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MULTIPLE THROTTLE CONTROL

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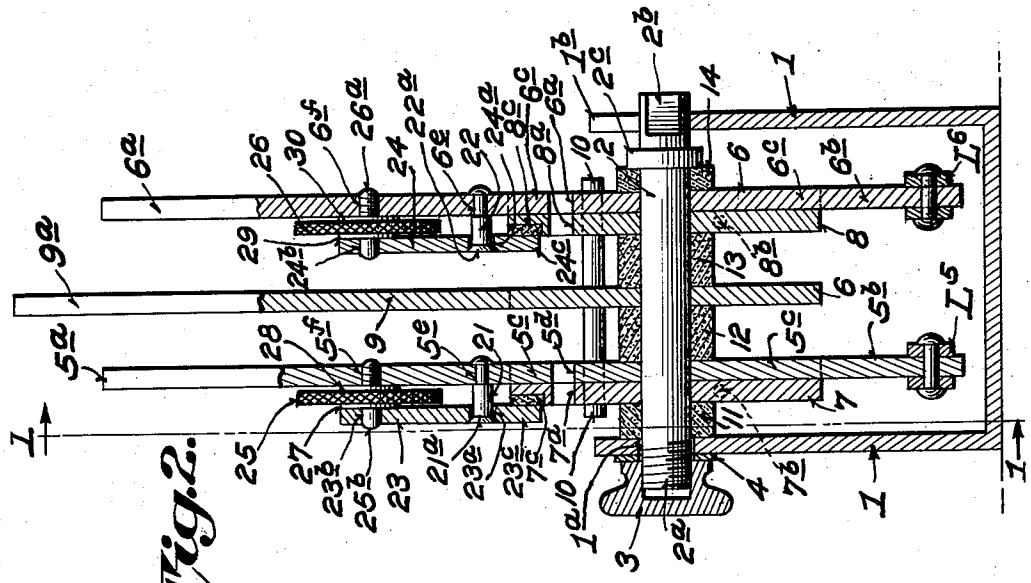


Fig. 2.

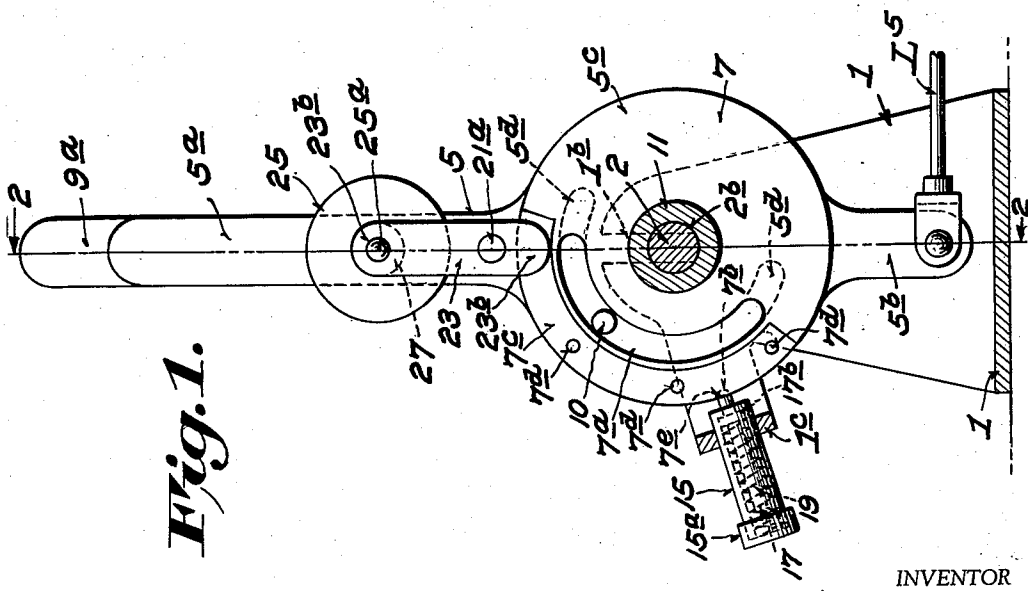


Fig. 1.

