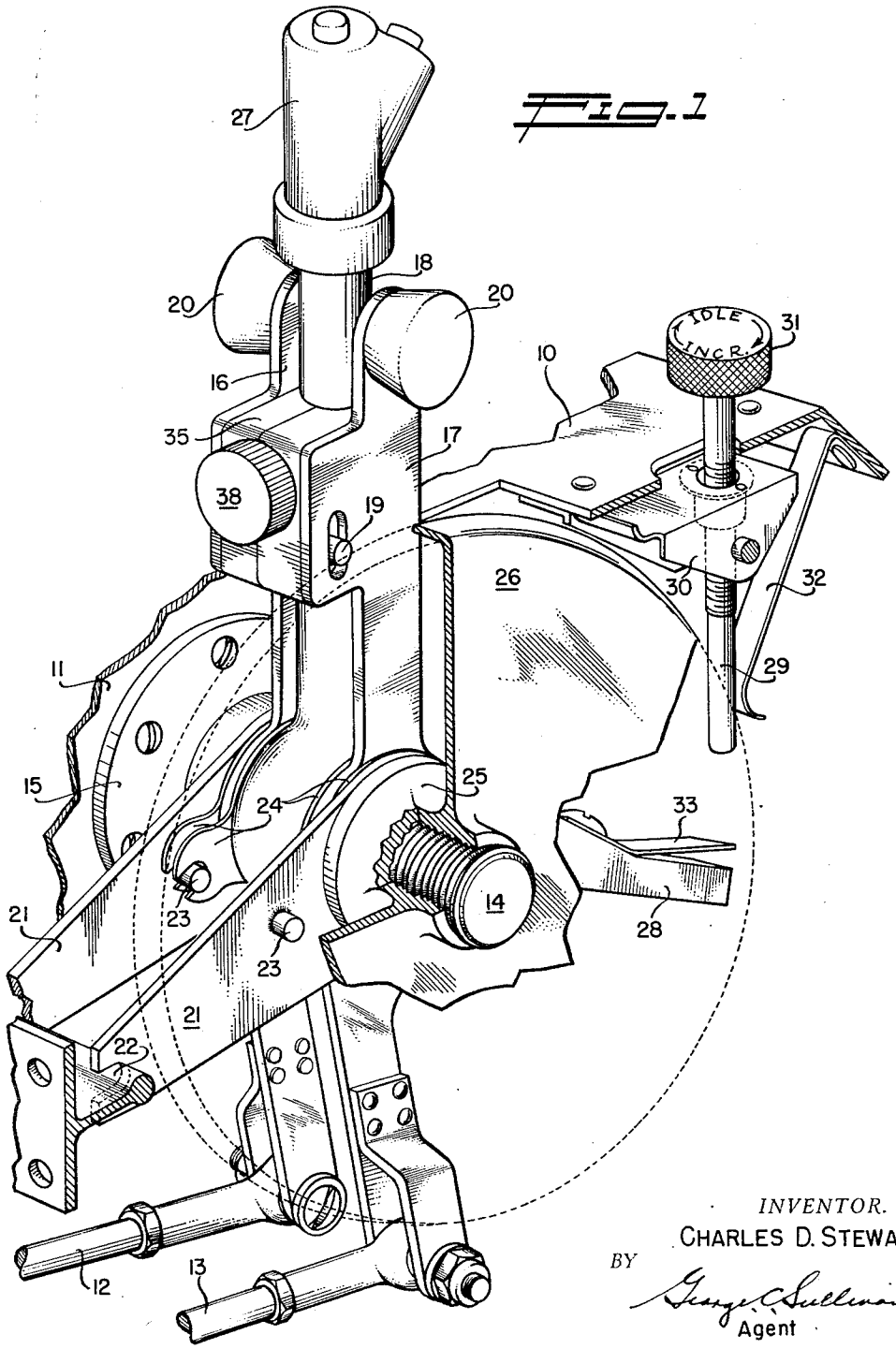
Oct. 14, 1952 C. D. STEWART 2,613,547

DUAL THROTTLE CONTROL

Filed Dec. 7, 1948 2 SHEETS—SHEET 1

Fig. 1



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Fig. 2

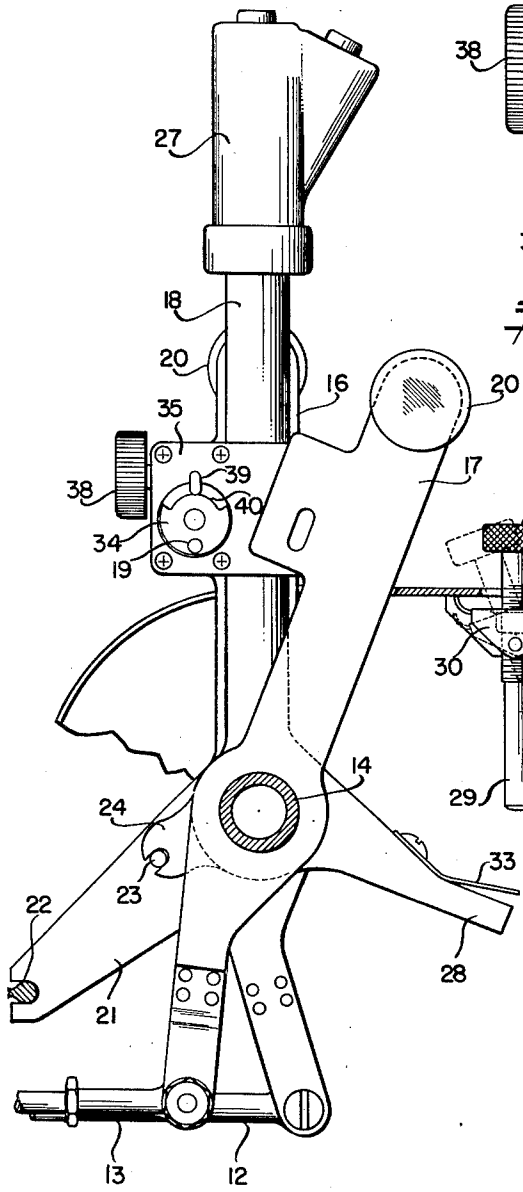


Fig. 3

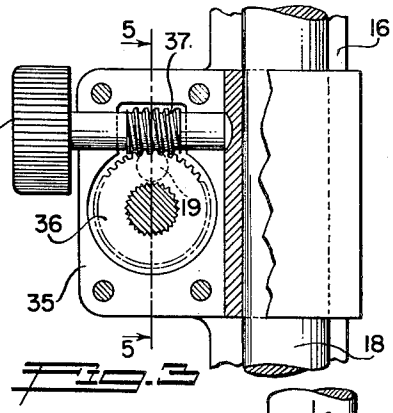


Fig. 4

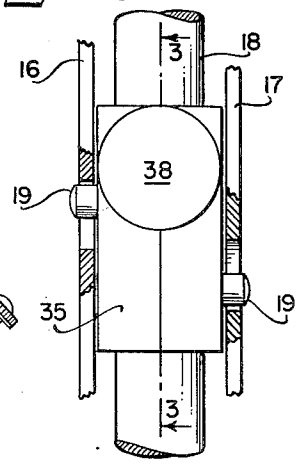
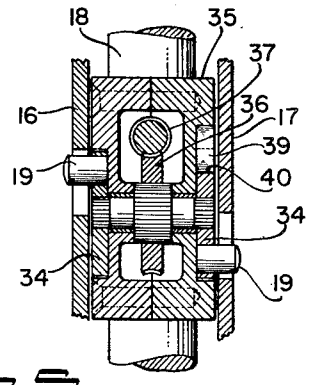


Fig. 5



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DUAL THROTTLE CONTROL

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3 Claims. (Cl. 74—471)

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This invention relates to an improved throttle control providing for the normal operation of two powerplants as a unit from a single master control lever, with provisions for close adjustment of synchronism, and overriding individual controls operable at the will of the pilot.

In multi-engined aircraft it has heretofore been the practice to provide individual throttle levers positioned side by side for simultaneous or individual operation by one hand of the pilot, the powerplants being substantially synchronized by minor independent movements thereof and/or thereafter accurately synchronized by speed responsive devices driven by the separate powerplants. Any of the powerplants could be separately shut down or operated, as in the case it was desired to assist in ground maneuvering. In twin engined single pilot aircraft, on the other hand, it is desirable to add other controls to the throttle lever, which would not be practical with separate levers, so that it has been necessary for the pilot to shift his hand from the throttles to adjacent separate controls for such auxiliary functions which ideally should be operable simultaneously with the throttle.

