July 26, 1960 C. A. HARLESS ET AL 2,946,230

REVERSING GEAR DRIVES FOR PRINTING MACHINES

Filed Feb. 19, 1957 3 Sheets-Sheet 1

FIG. 1.

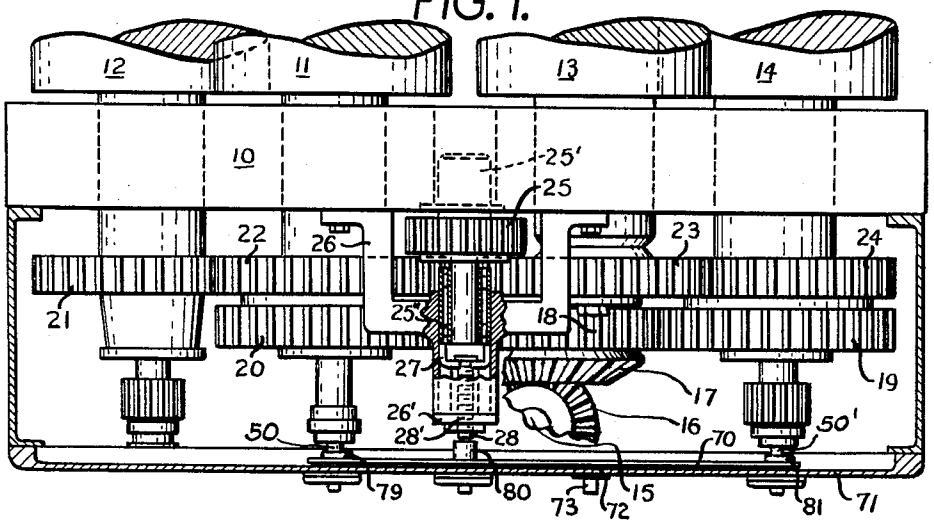


FIG. 2.

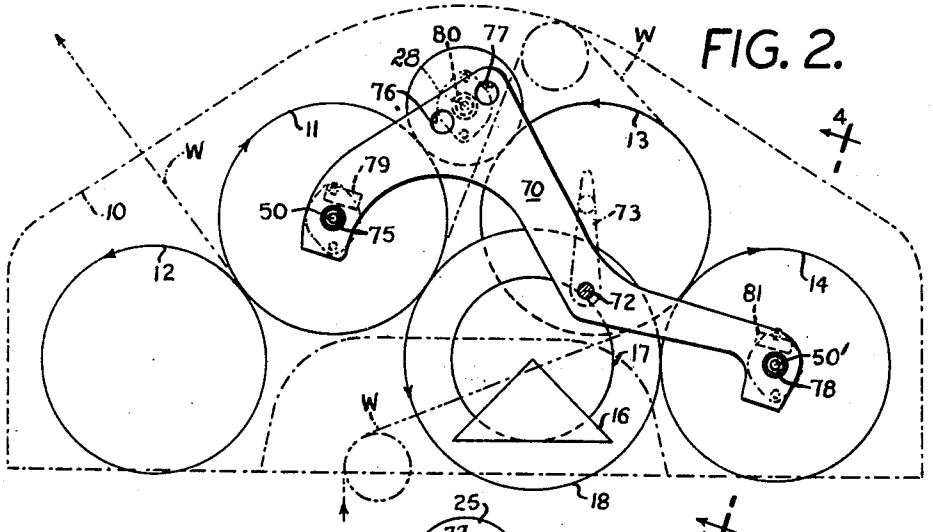
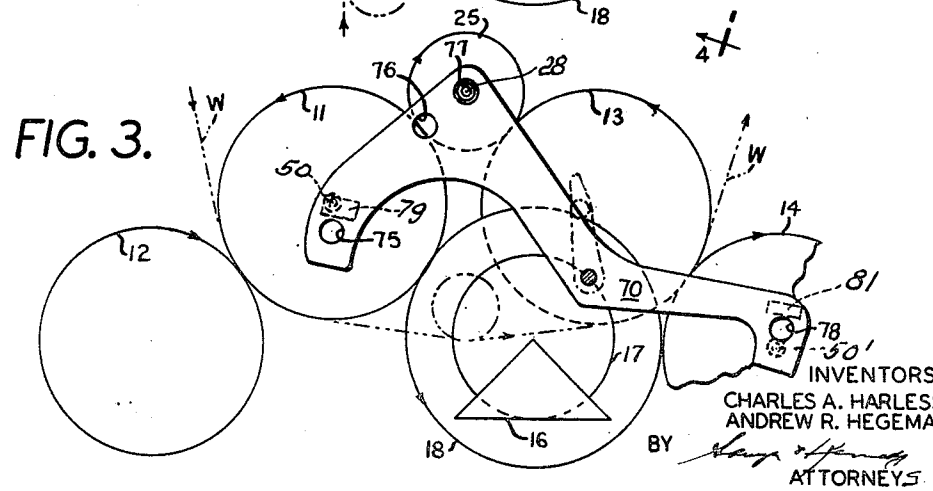


