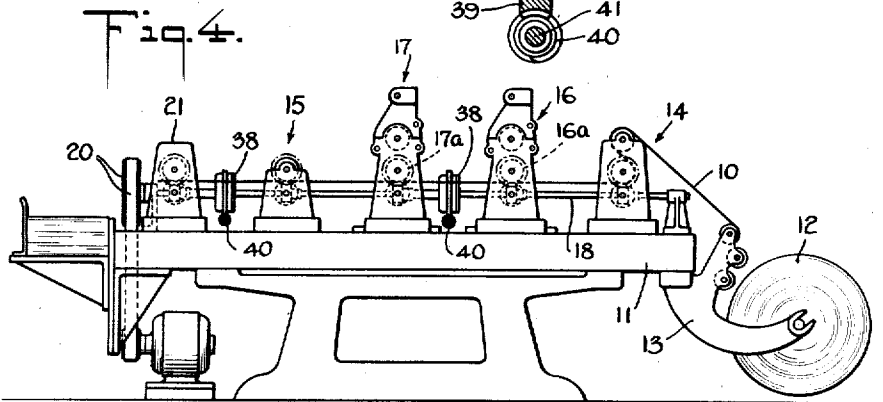
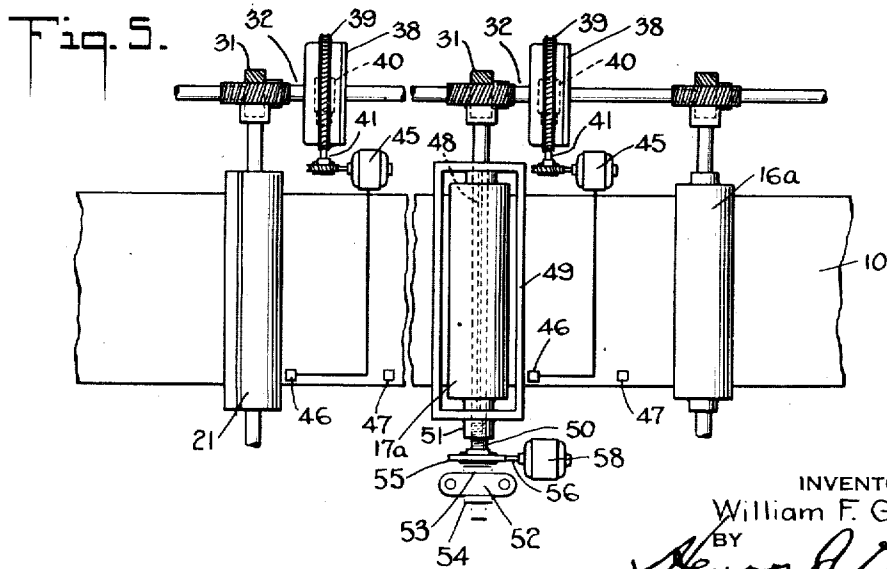
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APPARATUS FOR EFFECTING REGISTER OF MULTIPLE OPERATIONS

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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

2,163,035

APPARATUS FOR EFFECTING REGISTER OF
MULTIPLE OPERATIONSWilliam F. Grupe, Lyndhurst, N. J., assignor to
Chambon Corporation, Garfield, N. J., a corporation of New York

Application July 7, 1936, Serial No. 89,301

10 Claims. (Cl. 101—248)

My present invention relates to apparatus for effecting the register of multiple operations upon a moving web.

In general, my invention is applicable to a moving web subjected to printing or other desired operations, such as severing transversely or longitudinally, and/or scoring, perforating, embossing, die cutting and/or like or other mechanical operations.

Under such treatment, a web of sheet material such as paper, cellulose film, metallic foil, such as tin foil, aluminum foil and the like, etc., usually varies in length while passing through such operation, due to atmospheric and other effects upon the web and/or mechanical irregularities.

Accordingly, to effect proper register of a second and/or succeeding printing impression, frequently of different color and to effect proper register of transverse severing, scoring, perforating, embossing and/or die cutting, it is desirable to control the second and succeeding impression and/or mechanical treatment in relation to the first impression.

Most desirably, such control is effected while the web is in motion through the printing and/or other mechanical operation effecting means.

In general, my invention is preferably carried out by positively driving the respective two or more printing units and/or mechanical devices coordinated therewith by a common driving means and by providing suitable means such as a worm, adjustable in relation to the common driving means, individually for the respective second and succeeding printing units and/or other mechanical operation effecting means succeeding the first printing unit.

In the more preferred types of my invention, a "target" is employed, which may be in the form of a mark applied to the printed face of the web or a selected part of the printed matter, or a perforation or the like applied to the web, as an aid in effecting register.

