May 19, 1931. J. H. WALLACE 1,806,549

RETRIEVING DEVICE FOR AEROPLANES

Filed Oct. 1, 1928 2 Sheets-Sheet 1

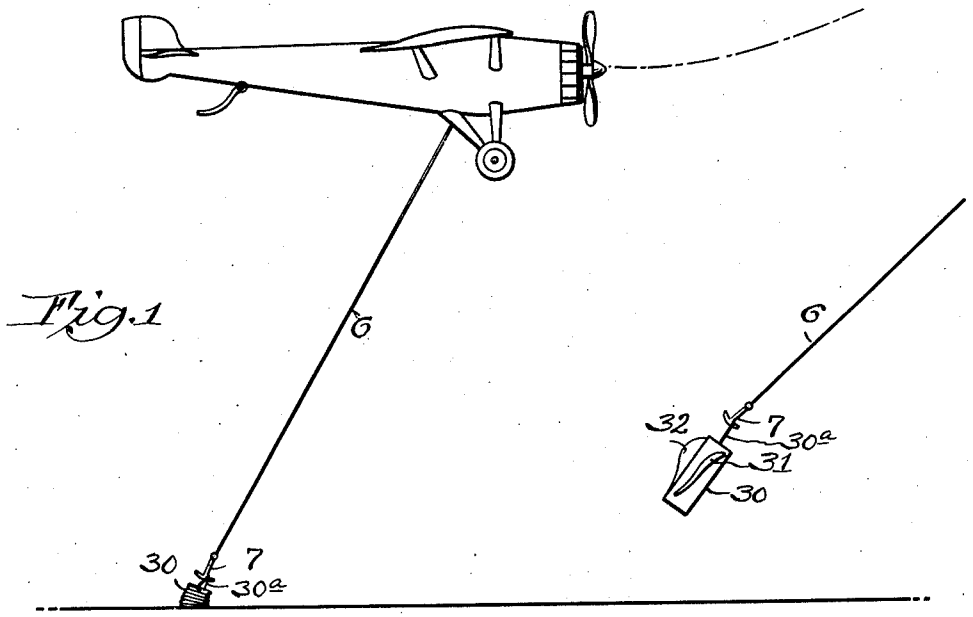

Fig. 1

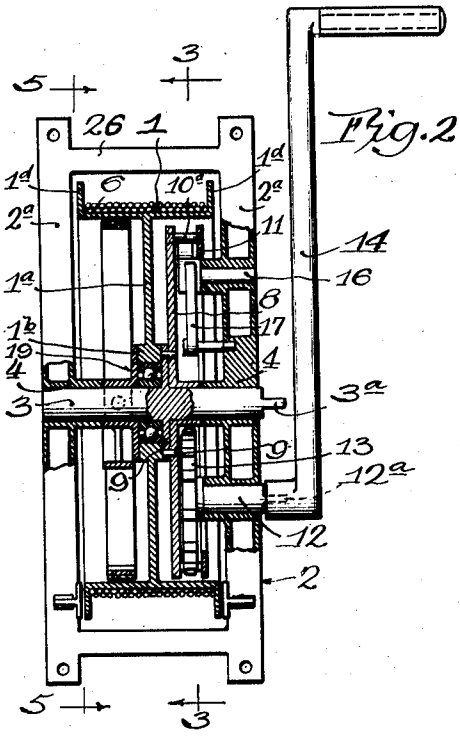

Fig. 2

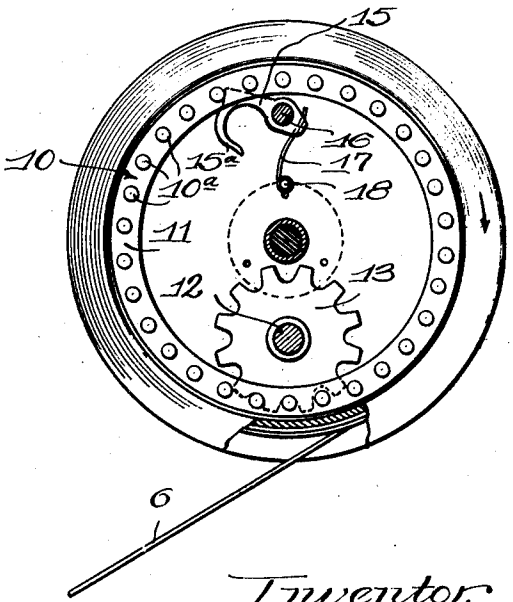

Fig. 3

Witness:
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Fig.5

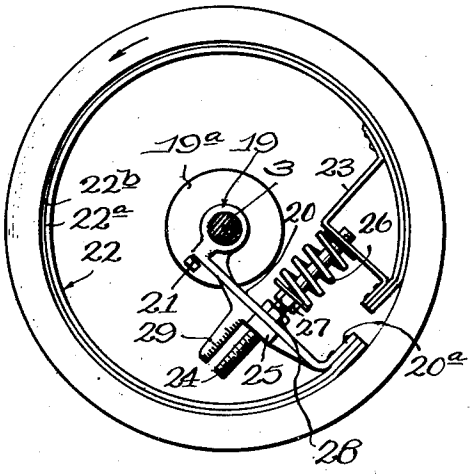


Fig.6

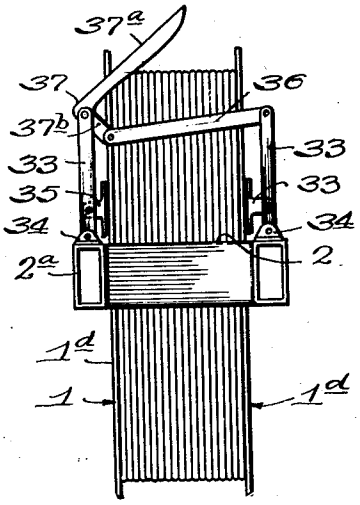


Fig.4

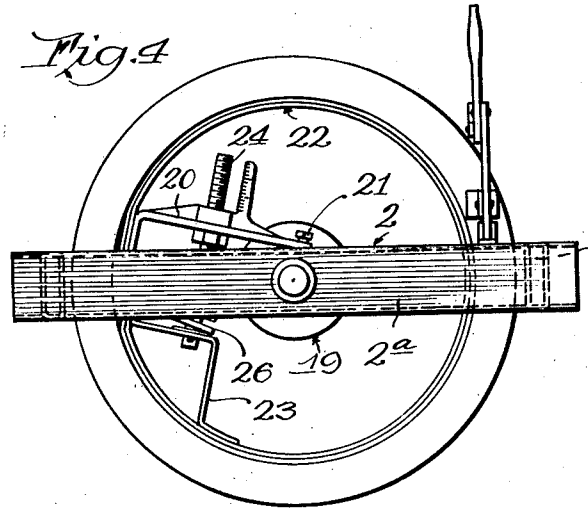
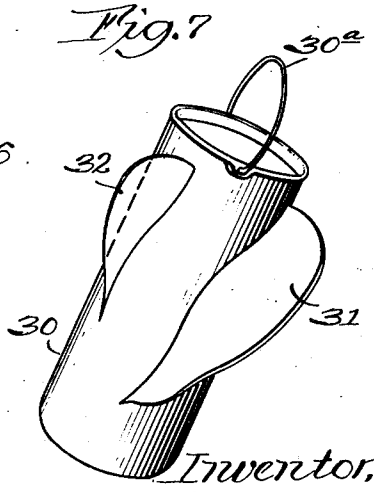


Fig.7



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Patented May 19, 1931

1,806,549

UNITED STATES PATENT OFFICE

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RETRIEVING DEVICE FOR AEROPLANES

Application filed October 1, 1928. Serial No. 309,659.

This invention relates to improvements in devices for retrieving or picking up objects from the ground by a moving aeroplane.

The objects of the invention is to provide improved equipment for aeroplanes, whereby goods, mail, fuel, supplies, and the like can be picked up from the surface of the ground or water while in flight and traveling at high speeds.

A preferred embodiment of the invention is disclosed in the accompanying drawings in which

Figure 1 is a view illustrating the manner in which a load is retrieved.

Figure 2 is a view in cross section of the cable drum and winding mechanism.

Figure 3 is a view in vertical section taken on line 3—3 of Figure 2.

Figure 4 is a view in side elevation of the cable drum showing the brake mechanism.

