

Feb. 1, 1966

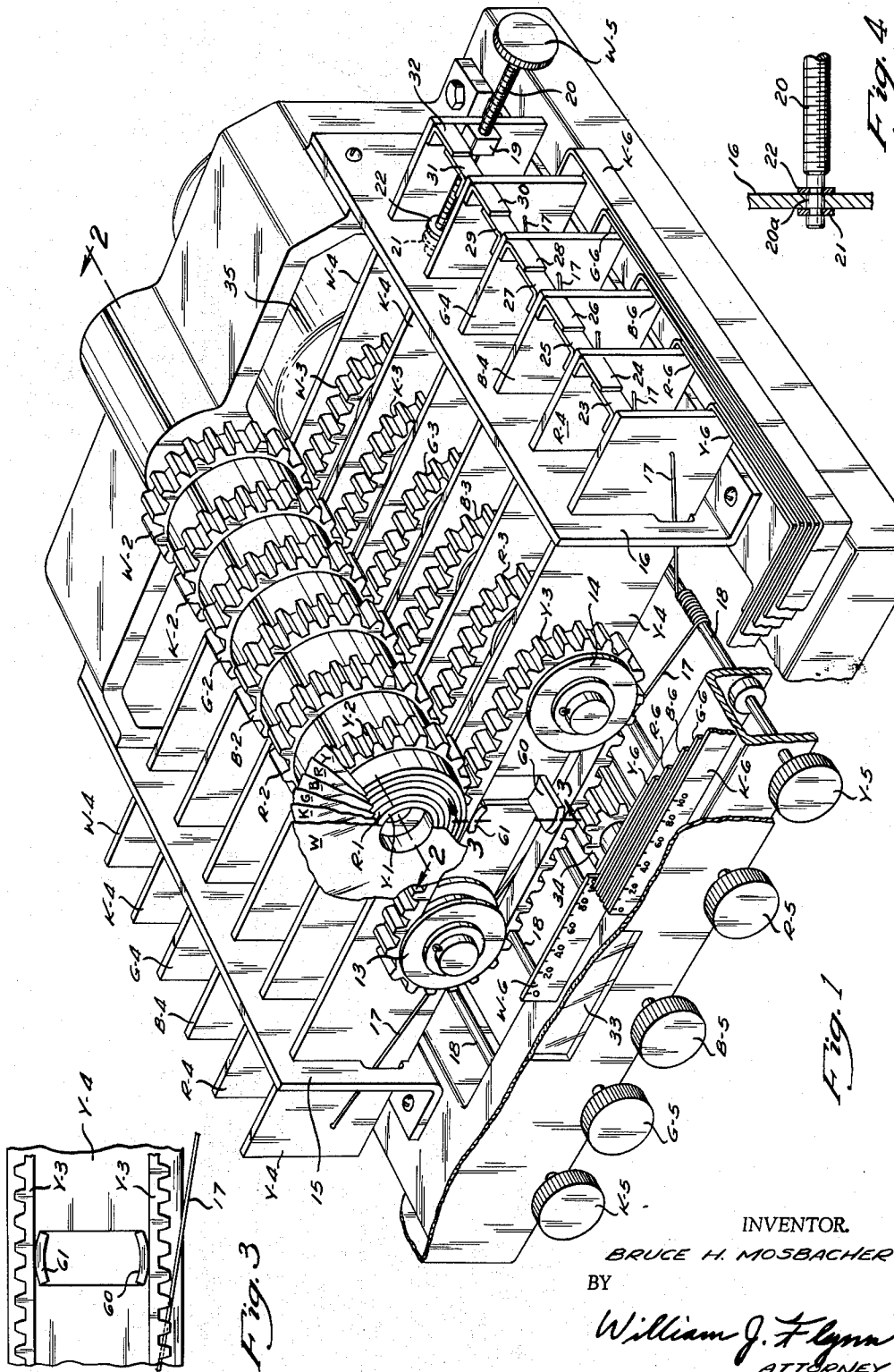
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3,231,990