It is accordingly an object of this invention to provide a single master throttle lever or handle control having provisions for simultaneous and overriding individual adjustments or operation of the throttle or control levers for separate powerplants. The control lever for conventional type piston engines is commonly called the throttle as it operates a valve in the intake duct thereof. For convenience in what follows I am using the term throttle to also refer to the control lever of jet or propeller drive turbine powerplants where such levers control the fuel supply and when moved past the idle position cut off the fuel supply to stop such engines. While the embodiment hereinafter disclosed is primarily designed for the control of such turbine powerplants, it is equally suitable for use in controlling piston type engines. Such a master throttle control permits the addition of auxiliary controls to the hand grip thereof, which grip may carry switches and may be longitudinally and/or rotatably movable to control still other functions interrelated to the throttle control of the powerplant.

It is a further object of this invention to provide a master throttle control lever normally used to simultaneously operate individual slave throttle levers, which levers are disengageable from the master control for individual operation at the will of the pilot. A further refinement of this object is to provide a differential control for

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adjusting the position of the slave throttle levers relative to the master control lever whereby to enable close synchronization of the separate powerplants at any point in their range of operation.

It is also an object of this invention to provide a master throttle control of the type described incorporating an adjustable and releasable idling position stop, the release of which stop can be accomplished by a predetermined movement of the pilot's throttle hand without necessitating a release of the flying controls by the pilot's other hand.

It is also an object of this invention to provide a master and slave throttle control lever arrangement of the type described wherein the individual levers are subjected to an adjustable braking force adequate to maintain any relative adjustment of an individual lever unaffected by movements of the other levers.

Other and further objects and advantages of my invention will appear as the description of a selected embodiment thereof proceeds, and my invention is not limited to the specific device to be now described.

In the drawings:

Figure 1 is a perspective view, partly broken away for clearness, of a master and slave throttle lever arrangement embodying a specific form of my invention;

Figure 2 is a side elevation of the device of Figure 1, with parts omitted for clearness;

Figure 3 is a central vertical section on the line 3—3 of Figure 4, showing details of the synchronizing adjustment;

Figure 4 is a fragmentary view from the left of Figure 2 showing the synchronizing adjustment mechanism to an enlarged scale; and

Figure 5 is a section on the line 5—5 of Figure 3.

As shown on the drawings, the throttle control of this invention is intended to be built into a side shelf 10 in the cockpit 11 of an airplane (not shown), and is intended to operate individual powerplant control rods 12 and 13 which extend to the powerplants themselves. In the case of piston type engines these rods would operate throttle valves for fuel injection controls, and in the case of turbine powerplants would operate fuel injection controls. For convenience, I will hereinafter refer to these controls as throttle controls.

In Figure 1 the throttle levers to be later described are pivoted on a stationary shaft 14 mounted by means of a flange 15 on the wall of

the cockpit 11, the shaft being shown as substantially horizontal and normal to the centerline of the cockpit. Rotatably assembled approximately midway of the length of the shaft are a pair of slave throttle levers 16 and 17 disposed on either side of a central master throttle lever 18. The slave levers 16 and 17 are of relatively thin section of a material sufficiently spring-like to enable the pilot to disconnect either lever from pins 19 associated with the master lever 18, by pulling outwardly on knobs 20 carried by the upper ends of the slave levers. These levers 16 and 17 are connected at their lower ends to the rods 12 and 13. As shown in Figure 1, clockwise movements of the levers 16, 17 and 18 tend to open the throttles of the powerplants, and counterclockwise motion of these levers closes the throttles.

Interposed between the slave lever 16 and the flange 15 is a stationary brake element 21 anchored to fixed structure at 22. This element 21 has a pin 23 which holds stationary a pair of discs 24 on either side of the lever 16. A second identical element 21 similarly holds stationary a second pair of the discs 24, located on either side of the other slave lever 17. Adjustable braking pressure is put on this assemblage by a hub 25 of a hand wheel 26 which hub is threaded on the shaft 14 and may be tightened as desired by the pilot to give sufficient friction for smooth operation of the levers and/or to hold them in their adjusted position if it is desired to take the hand off the master lever. The provision of stationary discs 24 between each of the movable parts assures that if either slave lever 16 or 17 is disconnected from the master lever it will remain in its set position, unaffected by subsequent movements of the master lever.