FIG. 3.



INVENTORS
CHARLES A. HARLESS
ANDREW R. HEGEMAN
BY
ATTORNEYS

July 26, 1960 C. A. HARLESS ET AL 2,946,230

REVERSING GEAR DRIVES FOR PRINTING MACHINES

Filed Feb. 19, 1957 3 Sheets-Sheet 2

FIG. 3A.

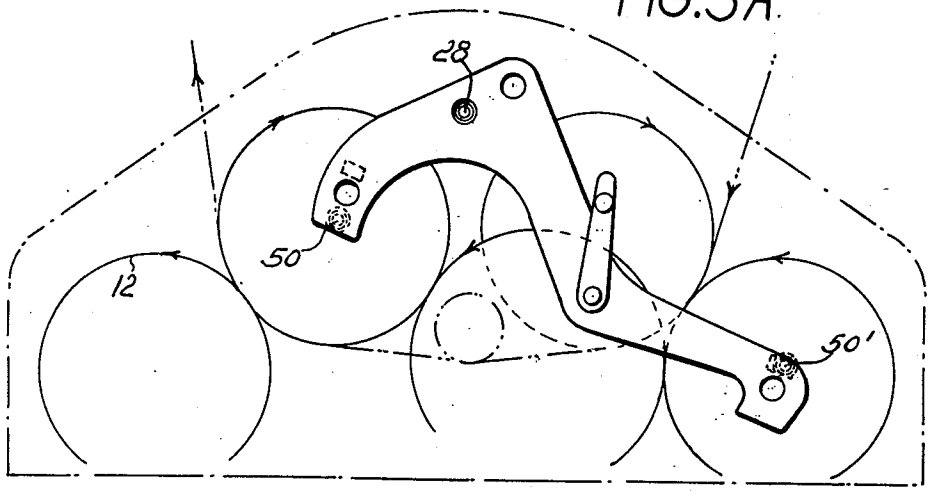
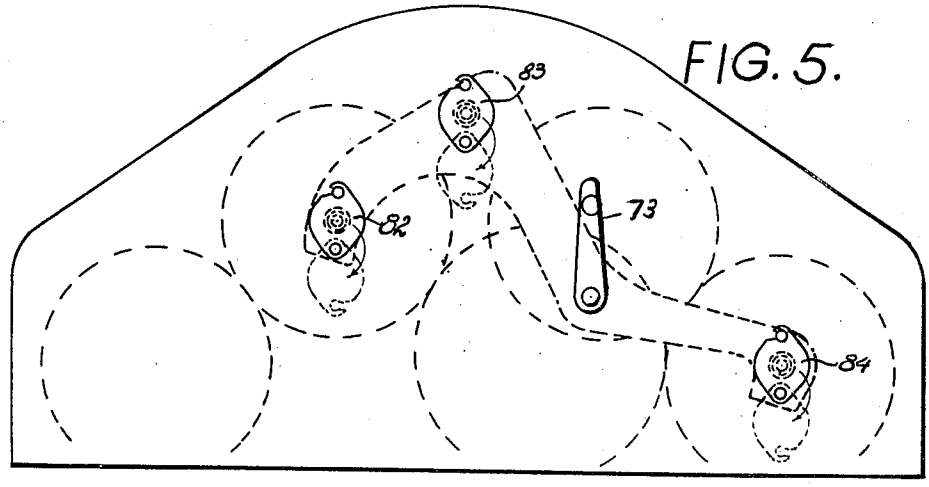


FIG. 5.



