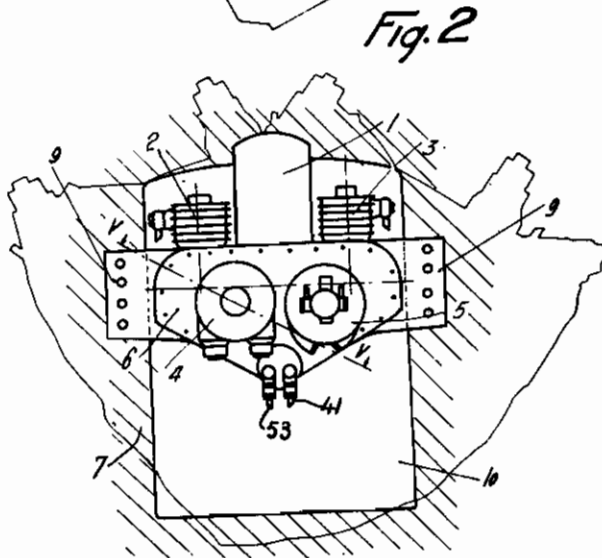
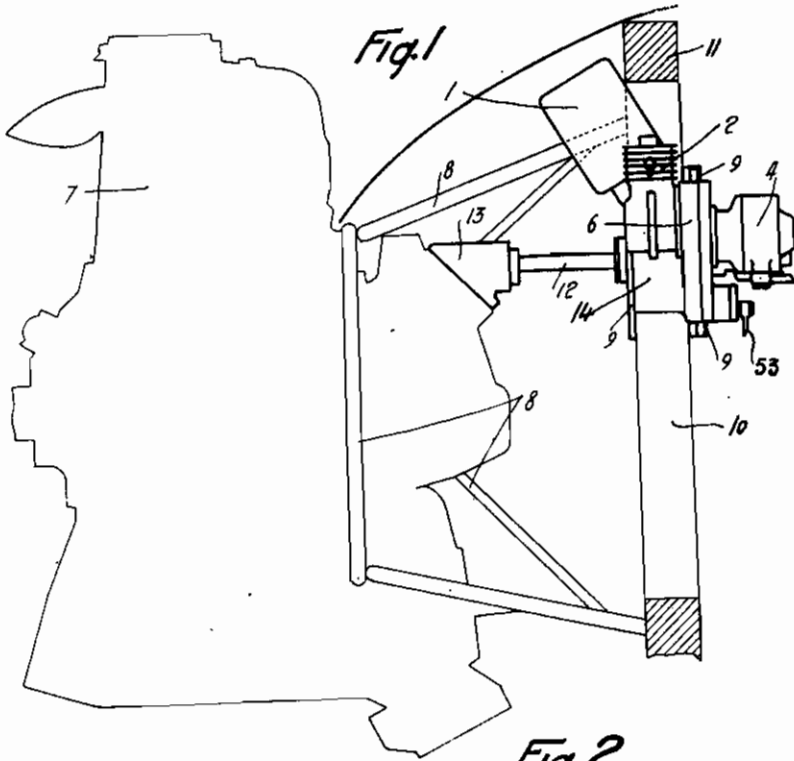


PUBLISHED  
MAY 18, 1943.  
BY A. P. C.