VARIABLE DRIVE IN A COLOR MIXER

Filed Nov. 29, 1962

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

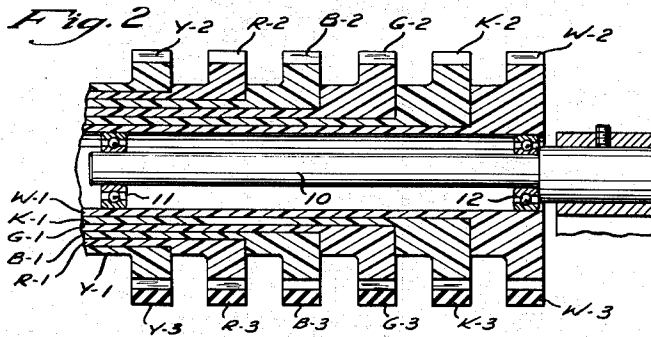
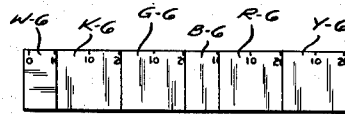


Fig. 5

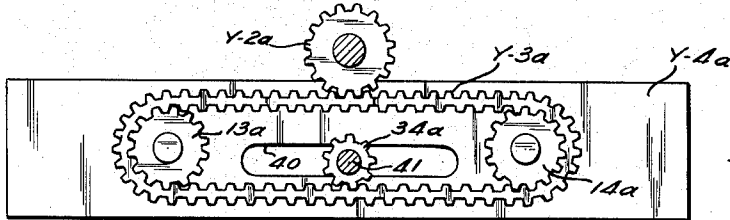


Fig. 6

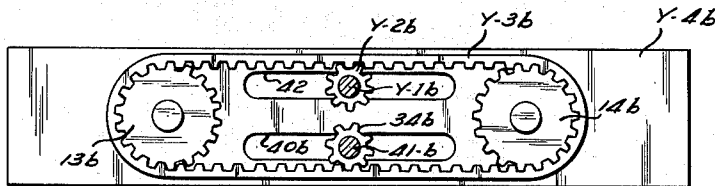


Fig. 7

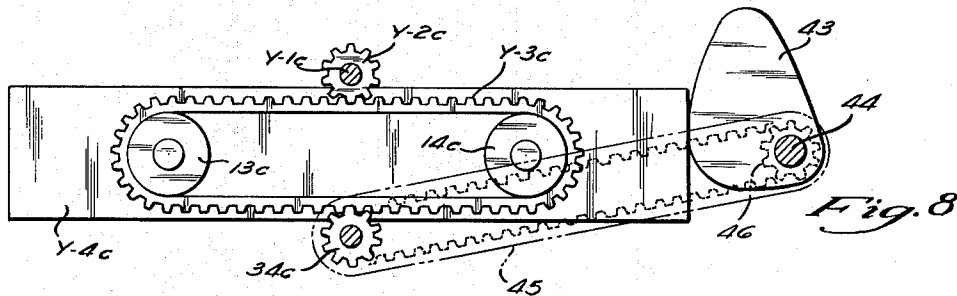


Fig. 8

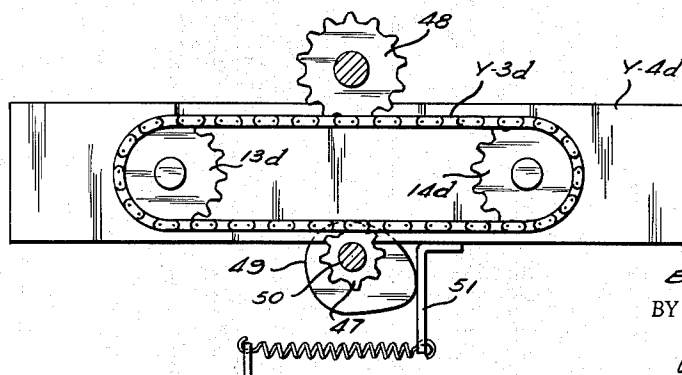


Fig. 9

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VARIABLE DRIVE IN A COLOR MIXER

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4 Claims. (Cl. 35—28.3)

This invention relates to a variable drive in a color mixer or blender.