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## MULTIPLE THROTTLE CONTROL

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7 Claims. (Cl. 74—480)

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My invention relates to improvements in throttle control means for multiple-engine aircraft, boats, or stationary machinery wherein it is desirable to be able to conveniently set all the engines to the same number of revolutions per minute by means of a single control lever.

The principal object of my invention is to provide a throttle control means whereby the throttles for the individual engines may first be adjusted to synchronism and then may be simultaneously advanced or retarded to maintain the synchronism by the moving of a single master control lever.

Another object of the invention is to provide a control mechanism of the character described having an individual control lever for each engine, which engine levers are moved simultaneously by the master control lever, but which engine levers may be individually retarded without disturbing the setting of the other engine control levers in the event that trouble developes with respect to one engine making it necessary to reduce the speed of the stricken engine.

Still another object of my invention is to provide a convenient means for setting and maintaining in synchronized adjustment the individual engine throttle settings.

A further object of the invention is to provide a simple and easily operated means for binding all throttle levers in their set positions to prevent vibration from making the levers creep out of adjustment.

In addition, the present invention is intended to be simple, rugged and dependable. Other objects and advantages will become apparent during the following discussion of the drawing, wherein:

Fig. 1 is a side view of the control showing all the levers in vertically aligned position, the view being taken along line 1—1 of Fig. 2.

Fig. 2 is a sectional view of the control taken along line 2—2 of Fig. 1.

Referring to the drawing, the control unit comprises a U-shaped frame 1 having a bore 1*a* in one side, and having an oppositely disposed slot 1*b* in the other side. A shaft 2 is supported near its end in the bore 1*a* and slot 1*b*, the shaft having threads 2*a* at the end which pass through the bore 1*a*, and having opposed flats 2*b* adapted to pass through and engage the slot 1*b* to prevent rotation of the shaft 2. Near the flatted end 2*b* of the shaft, is an annular collar 2*c* and at the other end of the shaft is a knob 3 having internal threads which engage the threads 2*a* of the shaft so that when the knob is tightened the

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shaft is pulled leftwardly in Fig. 2 for the purpose hereinafter discussed. A washer 4 is disposed between the knob 3 and the frame 1.

The shaft 2 supports, in the embodiment shown, two engine throttle levers 5 and 6, respectively, the levers having handles 5*a* and 6*a*, lugs 5*b* and 6*b* opposite said handles and pivotally attached at their outer ends to the engine throttle linkages L5 and L6 (which linkages from no part of the present invention), and having circular center portions 5*c* and 6*c* journaled at their respective centers on the shaft 2.

Adjacent each of the levers 5 and 6, and also journaled at their centers on shaft 2, are idler discs 7 and 8, respectively, having circumferentially disposed slots 7*a* and 8*a* which register with circumferentially disposed slots 5*d* and 6*d* located respectively in the adjacent levers 5 and 6. The slots 5*d* and 6*d*, however, are longer than the slots 7*a* and 8*a*, as shown in Fig. 1.

Between the two lever and idler assemblies mentioned above is a master control lever 9 having a handle 9*a* and having a circular body portion 9*b* journaled at its center on the shaft 2. A rod 10 is fixedly mounted in an offset position through the circular body portion 9*b* so that the rod passes through the respective slots 7*a*, 5*d*, 8*a*, and 6*d* for the purpose hereinafter stated. The spacing between the respective members 7, 5, 9, 8 and 6 is maintained by fibre spacers 11, 12, 13 and 14 journaled on shaft 2.

Across the front of the frame 1 is a bracket 1*c* attached at its ends to the respective upright ends of the frame so that the face of the bracket 1*c* is normal to a radial line from the axis of the shaft 2. A pair of tubes 15 and 16 are respectively mounted through said bracket 1*c*, the axes of the tubes being radially disposed with respect to the axis of the shaft 2 and the tubes being in lines with the outer edges of the idler discs 7 and 8, tube 15 opposite the disc 7 and the tube 16 opposite the disc 8. The outer ends of the tubes are respectively closed by caps 15*a* and 16*a* while within the tubes 15 and 16 are detent pins 17 and 18, respectively, loaded by springs 19 and 20 to yieldably urge the pins 17 and 18 inwardly toward shaft 2. The inner ends 17*a* and 18*a* are rounded hemispherically and collars 17*b* and 18*b* are adapted to prevent the respective pins from jumping out of tubes 15 and 16 respectively. The members 16, 18 and 20 are identical to the members 15, 17 and 19 respectively but are opposite the disc 8, and are not shown in the drawing. The discs 7 and 8 respectively have on their outer cylindrical surfaces hemispherical de-