C. R. WASEIGE  
MULTI-DRIVE GEAR BOX  
Filed May 21, 1942

Serial No.  
443,965  
4 Sheets-Sheet 1



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MAY 18, 1943.  
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443,965  
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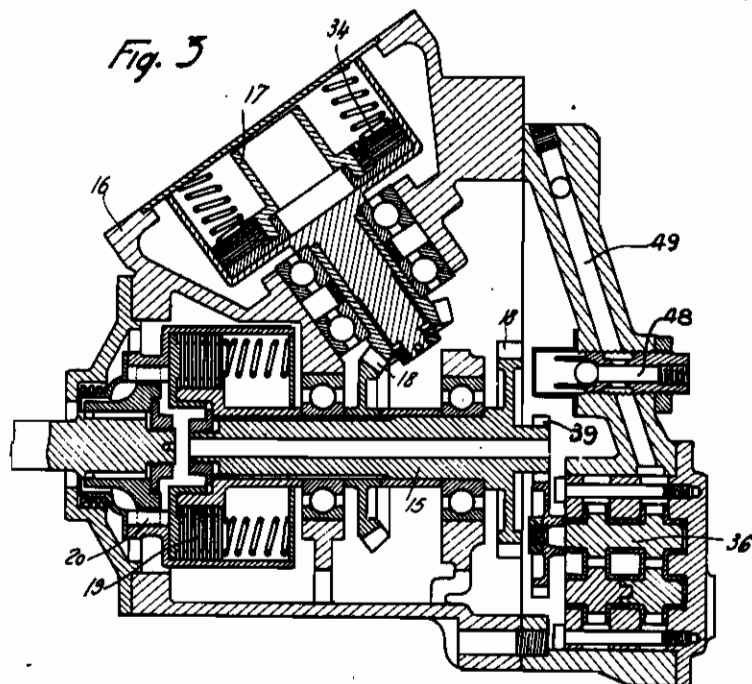
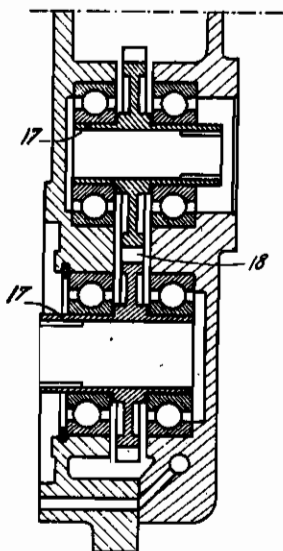


Fig. 3



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443,965  
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Fig. 4

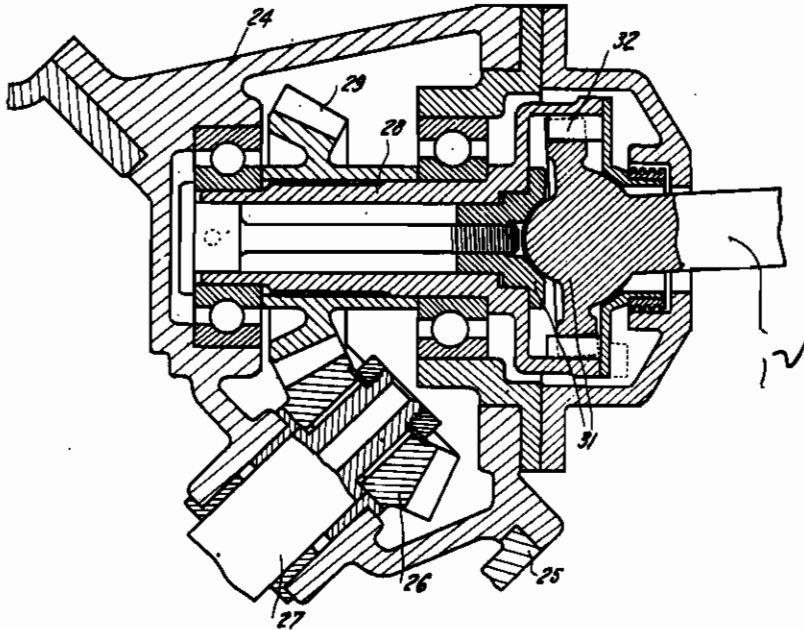
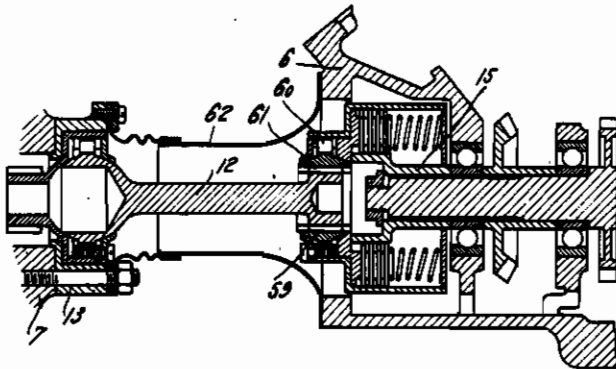