Prior to the present invention, various drive arrangements have been provided in which a rotary input drive member drives one or more rotatable output drive members, and in which it may be desired to vary the driving relationship between at least one of the output drive members and the input drive member. For example, the output drive members may be coupled to differently colored discs in a color mixer or blender, and it may be desired to selectively vary the individual driving relationships between these output drive members and a single input drive member which drives them all, in order to change the color blend or mix accordingly. In general, such drive arrangements have been unduly complex and expensive, as well as noisy in operation.

The present invention is directed to a novel drive arrangement which overcomes these difficulties and disadvantages and which is particularly useful in a color mixer or blender.

Accordingly, it is a general object of this invention to provide a novel and improved variable drive in a color mixer or blender.

Further objects and advantages of this invention will be apparent from the following detailed description of certain presently-preferred embodiments thereof, which are illustrated in the accompanying drawings.

In the drawings:

FIGURE 1 is a perspective view, with parts broken away for clarity, showing a color mixer or blender embodying the variable drive of the present invention;

FIGURE 2 is an axial section taken along the line 2—2 in FIGURE 1 and showing the several output gears in the drive arrangement therein;

FIGURE 3 is an enlarged fragmentary elevational view taken along the line 3—3 in FIGURE 1;

FIGURE 4 is an enlarged sectional view of a detail of the FIGURE 1 arrangement;

FIGURE 5 is an elevational view showing the overlapping calibrated scales for the differently colored discs in the FIGURE 1 arrangement;

FIGURE 6 is a fragmentary elevational view showing an alternative variable drive arrangement in accordance with the present invention; and

FIGURES 7, 8 and 9 are views similar to FIGURE 6 and showing three further embodiments of the present variable drive arrangement.

Referring first to FIGURE 1, the device shown there is a color mixer or blender which embodies the present invention. This color mixer includes a plurality of different colored discs, designated W, K, G, B, R and Y for the respective colors, white, black, green, blue, red and yellow. These discs are concentrically disposed and are arranged one behind the other, in the order named. The discs are suitably slotted and interleaved such that disc K may project partially or completely in front of disc W, disc G may project partially or completely in front of disc K, etc. The manner in which the discs are so mounted forms no part of the present invention, various arrangements of this general type being known per se. As an illustrative example, the interleaved disc arrangement of U. S. Patent 2,606,373 to Lamberger may be used.

As is well understood, when the interleaved and overlapping discs rotate in unison at a suitable speed, their respective exposed colors blend together to produce a

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composite color when viewed by the naked eye. The composite color seen by the eye is determined by the percentage exposure of the various differently colored discs. Color mixers or blenders of this general type are used for the selection of paint colors, for example.

In accordance with the present invention, a novel drive arrangement is provided which enables the various differently colored discs to be exposed selectively, so as to provide a virtually infinite choice of color blends.

Referring to FIGURE 2, six independently rotatable, concentrically disposed, hollow shafts W-1, K-1, G-1, B-1, R-1 and Y-1 are coupled to the correspondingly lettered color discs W, K, G, B, R and Y. Shaft W-1 is the smallest diameter shaft, shaft K-1 is the next largest, and so on in the order named. Shaft W-1 is rotatably mounted on a stationary shaft 10 by means of axially spaced ball bearings 11 and 12. Each of the other color disc shafts is rotatably mounted on the next smaller shaft.

Integrally connected to each color shaft is a corresponding spur gear W-2, K-2, G-2, B-2, R-2 and Y-2. These gears are of equal diameters and are arranged in axially spaced, concentric relation, with gear W-2 being at the back, gear K-2 spaced in front of gear W-2, and so on in the order named. These gears are in meshing engagement with individual endless, flexible, toothed "timing belts" of reinforced rubber or rubberlike material. These timing belts are designated W-3, K-3, G-3, B-3, R-3 and Y-3, respectively, in FIG. 1.

The timing belt Y-3 for driving the yellow color disc Y extends around two laterally spaced idler pulleys 13 and 14, which are rotatably supported by a carrier plate Y-4. This carrier plate is slidably supported in a pair of upstanding plates 15 and 16 fixedly mounted at the opposite sides of the machine.

Plate Y-4 may be moved laterally in either direction. For this purpose there is provided a flexible cable 17 having several turns wrapped tightly around a rotatable shaft 18 and having its opposite ends connected to opposite end portions of plate Y-4. A calibration knob Y-5 is mounted on shaft 18 at the front of the machine. By turning this knob, the carrier plate Y-4 may be shifted sideways in one direction or the other. Cable 17 extends at the front of plate Y-4. Cable 17 is disposed completely behind, and spaced from, the timing belt Y-3.