In the most preferred forms of my invention, assuming the "target" to be applied simultaneously with the first operation, and the employment of a photo-electric or other responsive device, upon longitudinal variation of the web relative to the stated succeeding operations, caused by atmospheric or other effects upon the web, the register of the second printing unit and/or other mechanical operation effecting device subsequent to the first printing unit is controlled relative to the first operation.

Further features and objects of the invention will be more fully understood from the following

detail description and the accompanying drawings, in which

Fig. 1 is a side elevation, largely diagrammatic, illustrating the application of my invention to a multiple printing machine, the registering mechanism indicated therein being of the manually controlled type.

Fig. 2 is a detail view, in elevation of an adjustable driving connection between a main drive shaft and a printing unit or other mechanical operation effecting device operable pursuant to my invention.

Fig. 3 is a detail central sectional view of another form of adjustable driving connection, operable pursuant to my invention.

Fig. 4 is a side elevation of another embodiment of my invention, illustrating the employment of the adjustable driving connection shown in Fig. 3.

Fig. 5 is a detail top plan view, largely diagrammatic, illustrating the principle of operation of the control individually of several operating units, such as a second printing and transverse severing device, respectively responsive to a photo-electric device, electric contact device or equivalent.

Referring to the drawings, illustrating a web 10 of paper, cellulose film, metallic foil, etc., subjected to multiple printing impressions and coordinated mechanical operation such as transverse slitting, perforating, scoring, embossing, die cutting or the like, I have indicated in Fig. 1 a bed 11, serving advantageously for the common support of such multiple printing and other mechanical operation effecting devices. The web 10 is desirably supplied from a roll 12, which may be rotatably supported in any suitable manner, as by means of the indicated bracket 13.

Preferably, as is indicated in Fig. 1, the web 10 is fed to the respective printing and/or other mechanical operation effecting units by means of a suitable feed unit such as is indicated at 14, comprising essentially a set of rolls 14a, 14a, for positively feeding the web 10 from such roll 12 or equivalent supply. Preferably, also, the web 10 after treatment is positively pulled by a suitable pull unit such as indicated at 15, comprising essentially a pair of rolls 15a, 15a, between which the web is positively passed.

As above indicated, such feed unit 14 and pull unit 15 is positively driven in coordination with the operation of the printing units and severing unit and similarly with additional printing units and/or mechanical operation effecting device, as appears more particularly hereinafter.

In Fig. 1 the first printing unit is indicated at 16, which may be of conventional or other approved construction. Its printing cylinder is indicated at 16a and its impression cylinder at 16b, between which the web 10 is passed. The second printing unit is indicated at 17, and with respect to its printing mechanism per se may be of conventional or of other approved construction. Its printing cylinder is indicated at 17a and its impression cylinder at 17b. At 21 is shown a transverse severing device.

As above indicated, and as illustrated in Fig. 1, the above stated mechanisms are positively driven by a main drive shaft 18, which for illustrative purposes may be driven by an electric motor 19, mechanically coupled with the main drive shaft 18 by any suitable means, such as a belt and pulley 20, the latter secured to the main drive shaft 18.

Pursuant to my invention, the printing cylinder 17a of the second printing unit 17, is connected by suitable adjustable means with the main drive shaft 18, whereby the effective movement of the printing cylinder 17a may be coordinated with the impression upon the web 10, effected by the first printing unit 16.

As one form of such adjustable connection I illustrate in Fig. 2 a worm 22 mounted on and positively driven by the main shaft 18 through the feather 23 and axially adjustable relative to the main shaft 18 by suitable means affording said axial adjustment while maintaining mesh of the convolutions of the worm relative to the teeth of the worm gear 24, which is rigidly secured to the shaft 17a' of the printing cylinder 17a.

Such axial adjustment of such worm 22 may be had by any suitable means. As one form of said adjustment means I have shown the worm 22 provided with recessed terminal portions 22a, 22b, the respective recesses being indicated at 22a' and 22b', in which are respectively received the forks 25, 25, projecting from and secured to a yoke 26, in turn suitably adjustable longitudinally of the bed 11, as by means of a screw 27, rotatably mounted in suitable brackets 28, 28, with suitable means such as thrust collars 29, 29, for precluding axial displacement of the screw 27. The setting of such screw 27 may be effected by any suitable means. In Fig. 2, as is also indicated in Fig. 1, I have shown a crank 30, as indicative of suitable means for operating the screw 27. The screw 27 may, as preferred, be operated either manually or by means of a suitable motor or other power means.

Accordingly, by rotation of the main shaft 18, the worm 22 is positively driven through the feather 23, in turn driving the worm gear 24 and the printing cylinder 17a at a predetermined surface speed. The rotation of the adjustment screw 27 causes a displacement of the yoke 26, which in turn displaces axially the worm 22, thus imparting an additive or subtractive increment to the movement of the worm gear 24, relative to its rotation by the main shaft 18.