INVENTORS
CHARLES A. HARLESS
ANDREW R. HEGEMAN
BY
ATTORNEYS

July 26, 1960 C. A. HARLESS ET AL 2,946,230

REVERSING GEAR DRIVES FOR PRINTING MACHINES

Filed Feb. 19, 1957 3 Sheets-Sheet 3

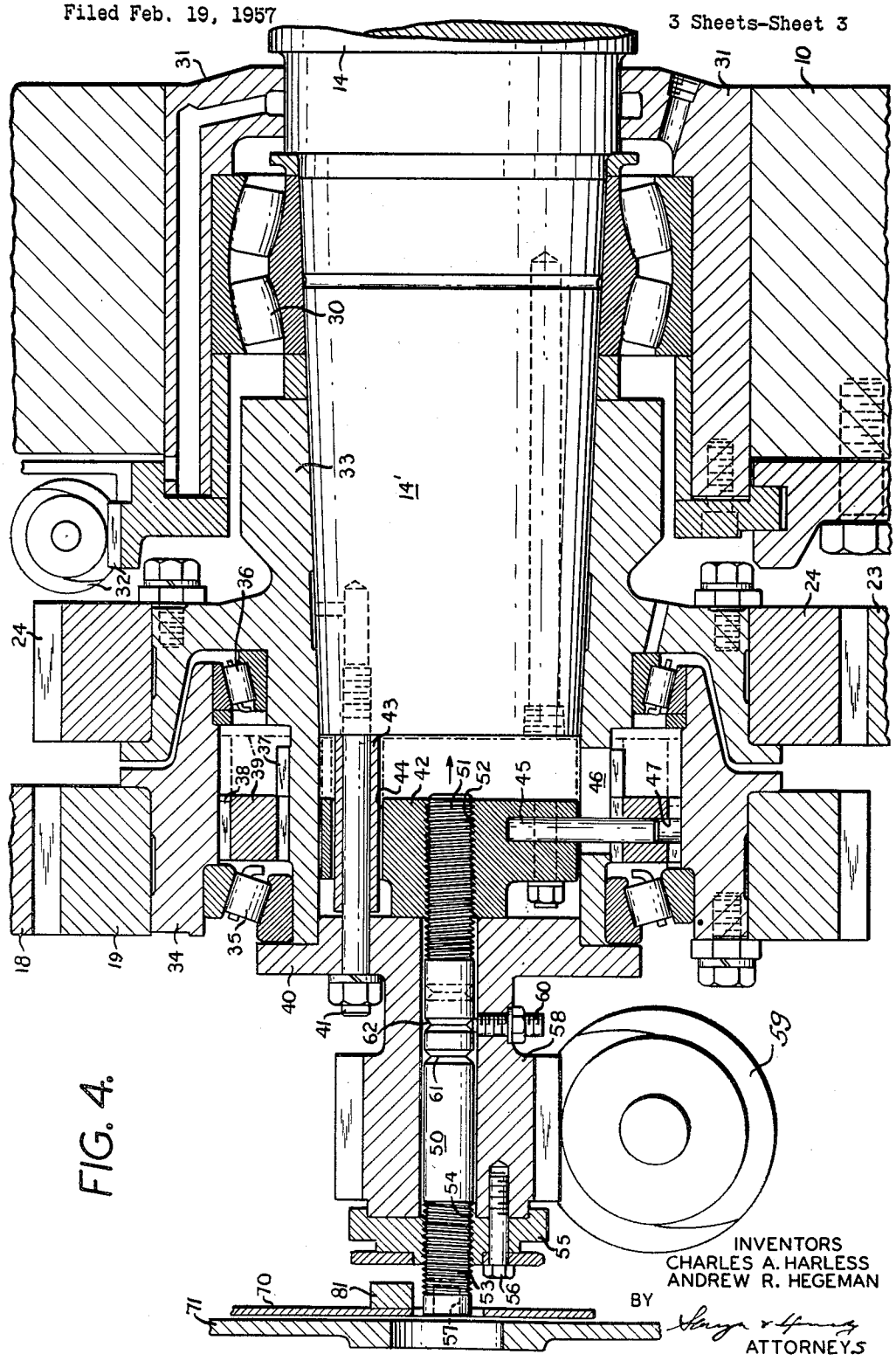


FIG. 4.

