June 27, 1950 H. C. VAN AUKEN 2,512,700

MULTIPLE VARIABLE SPEED DRIVE

Original Filed April 9, 1941

Fig. 3.

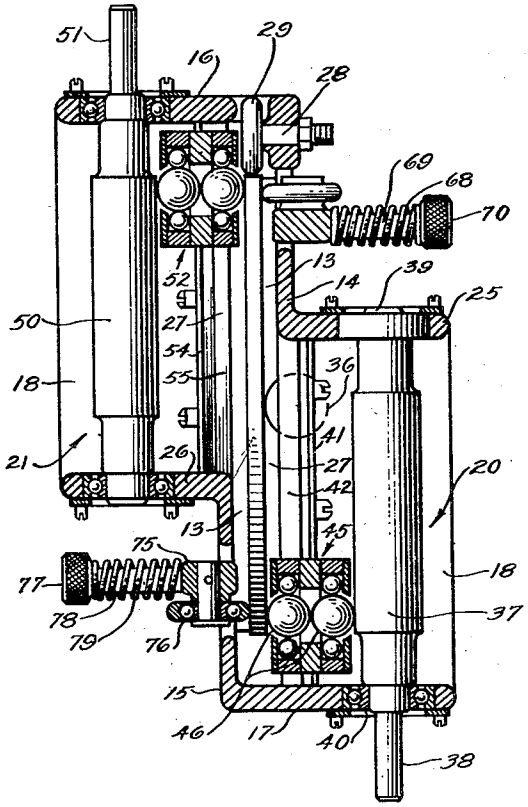
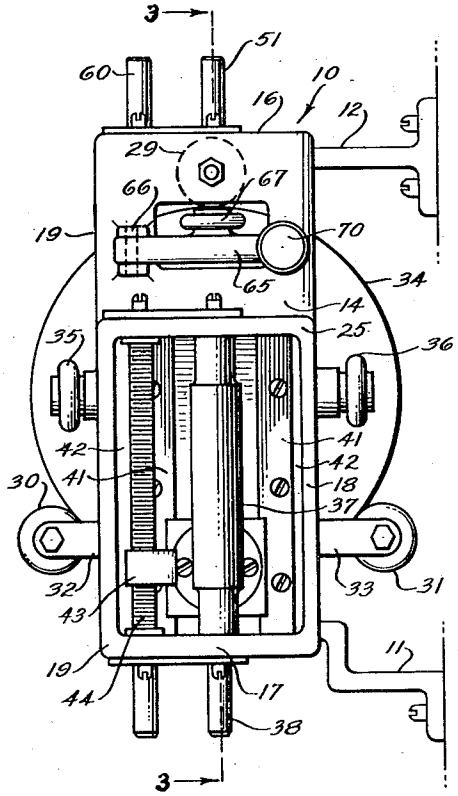


Fig. 2.



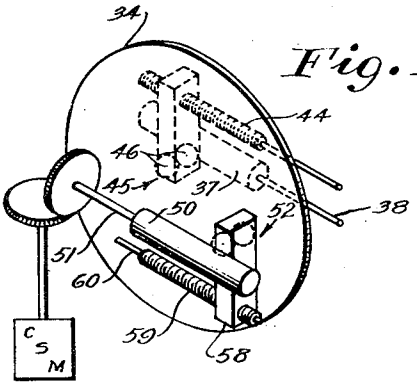


Fig. 1.

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MULTIPLE VARIABLE-SPEED DRIVE

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14 Claims. (Cl. 74—198)

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This invention is a division of application Serial No. 387,574 of Howard C. Van Auken and Frederick N. Esher for improvement in Bombsights, filed April 9, 1941, now Patent No. 2,410,469, issued November 5, 1946.

The present invention relates to a multiple variable speed drive such as is used in computing devices and has for its object the provision of a simple and compact multiple variable speed drive structure.

Other objects, features and advantages will be understood from the following description given with the aid of the accompanying drawings, of which:

Fig. 1 is a view showing the invention schematically;

Fig. 2 is a front elevation; and

Fig. 3 is a view in section, the section being taken through 3—3 of Fig. 2.

Referring to Figs. 2 and 3 of the drawings, a casing indicated generally by the reference character 10, provided with supporting legs 11 and 12 is formed with a narrow central compartment 13 coextensive with the height of the casing, defined laterally by front and rear partially open walls 14 and 15, top and bottom walls 16 and 17 and side walls 18 and 19. Compartments 20 and 21 are formed in the casing respectively at the front and rear of central compartment 13 and are partially offset from each other. The compartments are generally oblong in shape, compartment 20 being formed by side walls 18 and 19, and lower wall 17 of the casing, the upper wall 25 projecting forwardly from the casing above the central part of compartment 13. Compartment 21 is defined by the top wall 16 of the casing, side walls 18 and 19; and a lower wall 26 which projects horizontally outward from the casing below the central part of chamber 13.