As shown in FIGS. 1 and 3, the carrier plate Y-4 is formed with struck-out, forwardly projecting tabs 60 and 61 which overlie and underlie, respectively, the lower and upper courses of the belt Y-3 and guide the latter in its movement between the pulleys 13 and 14.

The other timing belts R-3, B-3, G-3, Y-3 and W-3 are individually supported in the same manner by respective carrier plates R-4, B-4, G-4, K-4 and W-4. The carrier plates R-4, B-4, G-4 and K-4 are coupled individually to respective adjustment knobs R-5, B-5, G-5 and K-5 located at the front of the machine in the same manner as the coupling between carrier plate Y-4 and its calibration knob Y-5.

The remaining carrier plate W-4 may be moved laterally by turning a calibration knob W-5, located at the right side of the machine. This plate carries an internally screw-threaded member 19 which threadedly receives a screw-threaded shaft 20 on which the calibration knob W-5 is mounted. At its inner end (FIG. 4) shaft 20 has an unthreaded shank 20a which is rotatably supported by the upstanding wall 16 and is held captive there by snap rings 21 and 22. With this arrangement, when calibration knob W-5 is turned in one direction or the other, the carrier plate W-4 may be shifted laterally in one direction or the other to shift the timing belt Y-3 and the pulleys 13 and 14 in unison in translatable fashion

laterally with respect to the gear Y-2. Also, such turning of calibration knob W-5 also moves the other carrier plates K-4, G-4, B-4, R-4 and Y-4 to their "zero" positions, as described in detail hereinafter.

The front carrier plate Y-4 carries a rearwardly projecting tab 23 at its right end in FIG. 1. The next carrier plate behind, R-4, carries a forwardly projecting tab 24 which is disposed to the right of tab 23 and is arranged to engage the latter when carrier plate R-4 is moved to the left.

Similar interlocks are provided:

(1) Between carrier plate R-4 and carrier plate B-4 by tabs 25 and 26;

(2) Between carrier plates B-4 and G-4 by tabs 27 and 28;

(3) Between carrier plates G-4 and K-4 by tabs 29 and 30; and

(4) Between carrier plates Y-4 and W-4 by tabs 31 and 32.

A calibration plate Y-6 is attached to the right end of carrier plate Y-4. This calibration plate extends forward from carrier plate Y-4 and then makes a right angle turn and extends to the left at the front of the machine.

A similar calibration plate R-6, which is attached to the next carrier plate R-4, extends forward from plate R-4 to the right of the forwardly extending portion of calibration plate Y-6 and then laterally to the left directly in front of calibration plate Y-6.

In like manner, individual calibration plates B-6, G-6 and K-6 are attached to carrier plates B-4, G-4 and K-4, respectively, and are disposed one in front of the other at the front of the machine.

Each of these calibration plates has a calibrated scale, progressing from zero to 100 from left to right at the front of the machine.

When the calibration plates Y-6 and R-6 are aligned at their left ends, as shown in FIG. 1, then the tabs 23 and 24 on carrier plates Y-4 and R-4 engage one another. If, now, carrier plate R-4 is moved to the left, it will carry the other carrier plate Y-4 in unison with it, due to these interengaging tabs. Consequently, both carrier plates R-4 and Y-4 and both calibration plates R-6 and Y-6 will move in unison. However, only the calibration plate R-6 will be exposed.

In like manner, when any of the other carrier plates is moved to the left it will carry with it all of the carrier plates in front of itself and its calibration plate will cover the calibration plates of all these carrier plates.

A fixedly positioned, calibrated scale W-6 is disposed at the front on the machine at a location behind the respective paths of travel of the scales on the calibration plates K-6, G-6, B-6, R-6 and Y-6. This scale W-6 may be viewed through a window 33 in the housing of the machine at the front.

All of the timing belts Y-3, R-3, B-3, G-3, K-3 and W-3 are driven by a single driving gear 34, which is driven by an electric motor 35 at constant speed. The driving gear meshes with the bottom course of each timing belt. The driving gear has a fixed axis of rotation which is spaced from and parallel to the fixed axis of rotation of the respective gears Y-2, R-2, B-2, G-2, K-2 and W-2.