Fig. 6

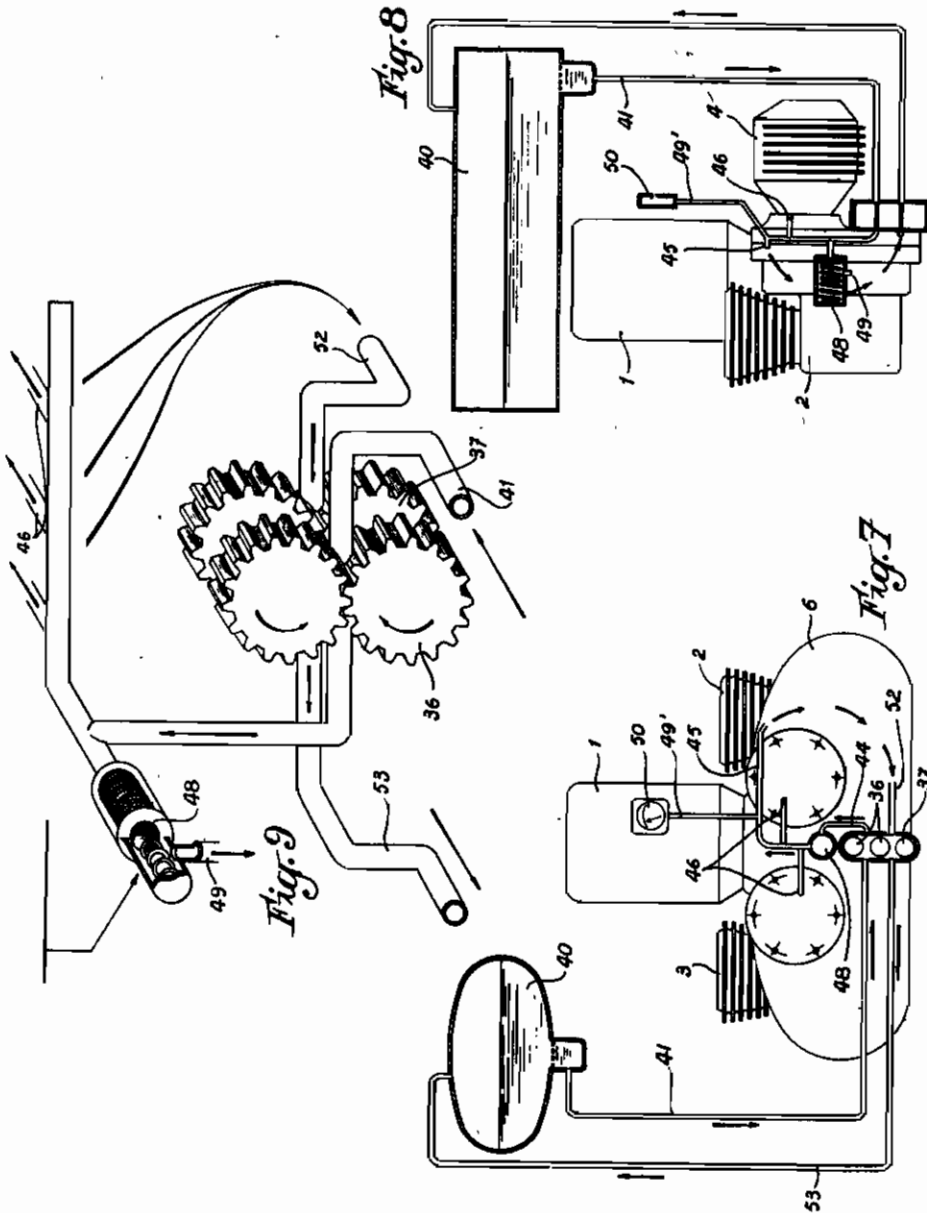


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PUBLISHED  
MAY 18, 1943.  
BY A. P. C.