A pair of rollers 30 and 31 are supported by arms 32 and 33 extending outwards on opposite sides of the casing in the lower portion thereof, the rollers being in register with openings 27 in opposite sides of compartment 13 communicating with the interior thereof. A stud 28 secured in the upper part of the casing supports a roller 29 in coplanar relation with rollers 30 and 31. A disc 34 disposed in compartment 13 is supported by rollers 29, 30 and 31 which engage the edge thereof and serve as alignment bearings therefor. The front surface of disc 34 rides on alignment rollers 35 and 36 supported on opposite sides of the casing along the horizontal center line of the disc. Disc 34 cooperates with a pair of ball carriage and roller

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mechanisms arranged respectively in compartments 20 and 21 which will now be described.

A roller 37, integral with shaft 38 is supported in bearings 39 and 40 in the upper and lower walls of compartment 20. Mounted upon a pair of guide rails 41 secured to webs 42 formed integrally with the casing and driven by a lead nut 43 threaded on a lead screw 44 supported by bearings formed in walls 17 and 25 of compartment 20 is a ball carriage 45 of known construction provided with balls 46 which engage disc 34 and roller 37.

The ball carriage and roller mechanism of compartment 21 is similar to that of compartment 20, and comprises a roller 50 formed integrally with shaft 51 supported by bearings in walls 16 and 26. A ball carriage 52, cooperating with roller 50 and disc 34 (Figs. 1 and 3) is supported on a pair of guide rails 54 attached to webs 55 integral with the casing. Only one of the latter rails 54 and webs 55 is shown in the drawings. The ball carriage is coupled with a lead nut 58 disposed on lead screw 59 formed on shaft 60 which turns in suitable bearings, not shown, in the upper and lower walls 16 and 26 of compartment 21.

An arm 65 pivoted to the casing by pivot 66 carries a pressure roller 67 which is yieldably pressed against the upper front surface of the disc 34 by a spring 68 disposed on a rod 69 attached to the casing, the spring being disposed between arm 65 and an adjustment nut 70 threaded on the outer end of the rod by which the pressure exerted by roller 67 on disc 34 may be adjusted.

A similar pressure roller arrangement is provided for the lower rear surface of disc 34 which comprises a pivoted arm 75, partly shown in section in Fig. 3, which supports a pressure roller 76 engaging disc 34. A spring 77 disposed on rod 78 between pivoted arm 75 and adjusting nut 79 threaded on rod 78 adjustably presses roller 76 against the surface of disc 34. Pressure rollers 65 and 76 maintain the balls of the respective ball carriages pressed between the disc and the associated rollers 37 and 50.

It will be understood that disc 34 is supported for rotation about a fixed axis by means of the various rollers described above. Either ball carriage may be positioned at any desired radial distance from the center of the disc, since no supporting shaft is attached to either side of disc 34.

For some purposes, a single multiple variable speed drive unit of the kind disclosed herein

may be used in place of two conventional variable speed drives. For instance, with roller 50 driven at a constant speed, as by the motor designated CSM, roller 37 may be driven at a speed which is a function of two different quantities, as respectively set up by lead screws 59 and 44. Thus if the distance of ball carriage 52 from the disc center is proportional to an independent variable T, the disc speed will be proportional to 1/T; and if the distance of ball carriage 45 from the disc center is proportional to another independent variable R, then the speed of the roller 37 will be proportional to the quotient of these two variables, or R/T.

Since many changes could be made in the above construction and many apparently widely different embodiments of this invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. A variable speed drive comprising a disc, bearing means disposed about the edge of the disc supporting the disc for rotation, a pair of rollers supported respectively on opposite sides of the disc, a movable cooperating ball carriage disposed between each roller and the surface of the disc, said ball carriages including balls for drivably coupling said disc and said rollers, and guideway means for the respective ball carriages in which the ball carriages are respectively displaceable from the axis of the disc toward the periphery thereof.

2. A variable speed drive comprising a disc, bearing means disposed about the edge of the disc supporting the disc for rotation, a pair of rollers supported respectively on opposite sides of the disc, a pair of ball carriage mechanisms each including balls respectively drivably coupling the rollers with the surface of the disc, and guideway means for the ball carriages so disposed that the ball carriages may be moved radially on the surface of the disc to and from the center thereof.

3. A variable speed drive comprising a disc, bearing means disposed about the edge of the disc supporting the disc for rotation, a pair of rollers supported respectively on opposite sides of the disc, a movable cooperating ball carriage disposed between each roller and the surface of the disc, said ball carriages including balls for drivably coupling said disc and said rollers, and guideway means for at least one of the ball carriages in which the latter is displaceable from the center of the disc toward the periphery thereof.