Initially all of the carrier plates Y-4, R-4, B-4, G-4, K-4 and W-4 are aligned as shown in FIG. 1, with their respective interlock tabs engaging one another. Knob W-5 is adjusted to position carrier plate W-4 (and all of the carrier plates in front of it) so that the calibration "100" on the fixed "white" scale W-6 is visible through the window 33. In this position of the carrier plates only the "white" color disc W will be exposed at the front of the machine.

Any one of the carrier plates in front of the "white" carrier plate W-4 may be shifted to the left by turning the corresponding calibration knob K-5, G-5, B-5, R-5 or Y-5. This causes the corresponding calibration plate

K-6, G-6, B-6, R-6 or Y-6 to be exposed at the window 33, covering the fixed "white" scale W-6 to an extent corresponding to the distance through which that carrier plate has been shifted to the left. Also, the corresponding color disc K, G, B, R or Y will be exposed in front of the white disc W to the extent of such shift. Such adjustment may take place while the timing belts are being driven by gear 34. However, to facilitate an understanding of the action which takes place, the adjustment will be described with the driving gear 34 assumed to be stationary.

Taking the carrier plate Y-4 as an example, and assuming gear 34 to be stopped, when knob Y-5 is turned in the appropriate direction the carrier plate Y-4 moves to the left in FIG. 1. Since gear 34 is stopped, the bottom course of the timing belt Y-3 carried by plate Y-4 must remain stationary also, due to its toothed engagement with gear 34. However, this does not prevent plate Y-4 and its idler pulleys 13 and 14 from moving to the left. Such movement of the idler pulleys causes the top course of the belt Y-3 to move to the left and this causes gear Y-2 to rotate clockwise in FIG. 1 by an amount proportionate the distance through which the top course of the timing belt moves to the left.

(Essentially the same action takes place when the drive gear 34 is rotating. The lower run of the timing belt Y-2 will then move at a speed equal to the peripheral speed of the drive gear 34, but this does not prevent the timing belt, as a whole, from moving to the left and causing gear Y-2 to advance angularly with respect to the other gears R-2, B-2, G-2, K-2 and W-2.)

Each of the other carrier plates R-4, B-4, G-4 and K-4 may be adjusted individually in the same manner to provide the desired exposure of its color disc R, B, G or K. If the black color disc K is to be exposed at all, then carrier plate K-4 should be adjusted first, and then the next carrier plate G-4 in front of it (if the green color disc G is to be exposed at all), and so on, because the adjustment on any particular carrier plate will also adjust all the carrier plates in front of it the same amount due to the interlocking tabs on the carrier plates. Then, if it is desired to advance one of these other carrier plates it will begin even with the carrier plates behind itself.

By turning the knob Y-5 for the front carrier plate Y-4 to return its calibration plate Y-6 to "zero," all of the other carrier plates behind it will be returned to "zero" due to the interlocking tabs.

With this same arrangement the color discs are adjustable individually, so that each may be exposed to any desired extent. As an example, FIGURE 5 shows the calibration scales viewed through window 33 with the "white" scale W-6 exposed 10%, the "black" scale K-6 exposed 20%, the "green" scale G-6 exposed 20%, the "blue" scale B-6 exposed 10%, the "red" scale R-6 exposed 20%, and the "yellow" scale Y-6 exposed 20%, making a total of 100%. Obviously, the respective color discs will have the percentage exposure shown by these scales.

FIGURE 6 shows an alternative drive arrangement which may be provided for each of the adjustable carrier plates Y-4, R-4, B-4, G-4 and K-4, in place of the arrangement shown in FIG. 1. As shown, the carrier plate Y-4a is formed with an elongated horizontal slot 40 through which extends the shaft 41 for the drive gear 34a for that carrier plate. The flexible timing belt Y-3a has teeth on both of its major faces. Drive gear 34a is in meshing engagement with the teeth on the inside face of the timing belt. The driven gear Y-2a, to which the corresponding color disc is connected, is driven by the teeth on the outside face of the timing belt. The pulleys 13a and 14a are provided with gear teeth which mesh with the teeth on the inside face of timing belt Y-3a.