C. R. WASEIGE  
MULTI-DRIVE GEAR BOX  
Filed May 21, 1942

Serial No.  
443,965  
4 Sheets-Sheet 4



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# ALIEN PROPERTY CUSTODIAN

## MULTI-DRIVE GEAR BOX

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Application filed May 21, 1942

The present application forms a continuation in part application of my co-pending application Serial No. 207,115 filed May 10, 1938.

My invention relates to the mounting of accessories on an aircraft or the like.

It is known that modern aircraft are provided with a number of accessory apparatus such for example as high, medium and low pressure air compressors, vacuum pumps, electric generators, hydraulic pumps, etc., the operation of which is necessary for the operation of numerous instruments.

Hitherto such accessories have generally been directly mounted on the engine, but the multiplicity and variety of said accessories makes such a mounting more and more difficult. Furthermore, engine constructors are in that case obliged to provide on their engines brackets and driving devices which are not always used, in the case of multi-engine aeroplanes, for example. This therefore leads to making rear parts of engines different, according to the use on the aeroplane, and this is very disadvantageous as regards interchangeability.

It has also been proposed to drive these generators by means of electric motors or by auxiliary engines, but these solutions are generally heavy and costly, and do not permit the lubrication of accessories.

My invention has for its object a multidrive gear box designed to removably carry accessories and to supply the same with power and with lubricating oil under pressure so that said accessories are placed under exactly the same conditions as are obtained when they are mounted on an engine.

A further object of my invention is a box of the aforesaid type adapted to be fixed to the structure of the airplane and to be driven by the engine through the medium of a common double Cardan shaft or the like allowing the engine to oscillate or to be displaced relatively to the box.

Other objects of my invention will be apparent in the following description taken with reference to the accompanying drawings, given solely by way of example and in which:

Fig. 1 is a mounting diagram of accessories on an aeroplane in a manner according to the invention;

Fig. 2 is a corresponding partial view looking in the direction of the arrow designated by *f* in Fig. 1;

Fig. 3 is a vertical section, on a larger scale, of the movement take-off box, along the axis of the drive shaft;

Fig. 4 is a similar view to Fig. 3 of the movement take-off on the engine;

Fig. 5 is a partial section along the line designated by V—V in Fig. 2;

Fig. 6 is a view of a modification of the drive shaft;

Figs. 7 and 8 are two sketches showing the lubricating arrangement;

Fig. 9 shows diagrammatically the pump.

In the embodiment shown it has been assumed that five accessories are to be mounted, viz.: an electric generator 1, a high pressure air compressor 2, a medium pressure air compressor 3, a vacuum pump 4 also serving as a low pressure compressor, a hydraulic pump 5 serving for example for supplying jacks not shown. Said five accessories are fixed on the outside of a case of a multidrive gear box 6 which is directly fixed on the structure of the aeroplane in such a manner that it is independent of the engine 7 carried by its supporting frame 8, by means of horizontal cross pieces 9 which are fixed at their ends on the edges of a window 10 provided in the fire-shield partition 11. The box 6 contains a suitable number of output components, five in this case, which are actuated by a common shaft 12 extending from a driving head 13 fixed on the engine above the movement take-off which is provided for this purpose on the back of the engine 7.