As described so far, the normal operation of the master lever carries both slave levers with it and the pilot merely has to grasp and push or pull on a knob 27 carried by the upper end of the master lever 18, which knob also may be rotatable and/or slidable on the lever 18 to actuate other accessory controls unrelated to the present disclosure. If it is desired to idle or shut down one powerplant, its slave lever 16 or 17 is pulled sideways to disconnect it from the pin 19 on the master lever, and the slave lever would then be moved counterclockwise. As shown in Figure 2, the slave lever 17 has been moved clockwise to open its throttle, a less likely but possible procedure, so shown for convenience in the drawing layout. Thereafter, control of the other powerplant would continue to be through the master lever.

The lever 18 carries an angularly disposed arm 28 at its lower end which forms an idling stop against the lower end of an adjustable screw 29 mounted in a pivoted nut bracket 30 and having a head 31 projecting through a slot in the shelf 10. A spring 32 normally holds the screw 29 vertical in a position to intercept the end of the arm 28, thus defining the idling position. A light spring 33, on top of the arm 28 facilitates the release of the idling stop when it is desired to move the master lever 18 beyond that stop to shut down the powerplant. This spring 33 is adapted to be depressed upon pressure of the arm 28 towards the idle stop 29 and the brake knob 26 can be set tight enough to hold the lever 18 in such position, so that the pilot can momentarily shift his throttle hand from the grip 27 to pull the knob 31 shifting the idle stop 29 off the spring 33 and clear of the end of the arm 28, in which position the spring 33 will move up to hold the idle stop in its released position to permit a return of the pilot's hand to the grip 27 to continue the counterclockwise movement of the throttle lever past its idle position to shut down the powerplants.

The pins 19, which normally lock the slave levers 16 and 17 for movement with the master lever 13, form, in effect, diametrically opposed crank pins projecting from crank discs 34 flush with the sides of a member 35 carried by the master lever 18. The member 35 is conveniently split on its center line and serves to support the discs 34 and a central worm gear 36 therebetween, the worm gear being adjustable by means of a worm 37 operated by an external knob 38. In the neutral position the pin 19 on one side disc 34 will be at its top position and the pin 19 on the other disc will be at its bottom position. Rotation of the knob 33 in either direction will move one pin and its associated slave lever in a direction to slightly open its throttle and simultaneously moves the other pin and its associated slave lever in a direction to slightly close its throttle. Thus the two powerplants can be closely synchronized in any position of the master lever, yet either slave lever can be pulled sidewise off its pin 19 and moved independently of the master lever to either open or close the throttle controlled thereby, leaving the master lever free to continue to operate the other slave lever if so desired. A stop 39, carried by the member 35, is adapted to cooperate with a cut-away part of one disc 34 to limit the range of movement thereof as best shown in Figure 2.

It will thus be seen that I have invented an improved and simplified throttle control for dual powerplants wherein either powerplant can be separately operated at will and wherein close synchronization of the separate throttles can be attained without the use of complicated power driven synchronizing apparatus.

I claim:

1. A throttle control arranged to permit both simultaneous and separate control of separate power plants comprising a pivoted master control lever, pivoted slave control levers disposed on either side of said master lever, and operable independently thereof a shaft on which said master and slave levers pivot, said shaft having a flange on one end stationary friction members disposed on both sides of each slave lever, and adjustable handwheel threaded on the free end of said shaft and arranged to compress said friction members and levers together to vary the frictional resistance of said levers to pivotal movement, and means releasably engaging each of said slave levers to said master lever for the operation of either or both of said slave levers by said master lever.

2. A throttle control arranged to permit both simultaneous and separate control of separate power plants comprising a pivoted master control lever, pivoted slave control levers disposed on either side of said master lever, a shaft on which said master and slave levers pivot, stationary friction members disposed on both sides of each slave lever, adjustable means carried on said shaft and arranged to compress said friction members and levers together to vary the frictional resistance of said levers to pivotal movement, means releasably engaging each of said slave levers to said master lever for the operation of either or both of said slave levers by said master lever, and means to differentially adjust the position of said slave

levers relative to the master lever when said slave levers are engaged to said master lever.

3. A throttle control arranged to permit both simultaneous and separate control of separate power plants comprising a pivoted master control lever, pivoted slave control levers disposed on either side of said master lever, a shaft on which said master and slave levers pivot, stationary friction members disposed on both sides of each slave lever, adjustable means carried on said shaft and arranged to compress said friction members and levers together to vary the frictional resistance of said levers to pivotal movement, means carried by the master lever and located between said slave levers comprising a transverse shaft having eccentric pins oppositely disposed and each engageable with one of said slave levers, and means to rotate said shaft to differentially adjust said slave levers relative to the master lever.

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