4. A variable speed drive comprising a disc, bearing means disposed about the edge of the disc supporting the disc for rotation, a pair of rollers disposed respectively on opposite sides of the disc, a pair of ball carriage mechanisms each including balls respectively drivably coupling the rollers with the surface of the disc, and guideway means for at least one of the ball carriages so disposed as to permit movement thereof radially of the disc to and fro from the center thereof.

5. A variable speed drive comprising a disc, bearing means disposed about the edge of the disc supporting the disc for rotation, a pair of rollers supported respectively on opposite sides of the disc, a movable cooperating ball carriage disposed between each roller and the surface of

the disc, said ball carriages including balls for drivably coupling said disc and said rollers, guideway means for at least one of the ball carriages in which the latter is displaceable from the center of the disc toward the periphery thereof, and spring pressed roller means engaging the surface of the disc for pressing the latter against the balls of the respective ball carriages.

6. A variable speed drive unit comprising a casing formed with outer compartments at opposite sides thereof and a relatively narrow inner compartment disposed therebetween, a disc disposed for rotation in the inner compartment, a roller in each outer compartment supported by the casing to turn about an axis spaced from and parallel to the surface of the disc, and a ball and ball carriage disposed between each roller and the disc cooperating therewith.

7. A variable speed drive unit comprising a casing formed with a pair of outer compartments and a communicating inner compartment disposed therebetween, a disc disposed in the inner compartment, roller bearing means attached to the casing and disposed remote from the center of the disc for supporting the disc for rotation, a roller in each outer compartment supported by the casing to turn about an axis spaced from and parallel to the surface of the disc, a ball and ball carriage disposed between each roller and the disc cooperating therewith, and spring actuated pressure roller means supported by the casing and engaging the disc for pressing the latter against the balls of the respective ball carriages.

8. A variable speed drive comprising a casing formed with a pair of compartments respectively on opposite sides thereof and a relatively narrow inner compartment communicating therewith and disposed therebetween, a disc disposed in the inner compartment, roller bearing means attached to the casing so disposed as to engage the disc remote from the center thereof for supporting the disc for rotation, a roller in each outer compartment supported by the casing to turn about an axis spaced from and parallel to the surface of the disc, a ball and ball carriage for each roller cooperating with the disc, and a guideway for each of the ball carriages, at least one of which is so disposed that the ball carriage thereon can be moved radially of the disc to and fro from the axis of the disc.

9. A variable speed drive comprising a casing formed with a pair of compartments respectively on opposite sides thereof and a relatively narrow inner compartment communicating therewith and disposed therebetween, a disc disposed in the inner compartment, roller bearing means attached to the casing so disposed as to engage the disc remote from the center thereof for supporting the disc for rotation, a roller in each outer compartment supported by the casing to turn about an axis spaced from and parallel to the surface of the disc, a ball and ball carriage for each roller cooperating with the disc, a guideway for each of the ball carriages so disposed that the carriages may be moved from the center of the disc toward the periphery thereof, and means for rotating the disc through one of said ball and ball carriages comprising a motor connected to drive one of the rollers.

10. A variable speed drive comprising a disc, means for rotatably supporting said disc, a pair of rollers supported respectively on opposite sides of said disc, a moveable ball and ball carriage disposed between each of said rollers and the

respective carriages for supporting and guiding both of said carriages to move along a diameter of said disc and from a position at the axis thereof toward the periphery thereof.

11. A multiple variable speed drive comprising a disc, means for rotatably mounting said disc, an input roller supported on one side of said disc, driving means connected to said roller for rotating the same, a first displaceable ball and ball carriage mechanism drivably coupling said input roller and said disc, an output roller supported on the opposite side of said disc, and a second displaceable ball and ball carriage mechanism drivably coupling said disc and said output roller, whereby the rotation of the output roller is proportional to the displacements of said first and second ball carriage mechanisms from the center of said disc.

12. A multiple variable speed drive comprising a disc, means for rotatably mounting said disc, an input roller supported on one side of said disc, driving means connected to said roller for rotating the same, a first displaceable ball and ball carriage mechanism drivably coupling said input roller and said disc, means cooperable with said carriage mechanism for displacing said carriage mechanism to and from the center of said disc, an output roller supported on the opposite side of said disc, and a second displaceable ball and ball carriage mechanism drivably coupling said disc and said output roller, means cooperable with said second ball carriage mechanism for displacing the same to and from the center of said disc, whereby the rotation of said output roller is proportional to the displacements of said first and second carriage mechanism from the center of said disc.

13. A multiple variable speed drive comprising a disc, means for peripherally and rotatably supporting said disc, a pair of rollers disposed on each side of said disc, and a pair of movable ball carriages each including cooperating balls respectively drivably coupling the rollers with said disc.

14. A multiple variable speed drive comprising a disc, means for peripherally and rotatably supporting said disc, a pair of rollers disposed on each side of said disc, a pair of movable ball carriages each including cooperating balls respectively drivably coupling said rollers and said disc, and means connected to one of said rollers for driving the same.

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