pressions 7b and 8b located in predetermined relation with respect to the slots 7a and 8a, said depresisons 7b and 8b being adapted to receive the detent pins 17 and 18 at their rounded ends 17a and 18a when the discs are rotated so that the said depressions 7b and 8b are opposite the tubes 15 and 16, and when so disposed, the slots 7a and 8a are opposite each other and angularly aligned about the axis of the shaft 2.

The handles 5a and 6a respectively have bores 5e and 6e wherein rivets 21 and 22 are fixed, the rivets 21 and 22 having their outer ends enlarged as at 21a and 22a respectively. A pair of locking pawls 23 and 24 are provided with bores 23a and 24a having conical outer ends adapted to receive the enlarged rivet ends 21a and 22a which ends prevent the disengagement of the pawls 23 and 24 but at the same time provide a loose fit. Near the outer ends of the pawls 23 and 24 are bores 23b and 24b opposite bores 5f and 6f, the latter bores having left-handed internal threads. A pair of locking wheels 25 and 26 having shafts 25a and 26a extending through their centers are provided so that the pawls 23 and 24 may be forced away from the handles 5a and 6a, respectively, one end of each shaft having left-handed threads engaging the threads in bores 5f and 6f, respectively, and the other ends of the shafts being journaled in the bores 23b and 24b. Washers 27, 28, 29 and 30 are provided on the shafts 25a and 26a. The inner ends 23c and 24c of the pawls 23 and 24 overlie the discs 7 and 8 which are provided with friction inserts 7c and 8c respectively, for the purpose hereinafter described, the friction inserts being held in place by rivets 7d and 8d.

Operationally, the performance is as follows: The device is secured at the base of frame 1 to the instrument panel, and the throttle linkages L5 and L6 are connected to the lugs 5b and 6b as shown in the drawing. The knurled locking wheels 25 and 26 are loosened by turning them so that the wheels approach the handle levers 5a and 6a. This loosens the pawls 23 and 24 and permits the discs 7 and 8 to turn free of the levers 5 and 6 on the shaft 2. The master lever 9 is then rotated about shaft 2 so that the rod 10 engages the ends of the slots 7a and 8a and moves the discs 7 and 8 around until the ends of the detent pins 17a and 18a drop into the depressions 7b and 8b on the edges of the discs 7 and 8. The discs are now lined up so that the slots 7a and 8a are exactly opposite each other and parallel. At this point the first engine is brought up to the speed at which it is to be operated by advancing the throttle lever 7. The knurled wheel 25 is rotated so that it presses the pawl 23 leftwardly in Fig. 2 and locks the lever 5 to the disc 7 by pressing the inner end of the pawl 23c against the friction insert 7c on the disc 7. Then the second engine is brought up to speed; the first engine either being retarded or left at operating speed. The locking of the throttle 6 to the disc 8 is then accomplished by the knurled wheel 26 acting on the pawl 24 in the manner above described. Usually, the throttle handles 5a and 6a will be around 10° or 15° advanced of center when operating speed is reached. The knob 3 is used to adjust the drag resisting a change in throttle position. It may be seen from Fig. 2 that when the knob 3 is tightened on the threads 2a of the shaft 2 the shaft is pulled leftwardly so that the collar 2c is pressed against the spacer 14 compressing



the other spacers 11, 12 and 13 and binding the hubs of the elements 7, 5, 9, 8 and 6.