INVENTORS
CHARLES A. HARLESS
ANDREW R. HEGEMAN

BY

ATTORNEYS

United States Patent Office 2,946,230 Patented July 26, 1960

2,946,230

REVERSING GEAR DRIVES FOR PRINTING MACHINES

Charles A. Harless, Riverside, Conn., and Andrew R. Hegeman, Yonkers, N.Y., assignors to R. Hoe & Co., Inc., a corporation of New York

Filed Feb. 19, 1957, Ser. No. 641,126

10 Claims. (Cl. 74—361)

This invention relates to reversing gear drives for printing machines, and more particularly to such drives for use in printing units incorporating two printing couples.

In such printing units, frequently known as "arch" type units, reversing may be accomplished by the use of axially movable intermediate gears and by the use of gears rotatably mounted on the cylinder shafts together with means for engaging and disengaging them with the shafts.

It is one object to provide an improved mechanism for thus mounting the gears and for engaging and disengaging them.

In reversing drives of the type indicated, there exists a possibility of damage to the machine by simultaneously engaging the wrong elements so that an interference or damage to or breakage of the gear teeth is caused.

It is another object of the invention to provide a means for preventing engagement of elements in improper combinations.

With these and other objects which will appear in the following full description in mind, the invention consists in the combinations and arrangements of parts and details of construction which will now first be fully described in connection with the accompanying drawing and then pointed out more particularly in the appended claims.

In the drawing:

Fig. 1 is a plan view partly broken away, showing the reversing drive of the invention;

Fig. 2 is an elevation, largely schematic;

Fig. 3 is a view similar to Fig. 2, but showing the parts in a different position;

Fig. 3A is another view similar to Fig. 2, but showing the parts in another different position;

Fig. 4 is an enlarged section of the line 4—4 of Fig. 2, showing the mounting of one of the gears; and

Fig. 5 is an external view of a portion of a printing unit embodying the invention.

The unit which is of generally familiar type comprises a frame structure 10 supporting a left hand printing couple including an impression cylinder 11 and plate cylinder 12 and a right hand printing couple including an impression cylinder 13 and plate cylinder 14. In the "standard" operation, a web W may be printed first on one side by the couple 13—14 and then on the other side by the couple 11—12, following a path such as indicated in Fig. 2. Under this condition, the drive is taken from a vertical shaft 15 through bevel gear pair 16—17 to a spur gear 18 which drives plate cylinder 14 through a gear 19 carried on its shaft and also drives impression cylinder 11 through a gear 20 carried on its shaft. Plate cylinder 12 cooperating with impression cylinder 11 is driven therefrom by means of gears 21 and 22 fixed to the shafts of these cylinders and the impression cylinder 13 is driven from plate cylinder 14 by means of gears 24 and 23 fixed to the shafts of these two cylinders.

Means as later described is provided for uncoupling

gears 19 and 20 from the shafts of cylinders 14 and 11 so as to permit them to rotate freely and thus provide for reversing the direction of rotation of either couple as desired for printing in color. An idle gear 25 is provided for coupling gears 22 and 23 together when using the unit in this manner. Gear 25 is carried in bearings 25′ and 25″, the bearing 25′ being slidable in a bore in frame 10, and the bearing 25″ being slidable in a bracket 26 attached to the frame 10. A screw rod 28 is rotatably secured to bearing 25″ by a U-shaped member 27 and is threadably engaged at 28′ in an extension 26′ of the bracket 26. By turning screw rod 28 the gear 25 may be moved from the disengaged position of Fig. 1 to a position where it meshes with gears 22 and 23.