The operation of the FIG. 6 drive arrangement is essentially the same as that of FIG. 1. As will be readily apparent, there will be an individual drive gear for each

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timing belt, all of these gears being mounted on the same drive shaft 41.

FIGURE 7 shows a further embodiment of the drive arrangement for each of the shiftable carrier plates. Here, the carrier plate Y-4b has an elongated horizontal slot 42 which passes the shaft Y-1b of the driven gear Y-2b. The carrier plate also has an elongated horizontal slot 40b which passes the shaft 41b on which the drive gear 34b is mounted. The timing belt Y-3b has teeth on its inside face only which mesh with the drive gear 34b and the driven gear Y-2b. The pulleys 13b and 14b have gear teeth meshing with the teeth on the timing belt.

The operation of this embodiment is essentially similar to those of FIGS. 1 and 6.

FIGURE 8 shows in full lines an alternative drive arrangement essentially the same as that of FIGURE 1, except that the carrier plate Y-4c is shifted laterally by a cam 43 rotatable about the axis of a shaft 44 on which it is secured.

If desired, as shown in phantom in FIGURE 8, the cam 43 may be driven by the drive gear 34c through a timing belt 45 meshing with the drive gear and with a gear 46 on the cam shaft 44. This would provide a continuously varying speed of the driven gear Y-2c. The gear ratios in this drive arrangement may be suitably chosen to provide the desired effect.

Alternatively, the timing belt 45 may extend between the output gear Y-2c and the cam shaft gear 46 to provide a continuously variable drive arrangement with any desired gear ratio.

FIGURE 9 shows a still further embodiment of the present drive arrangement. Here, the carrier plate Y-4d carries a pair of laterally spaced idler gears 13d and 14d over which a chain Y-3d is trained. One gear 47 meshes with the bottom course of this chain. Another gear 48 meshes with the upper course of this chain. Either gear 47 or gear 48 may be the driving gear and the other the driven gear. A cam 49 is mounted on the shaft 50 of gear 47. This cam bears against an arm 51 which is attached to the carrier plate Y-4d. A tension spring maintains arm 51 in engagement with the periphery of the cam. With this arrangement, whether gear 47 is the input or output gear, a continuously variable speed drive is provided for the output gear.

While certain presently-preferred embodiments of this invention have been described in detail and illustrated in the accompanying drawings, it is to be understood that various modifications, omissions and refinements which depart from the disclosed embodiments may be adopted without departing from the spirit and scope of this invention.

I claim:

1. In a color mixer having a plurality of interleaved color panels mounted to project one in front of the other and a plurality of concentric rotatable shafts coupled indi-

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vidually to said panels to rotate the latter, the improvement which comprises:

a plurality of axially spaced output gears mounted individually on said shafts;

a rotary input shaft having gear means thereon and mounted for rotation about an axis spaced from, and extending parallel to, the axis of said shafts;

a plurality of carriers spaced apart in succession axially along said input shaft and extending perpendicular to said axes of rotation;

a first pulley and a second pulley rotatably supported by each carrier, each first pulley being disposed laterally to one side of said input shaft and said concentric shafts, each second pulley being disposed laterally to the opposite side of said input shaft and said concentric shafts;

a flexible endless drive loop trained over each pair of first and second pulleys and having opposite, straight, elongated, parallel courses of movement between them, each said flexible endless drive loop in one of said straight courses of its movement meshing with said gear means on said input shaft, each said flexible endless drive loop in the opposite straight course of its movement meshing with a corresponding one of said output gears;

and means for selectively shifting certain of said carriers laterally with respect to said input shaft and the corresponding output gear while maintaining the corresponding flexible endless drive loop meshing with both.

2. The color mixer of claim 1 wherein each of said flexible endless drive loops is a toothed belt of rubber-like material.

3. The color mixer of claim 1 wherein there is provided a calibrated color scale coupled to each of said certain carriers and movable therewith.

4. The color mixer of claim 1 wherein there are provided interlock means acting between successive carriers and interlocking the latter for movement of all of the carriers which are disposed axially to one side of a selected carrier in unison with the selected carrier when the latter is shifted laterally.

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