With the knob 3 set for the proper drag, and the pawls 23 and 24 locking the disks 7 and 8 to throttle levers 5 and 6, respectively, the speed of the engines may simultaneously be controlled by the master lever 9, the rod 10 passing through the respective slots 7a, 5d, 8a and 6c. The rod 10 moves with the master lever 9 so that when the lever 9 is advanced, the rod 10 travels in the slots 7a and 8a until it reaches the upper ends, Fig. 1, of the slots. Here, the rod 10 engages the slots and causes the discs 7 and 8 to rotate with the lever 9, the motion of the discs being imparted to the throttle levers 5 and 6 to which they are locked. When the master lever is retarded, the rod 10 moves to the bottom, Fig. 1, of the slots 7a and 8a and then picks up the throttle assemblies and retards them. The length of the slots is such as to permit the levers 5 and 6 to be turned to any angle with respect to each other, if so desired, to correct for a cross wind in an airplane or to permit the reduction in speed of one engine if trouble develops therein. The purpose of the detents 17a and 7b, and 18a and 8b is to provide a reference position to which the discs 7 and 8 may be initially set when the adjustment is first being made, and which will retain the discs in the detent position while the throttles 5 and 6 are being moved independently of the discs 7 and 8.

Although the drawing shows only two throttles, it is apparent that any number desired may be mounted on the shaft 2 and that these may be operated by the master lever 9. It is only necessary to extend the length of the rod 10 to engage the increased number of throttle levers and discs.

I do not limit the scope of my invention to the exact form shown in the drawing, for obviously changes may be made within the scope of the claims.

I claim:

1. A throttle control device for multiple-engine installations, each engine having a throttle-control linkage; comprising a frame; a shaft extending through said frame; a throttle-control lever for each engine journaled on said shaft and operatively connected to the throttle-control linkage of said engine; a master-control lever journaled on said shaft and having an offset rod fixed through it parallel to the shaft and extending laterally beyond said throttle-control levers; an idler disc journaled on the shaft adjacent each control lever, each disc having a circumferential slot receiving said rod, the length of the slot extending through the angle of maximum throw of the throttle-control lever plus the diameter of the rod, and the respective throttle-control levers being cut away to afford lateral clearance to said slots; and means for locking each of said discs to its adjacent throttle-control lever so that when the master-control lever is moved, the rod simultaneously imparts rotation to said discs which in turn move their respective control levers in unison.

2. In a device as set forth in claim 1, means on said shaft for adjusting the frictional drag resisting rotation of the elements journaled thereon.

3. In a device as set forth in claim 2, said means comprising opposed flats at one end of said shaft, said frame having a flattened hole engaging said shaft on said opposed flats to prevent rotation of said shaft, a collar fixed on said shaft

near the flattened end; spacing collars journaled on said shaft between said adjacent disc-lever assemblies and between said assemblies and said master-lever; threads on the other end of said shaft outside said frame; and threaded knob means on said shaft threads adapted when tightened to pull the shaft axially so that the fixed collar on the shaft tightens and compresses said journaled collars to increase the friction between those collars and the journaled levers and discs.

4. In a device as set forth in claim 1, detent means for yieldably holding the said discs in an indexed position so that the respective slots are all laterally aligned.

5. In a device as set forth in claim 4, said detent means comprising a bracket across the frame parallel to the shaft, the bracket having a hole opposite the edge of each disc; a tube mounted in each hole, the axis of each tube lying along a radial from said shaft; a spring-loaded captivated detent pin in each tube yieldably urged toward said shaft, the inner end of each pin being hemispherical; and each disc having a hemispherical detent depression in its outer edge adapted to receive the opposed detent pin when the disc is in indexed position.

6. In a device as set forth in claim 1, said locking means comprising a pawl pivotally secured



near its center to each throttle-control lever, the inner end of the pawl overlying the outer periphery of the adjacent disc, and each pawl having a hole near its outer end, said hole registering with a threaded hole through the adjacent throttle-control lever; a shaft transfixing said holes, the shaft being threaded at one end to engage said threaded hole; and a knurled wheel fixed on each shaft between said pawl and said lever so that when the shaft is unscrewed, the wheel bears against the pawl forcing the outer end of the pawl away from the lever and compressing the inner end of the pawl against the disc.

7. In a device as set forth in claim 6, a friction pad attached on the outer periphery of each disc underlying the inner end of the pawl.

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