There are, as indicated above, two color run drive arrangements of the gearing referred to in addition to the standard drive arrangement described above and shown in Fig. 2. One such arrangement is shown in Fig. 3. In this case, the couple 11—12 has been reversed and the web W is led through the two couples from left to right so that they print upon the same side of the web instead of on opposite sides as in Fig. 2. In this arrangement, the gear 25 is slid forwardly so as to mesh with and connect gears 22 and 23, and gear 20 is disconnected (in a manner described below) from the shaft of cylinder 11 so as to rotate idly thereon. As will be apparent, the drive is now from gear 18 through gear 19 to the plate cylinder 14 and then by way of gears 24, 23, 25, 22 and 21 for driving the remaining cylinders.

Alternatively, and if it is wished to have the web W travel in the opposite direction from that indicated in Fig. 3, i.e. from right to left, as shown in Fig. 3A the gear 19 may be disconnected from driving relation to the shaft of cylinder 14 while gear 20 is left connected to the shaft of cylinder 11 and gear 25 is put in mesh with gears 22 and 23, as before. The operation under these conditions will be obvious.

The mounting of gears 19 and 20 may be and preferably is the same, and the mounting of gear 19 as shown in Fig. 4 will serve to make clear the structure involving both these gears.

Referring now to Fig. 4:

The shaft 14′ of cylinder 14 is supported in frame 10 by means of an anti-friction bearing 30, carried within an eccentric bushing 31 which is rotatably adjustable by means of worm gearing 32 for varying the impression. The hub 33 of gear 24 is force fitted to the shaft 14′ and rotatably carries the hub 34 of gear 19 by means of a pair of roller bearings 35 and 36, as indicated. Hub 33 is formed with external splined teeth 37, and hub 34 of gear 19 is formed with internal splined teeth 38, these teeth cooperating with a clutch ring 39 having both internal and external teeth. In the position of Fig. 4, the hub 34 of gear 19 is coupled through these teeth to the hub 33 and, hence, to the shaft 14′ of the cylinder 14. Moving the ring 39 to the phantom position of the figure will, however, bring the ring 39 out of engagement with teeth 38 thus uncoupling gear 19 and permitting it to rotate freely upon the shaft 14′.

The arrangements for thus moving the clutch ring 39 are carried by the shaft 14′ and by a cap element 40, fixed thereto by studs 41. They include a slidable member 42 mounted inside the hub 33 and held from rotation by the bolt 41 which is surrounded by a sleeve or bushing 43 passing through a bore 44 in the member 42. Member 42 carries a pin 45 which passes through an axial slot 46 in the hub 33 and into a bore 47 in the ring 39, thus coupling this ring to the member 42. Member 42 is moved axially of the shaft 14′ by means of a rotatable and axially movable screw rod 50, the inner end 51 of which is screw threaded and fits in a correspondingly threaded

central bore 52 in the member 42. The outer end 53 of the rod 50 is also screw threaded and engages in the threaded central bore 54 of a cover plate 55 fixed to the cap element 40 as by means of screw 56. Means such as socket 57 in the end of the rod 50 is provided for turning this rod. A drive for ink pumps or other mechanism may be taken off shaft 14' as by means of the gearing indicated at 58 and 59, but this feature of the mechanism does not involve the present invention. A spring detent 60 cooperating with grooves 61, 62 is provided for catching the rod 50 in the outward position of Fig. 4 and in the inward or phantom position thereof, these positions being the engaging and disengaging positions of the gear 19. The ends 51 and 53 of the rod 50 are threaded to opposite hands, as, for example, the end 51 being right hand threaded and the end 53 being left hand threaded. Accordingly, where these threads are of equal pitch, as shown, the turning of the rod 50 moves this rod axially and moves the member 42 axially but by double the amount.

The fact that the engagement and disengagement of gears 25, 19 and 20 involves an axial movement of the screw rods associated therewith, is utilized to limit the possible movements of the adjustable clutches and gearing and thus avoid damage to the machine. This is accomplished by means of a masking plate or spider 70 pivotally mounted on the gear housing or cover 71 at 72 and rotatably movable by means of a crank handle 73 into any of three positions. This spider is provided with a set of holes 75, 76, 77 and 78, which may be brought into or out of alignment with the screw rods 28, 50 and 50'.