The gear box 6 is itself composed of a substantially flat case having a vertical and substantially plane rear face and a front face comprising two plane vertical portions on either side of the central nose 14 serving as a housing for the main shaft 15. It is on said plane faces that the accessories are adapted to be mounted so that they cover the movement take-offs. The central nose 14 furthermore has at its upper part an inclined plane face 16 which serves as a support for the generator 1. The main shaft 15 drives the various accessory devices driving shafts 17 through the intermediary of suitable gears 18 and is itself driven, through the intermediary of a friction coupling 19 forming a torque limiting device, by the drive shaft 12. This latter engages endwise with the driving part of the coupling 19 through the intermediary of splines 20 having a slight play which enables the shaft 12 to take up a slight incline relatively to the shaft 19. Furthermore, the driving splines are shorter than the driven splines so that the shaft 12 can slide longitudinally. At its opposite end, the shaft 12 penetrates into the driving head 13 which is formed by a case 24 fixed on the case 25 of the engine 7 above the movement take-off which is in this case formed by a

bevel pinion 26 the shaft 27 of which is actuated by the engine 7. The case 24 supports a shaft 28 on which is fixed a pinion 29 meshing with the pinion 26 and said shaft 28 is connected to the shaft 12 by a swivel joint 31 and splines 32 similar to the splines 20. The shaft 12 is furthermore so dimensioned as to form a resilient shaft which damps the vibrations and the variations of torque of the engine.

At the end of the shaft 17 which is intended for driving the generator, is arranged a torque limiting device 34 which is adjusted in such a manner that it can only transmit the maximum torque required for normally driving the generator, this being done in order to protect the members of the gear box from the effects of inertia of the rotor of the generator in the event of a sudden stoppage of the engine.

The case of the gear box furthermore contains a double gear pump 36 comprising a first pair of gears 36 forming an oil pump proper, coupled with a further pair of gears 37 forming a scavenging pump (Figs. 3 and 7 to 9). Both said pairs are driven through the intermediary of a toothed wheel 39 by the main shaft 15.

As shown in Fig. 7, the gears 38 suck oil from the oil tank 40, which may be the oil tank of the engine, through the pipe 41 and forces same through a pipe 44 in a lubricating circuit. The said circuit includes on the one hand passages 45 adapted to supply the gears of the box itself and further passages 46 opening in the faces of the case of the box in register with corresponding passages 48—provided in the fixing flanges of the accessories 2, 3, 4, 5, which flanges are pressed against said faces to form a joint therewith. The pipe 44 is in communication with a relief valve 43 provided with an overflow pipe 49 and through a pipe 49' (Figs. 3, 7 and 8) with a pressure gauge 50.

The oil which has lubricated the accessories returns in the case of the gear box through the passage formed for the output component. The said oil, together with the oil used for the lubrication of the gear box is sucked up at the bottom of the case in the inlet pipe 52 of the scavenging pump formed by the gears 37, and is delivered through the pipe 53 to the oil tank 40. The case of the gear box is thus kept dry, thereby preventing losses of oil which are particularly objectionable on board aircraft and the lubrication of the accessories is obtained together with their driving.

In the modification of construction of Fig. 6, a swivel joint 59 is provided to support the end of the drive shaft 12 at the entrance of the movement take-off box 6. In this case the two male and female parts are connected to each other by driving splines 60 which allow them a slight transverse play and the driving part is mounted on the shaft 12 by means of a splined sliding mounting 61. The shaft 12 is furthermore remotely surrounded by a protecting casing 62 having a flexible or resiliently deformable part.

Of course my invention is in no way limited to the constructional details described or illustrated which have only been given by way of example. Thus there may be any number of accessories and they may be distributed in any manner over the common movement take-off box. The swivel jointed modification shown in Fig. 6 can be used for the driving head which is fixed on the engine or again simultaneously on both ends of the shaft 12. The oil pump which forms an autonomous lubricating means for the movement take-off box may also be separately fitted on the outside of the case instead of being incorporated therein.

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