In operation, the feed rolls 14a, 14a, of the feed unit 14, the printing cylinder 16a and its impression cylinder 16b of the first printing unit, the printing cylinder 17a and its impression cylinder 17b of the second printing unit and the rolls 15a, 15a, of the pull unit 15 are positively driven by the common driving means, such as the main drive shaft 18, to attain identical surface speed. The mechanical operation effecting means, such as the transverse severing means 21, is likewise

driven in synchronism with such predetermined surface speed. Under the condition of stretching on contraction of the web, during the transit of the web through the stated mechanism, registration of the second printing unit, and similarly registration of any succeeding printing unit and of the transverse severing means 21 and/or other mechanical operation effecting means, is had by proper adjustment of the respective individual driving means of the character shown in Fig. 2.

In the arrangement shown in Fig. 3 the printing cylinder 17a of the printing unit 17, is driven by the worm gear 24, which meshes with the worm 31, secured to a collar 32, embracing and supported by the shaft 18, but rotatable relative thereto, and driven by pinion 33. Pinion 33 is driven by pinion 34 which may be secured through a freely rotating shaft 35 to the pinion 36, pinions 34 and 36 being of different pitch diameters. Pinion 36 is driven by pinion 37, secured to the main drive shaft 18. Desirably, two or more sets of pinions 34, 36, with their associated shafts 35, may be symmetrically arranged in planetary relationship to the shaft 18. Such one or more shafts 35 are freely rotatively mounted in the housing 38, to which is suitably attached the worm wheel 39 meshing with the worm 40, secured to the regulating shaft 41.

Under the stage of drive of the main drive shaft 18, assuming the housing 38 at a set, i. e., stationary position, the stated gearing effects the drive of the printing cylinder 17a at the predetermined surface speed. Additive or subtractive increments of motion of the printing cylinder 17a are obtained by rotation of the housing 38, by suitable movement of the regulating shaft 41, which may be actuated manually, or by motor or other suitable power means.

Fig. 4 illustrates the employment of the form of my invention shown in Fig. 3, applied to a second printing unit, i. e. the printing unit 17, and transverse severing device 21, like reference characters indicating corresponding parts shown in Fig. 3 and Fig. 1.

Fig. 5 illustrates diagrammatically the application of the form of my invention illustrated in Fig. 3, to the regulation of a printing cylinder 17a and also a transverse severing device 21, the registration being controlled by motors 45, suitably connected to the regulating shafts 41, individually for the respective printing or mechanical operation effecting devices, such motors 45 being selectively actuated by suitable "target" responsive means indicated diagrammatically at 46, 46, such "target" responsive means being disposed in the normal path of the "targets" 47 applied to the web 10 by any suitable means such as the first printing cylinder 16a.

It will be noted that printing cylinder 17a is mounted on shaft 17a' through a feather 48, so that said printing cylinder 17a may be axially displaced relative to its shaft 17a'. A yoke 49, in which the shaft 17a' is rotatively mounted, which bears respectively against the opposite ends of the printing cylinder 17a, is maintained or adjusted in lateral position by the screw 50, which engages suitably threaded end 51 of the yoke 49. Said screw 50 is rotatably supported in the bracket 52, secured to the bed 11 of the press. Axial movement of the screw 50 is prevented by the thrust collars 53, 54. The rotation of the screw 50 may be had by any suitable means, such as by means of a worm wheel 55, suitably driven by a worm or equivalent attached to a regulatory shaft 56, which may be controlled manually or by motor

or other suitable power means. In this manner, corrections in lateral registration may be effected, though this mechanism forms no part of my present invention.

Under certain circumstances, if desired as in a printing machine embodying two printing devices or a single mechanical operation effecting device succeeding a single printing device, my arrangement for effecting registration of such two devices may be applied to the first printing device.

Whereas I have described my invention by reference to specific forms thereof, it will be understood that many changes and modifications may be made without departing from the spirit of the invention.

I claim:

1. Apparatus for effecting the register of successive operations upon a longitudinally traveling web, comprising a plurality of rotatable devices arranged successively longitudinally of the web for operation thereon; a drive shaft extending longitudinally of the web and interconnecting in drive relation with the first of said rotatable devices; and respective adjustable means interconnecting the said drive shaft in drive relation with each rotatable device subsequent to the first, said adjustable means comprising a drive gear in mesh with a gear adapted to rotate the particular rotatable device concerned, said drive gear being mounted on said drive shaft with its rotative axis in common therewith, said drive gear, further, being mounted on said drive shaft for free movement relative to said drive shaft at a speed different than the speed of rotation of said drive shaft.