The arrangement for standard operation is shown in Fig. 2. With the crank handle 73 in a vertical position, the holes 75 and 78 are both in alignment with screw rods 50 and 50' of cylinders 11 and 14 respectively. Neither of the holes 76 or 77 is aligned with the screw rod 28 that is associated with gear 25. Hence, movement of idler gear 25 outwardly from the frame 10, is prevented, and the coupling of gears 22 and 23 thereby is impossible.

Under these conditions, the screw rod 50 associated with cylinder 11, is backed out into the hole 75 in spider 70, and the screw rod 50' associated with cylinder 14 is backed out into the hole 78. As shown in Fig. 4, the gear 19 will be coupled to gear 24 which is fast on cylinder 14. Similarly with the screw rod 50 in the outward position, the gear 20 will be coupled to the gear 22 which is fast on the cylinder 11. The gears 19 and 20, which are both driven by the gear 18, will drive the cylinders in the direction indicated in Fig. 2, to print a web in one color on each side.

For reverse operation of cylinders 11 and 12, to print two colors on one side of a web lead through the machine from left to right (as shown in Fig. 3), the screw rod 50 is screwed inward to uncouple the gear 19 from gear 24. This releases the spider 70, and the crank handle 73 is then swung to the left to align the hole 77 with the screw rod 28 which is then screwed outward to mesh the idler gear 25 with gears 22 and 23. Under these conditions the gear 18 will drive the gear 19 and the cylinders 13 and 14 in the same directions as in the Fig. 2 arrangement, but the cylinders 11 and 12 will rotate in the opposite directions, because with the gear 20 uncoupled, they are driven from gear 18, through coupled gears 19 and 24 on cylinder 14, gear 23 and idler 25 to gear 22 on cylinder 11.

For the second reverse operation whereby the web is led from right to left to print two colors on one side, the parts are arranged as shown in Fig. 3A. The screw rod 50' is screwed inward to uncouple the gear 20 from the gear 22, and release the spider 70, and the crank handle 73 is swung to the right to align the hole 76 with screw rod 28 which is then screwed outward to mesh the idler gear 25 with gears 22 and 23. Under these conditions the gear 18 will drive the gear 20 and the cylinders 11 and 12 in the same directions as in the Fig. 2 arrangement, but the cylinders 13 and 14 will rotate in the opposite directions, because with the gear 19 uncoupled, they are driven from gear 18 through coupled gears 20 and 22 on cylinder 11, and idler 25 to gear 23 on cylinder 13.

Numerals 79, 80 and 81 indicate stop members on the inner side of the spider 70 which engage the several screw rods when they are screwed outward, and serve to prevent placing the clutches and gears in any positions where damage could be caused by improper manipulation of the adjusting mechanism, and numerals 82, 83 and 84 indicate swinging plates that are moved aside to insert the operating wrench used to shift the gears.

With the spider 70 in standard position neither couple can be reversed without first screwing in one of the rods 50 or 50', then moving the spider 70 to either right or left, and then moving the gear 25 into mesh. Also if the gears are set to reverse either of the couples, the gear 25 must be moved out of mesh before the spider 70 can be moved to make the rods 50 and 50' accessible for moving the spider 70 to the standard position of Fig. 2. It will be seen the position of the spider 70 determines what screw rods can be moved, and the position of the screw rods determines whether and where the spider can be moved. Each of these members is so interlocked with the others that it is impossible to cause damage when making an adjustment.

What is claimed is:

1. In a printing machine unit having a pair of printing couples and a common frame structure supporting the same, a reversing drive comprising gearing and clutch mechanism for selectively driving the said printing couples in the same direction and in opposite directions, a plurality of screw rod control members, each movable between inner and outer positions, one such position corresponding to the drive in the same direction and the other to the drive in opposite directions, and means preventing the setting of the said control members simultaneously in positions corresponding respectively to driving the couples in the same direction and in opposite directions.

2. A reversing drive according to claim 1, in which the last said means comprises an angularly movable spider having openings providing access to the said screw rods for turning the same to move them from inner to outer position and also having means preventing a screw rod from being in outer position in one angular position of the spider while permitting it to be in outer position in another position of the spider.