2. Apparatus for effecting the register of successive operations upon a longitudinally traveling web, comprising a plurality of rotatable devices arranged successively longitudinally of the web for operation thereon, each being provided with an actuating worm gear; a drive shaft extending longitudinally of the web and interconnecting in drive relation with the first of said rotatable devices; and respective adjustable means interconnecting the said drive shaft in drive relation with each rotatable device subsequent to the first, said adjustable means comprising a worm coaxially keyed to said drive shaft for limited sliding movement therealong, said worm being in mesh with the said worm gear of its corresponding rotatable device, and means adapted for actuation independently of said drive shaft for effecting said sliding movement of the worm relative to the drive shaft.

3. A variable drive for a rotatable element, comprising a drive shaft adapted to rotate at constant speed, a rotatable drive member mounted coaxially with said drive shaft for rotation in synchronism therewith and for controlled movement out of synchronism therewith, means interconnecting said rotatable element and said rotatable drive member in drive relationship, and means adapted to be driven independently of said drive shaft for actuating the said rotatable drive member in its said movement out of synchronism with said drive shaft.

4. A variable drive for a rotatable element, comprising a drive shaft adapted to rotate at constant speed, a worm gear adapted to actuate said rotatable element, a worm coaxially keyed to said drive shaft for limited sliding movement thereon parallel with its axis of rotation, said worm being in mesh with said worm gear, and means adapted to be actuated independently

of said drive shaft for effecting said sliding movement of the worm relative to the drive shaft.

5. The combination with a printing machine adapted to operate on a moving web and including a printing unit and a device operative on the web subsequently thereto, of a drive shaft extending longitudinally along the path of travel of said web for driving said printing unit and said device, and means operatively disposed intermediate said device and said drive shaft for affording additive or subtractive increments of movement of said device relative to said drive shaft, and means responsive to a target carried by said web for initiating operation of said intermediate means.

6. The combination with a printing machine adapted to operate successively on a target bearing web, said machine embodying a printing unit, a device operative on the web subsequently thereto, and means for feeding the target bearing web through the machine, of a drive shaft extending longitudinally along the path of travel of said web for driving said printing unit and said device, means operatively disposed intermediate said device and said drive shaft for affording additive or subtractive increments of movement of said device relative to said drive shaft, and means responsive to said target for initiating operation of said intermediate means, said intermediate means comprising worm means and a thereto meshing worm wheel.

7. The combination with a printing machine adapted to operate on a moving web and including a printing unit and a device operative on the web subsequently thereto, of a drive shaft extending longitudinally along the path of travel of said web for driving said printing unit and said device, means operatively disposed intermediate said device and said drive shaft for affording additive or subtractive increments of movement of said device relative to said drive shaft, and means responsive to a target carried by said web for initiating operation of said intermediate means, said intermediate means comprising worm means adjustably related to said drive shaft.

8. The combination with a printing machine adapted to operate on a moving web and including a printing unit adapted to apply a target to the web, a device operative on the web subsequently thereto, and means for feeding said web into the machine, of a drive shaft extending longitudinally along the path of travel of said web for driving said printing unit and said device; means operatively disposed intermediate said device and said drive shaft for affording additive or subtractive increments of movement of said device relative to said drive shaft, said means comprising worm means adjustably related to said drive shaft, and a worm wheel meshing with said worm means and associated with said device for driving the same; and means responsive to said target for initiating operation of said intermediate means.

9. The combination with a printing machine adapted to operate on a moving web and including first and second printing units, of a drive shaft extending longitudinally along the path of travel of the web for driving said first and second printing units, means operatively disposed intermediate said second printing unit and said drive shaft for producing additive or subtractive increments of movement of said second printing unit relative to said drive shaft, and means responsive to a target carried by said web for initiating operation of said intermediate means.

10. The combination with a first printing unit adapted to print a target on a moving web and a second printing unit including a printing cylinder for operating on said web, of a drive shaft extending longitudinally along the path of travel of the web for driving said first and second printing units, means operatively disposed intermediate

said second printing unit and said drive shaft for producing additive or subtractive increments of movement of said printing cylinder relative to said drive shaft, and means responsive to said target for initiating operation of said intermediate means.

WILLIAM F. GRUPE.

DISCLAIMER

2,163,035.—*William F. Grupe*, Lyndhurst, N. J. APPARATUS FOR EFFECTING REGISTER OF MULTIPLE OPERATIONS. Patent dated June 20, 1939. Disclaimer filed December 7, 1940, by the assignee, *Champlain Corporation*.

Hereby enters this disclaimer to claims 2 and 4 of said Letters Patent.

[*Official Gazette January 7, 1941.*]

10. The combination with a first printing unit adapted to print a target on a moving web and a second printing unit including a printing cylinder for operating on said web, of a drive shaft extending longitudinally along the path of travel of the web for driving said first and second printing units, means operatively disposed intermediate

said second printing unit and said drive shaft for producing additive or subtractive increments of movement of said printing cylinder relative to said drive shaft, and means responsive to said target for initiating operation of said intermediate means.

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