3. In a printing machine unit having a pair of printing couples and a common frame structure supporting the same, a reversing drive comprising gearing and clutch mechanism for selectively driving the said printing couples in opposite directions, both clockwise and both counterclockwise, a plurality of control members, including three control members, each movable between a first position and a second position, the three settings of a pair of said control members in said first position and the remaining one in said second position corresponding respectively to the two drives in the same direction and the drive in opposite directions, and means preventing the setting of the three said control members simultaneously in their said first position.

4. In a printing machine unit having a pair of printing couples and a common frame structure supporting the same, a reversing drive comprising gearing and clutch mechanism for selectively driving the said printing couples in opposite directions, both clockwise and both counterclockwise, a plurality of control members, including three control members, each movable between an outer position and an inner position, the three settings of a pair of said control members in outer position and the remaining one in inner position corresponding respectively to the two drives in the same direction and the drive in opposite directions, and means preventing the setting of the three said control members simultaneously in outer position.

5. In a printing machine unit having a pair of printing couples and a common frame structure supporting the same, a reversing drive comprising gearing and clutch mechanism for selectively driving the said printing couples in opposite directions, both clockwise and both counterclockwise, a plurality of control members, including three control members, each movable between an outer position and an inner position, the three settings of a pair of said control members in outer position and the remaining one in inner position corresponding respectively to the two drives in the same direction and the drive in opposite directions, and a spider angularly adjustable into any of three positions, the said spider having means preventing a different one of said control members from being in outer position when in each of the said three positions and also having openings providing access for moving the other two of said control members into outer position, whereby the setting of any two of the said control members in outer position is permitted and the setting of all three in outer position is prevented.

6. A reversing drive according to claim 5, in which the spider comprises a projection aligned with one of said three control members when the spider is in an intermediate position, thereby requiring that the said control member be in inner position when the spider is in intermediate position or is moved from either extreme position to the other, an aperture on either side of the projection aligned with the said control member in the respective extreme positions of the spider, an aperture aligned with the second of the said three control members and an aperture aligned with the third of the three control members, when the spider is in said intermediate position, a projection adjacent one of the last said apertures for engaging the control member aligned therewith, if in outer position upon attempted movement of the spider toward one extreme position, and a projection associated with the other of the last said apertures for engaging the control member aligned therewith, upon attempted movement of the spider toward the other said extreme position.

7. In a printing machine unit having a pair of printing couples, each comprising a printing cylinder and impression cylinder having supporting shafts and common frame structure rotatively supporting the cylinders thereof by their shafts, a reversing drive mechanism comprising gears on the said shafts coupling the cylinders of each couple together for driving one with the other, an idle gear slidable between a position engaging the gears on the impression cylinder shafts of the two couples for driving one couple from the other and a position of disengagement with the said gears on the impression cylinder shafts, a drive shaft, and further gearing for driving the unit therefrom, comprising a second gear on the shaft of the plate cylinder of one couple and a second gear on the shaft of the impression cylinder of the other couple, means rotatively engaging the said second gears with their respective said shafts, a drive gear meshing with the last two said gears for driving the same, and means for selectively disengaging a said second gear from its shaft.

8. A reversing drive according to claim 7, in which the gears coupling the cylinders of each couple comprise hubs extending outwardly of the frame, and comprising anti-friction bearings carried on the said hubs and rotatably supporting the said second gears.

9. A reversing drive mechanism according to claim 8, in which the said anti-friction bearings comprise axially spaced bearings and comprising means therebetween for releasably clutching the said second gears to the said hubs.

10. A reversing drive according to claim 9, in which the said releasable clutching means, comprises external spline teeth formed on the said hubs, internal spline teeth formed on the said second gears, and an annular coupling member having internal and external spline teeth meshing with the said spline teeth, and axially slidable between a position engaging both sets of teeth and a position of disengagement of one set of teeth.

References Cited in the file of this patent

UNITED STATES PATENTS

1,532,542	Miller	Apr. 7, 1925
1,772,182	Huber	Aug. 5, 1930
2,521,607	Rohn	Sept. 5, 1950
2,527,965	Russey	Oct. 31, 1950
2,637,221	Backus et al.	May 5, 1953

FOREIGN PATENTS

336,107	Italy	Feb. 12, 1936