Figure 5 is a view in vertical section taken on line 5—5 of Figure 2, showing the cable drum and brake mechanism.

Figure 6 is a view in end elevation of the cable drum and frame, showing the auxiliary brake, and

Figure 7 is a perspective view of a bucket or container suitable for the goods to be retrieved.

The retrieving or lifting apparatus is mounted within the fuselage or body of the aeroplane and preferably within a compartment for the purpose. In general the apparatus consists of a drum on which is wound a length of cable which is let out through an opening in the bottom of the aeroplane body, and carries at its end a hook, as illustrated in Figure 1.

The invention, however, provides for more than merely a cable which can be let down and drawn up into the plane by means of a winding drum, inasmuch as means must be provided for slacking away on the cable when contact is made with the load, and until the inertia of the load has been overcome and its speed accelerated to that of the plane. This is accomplished, as will presently be seen, by means of brake mechanism acting on the cable drum, thereby permitting a certain amount of slippage between the drum and the winding mechanism, which can be adjusted to the weight of the load to be lifted or picked up.

The cable drum 1 is supported in a rectangular frame 2 (Figure 2) which is mounted in a horizontal position in the aeroplane body either crosswise or lengthwise thereof, which ever is more convenient. The frame may be of any suitable construction, preferably including a pair of longitudinal frame members 2*a*, 2*a* and cross members 2*b*, 2*b* set in from the ends of the longitudinal frame members.

Extending transversely of the frame is a shaft 3 journalled in bearings 4, 4, midway between the ends of the longitudinal frame members 2*a*, 2*a*. Centrally of this shaft 3 is a ball bearing assembly on which the cable drum 1 rotates. The cable drum comprises a central disc or web 1*a* having a heavy annular bearing portion 1*b* surrounding the ball bearings 5, and a wide outer marginal rim 1*c* with edge flanges 1*d*. On the rim of the drum is wound a length of cable 6, the end portion of which is shown in Figure 1 as extending downwardly to the ground and carrying a hook 7 at its end.

Adjacent the disc 1*a* of the drum is a circular gear plate 8, having a hub surrounding the shaft 3 between the right-hand bearing 4 and a radial flange 9, integral with the shaft 3, and forming a side bearing for the drum bearing 5. The plate 8 is made fast to the flange 9 by means of pins 9*a*, thus the plate and shaft turn together. About the periphery of the plate 8 is an internal gear formed of pins 10*a* spaced about the edge of the plate and projecting laterally from its outer face, the ends of the teeth being anchored in a flat ring 11. Offset from the main shaft 3 is a stub shaft 12 journalled in a bearing in the frame, and carrying at its inner end a spur gear 13 meshing with the internal gear 10 of the plate 8. The outer end of the stub shaft 12 has a tongue 12*a* to fit the slotted end of a crank handle 14, the corresponding end of the main shaft 3 being similarly tongued at 3*a* for the same purpose. Thus the crank handle 14 may be applied to either shaft, in one instance the turning movement

being imparted direct to the main shaft and in the other instance through the intermediate spur gear 13 and gear plate 8.

Diametrically opposite the spur gear is a spring pawl 15, journalled on a pin 16 supported in the adjacent frame member 2*a*. The pawl has a detent on its end adapted to engage the pin teeth 10*a* on the gear plate 8, to lock the same against rotation in one direction, and also a release lever 15*a* whereby the pawl may be held out of tooth-engaging position. A flat spring 17 fixed to a pin 18, anchored in the side frame member 2*a*, bears at its free end against the short arm of the pawl to hold the same yieldingly in tooth-engaging position.

On the opposite side of the drum disc from the gear plate (left in Figure 2) is located the brake mechanism (Figures 4 and 5), comprising parts as follows: A hub 19, having a flange 19*a* at its inner end, occupies the space on the main shaft 3 between the left-hand bearing 4 and the ball bearing 5. Integral with the hub 19 is a brake arm 20, fixed to the main shaft by a set screw 21 in the hub 19. The brake arm extends radially from the main shaft to a point adjacent the internal face of the cable drum and to its outer end is fixed one end of an internally expanding and contracting brake band 22. The brake band preferably consists of a metal ring or band 22*a* of practically a full circle, having a strip of brake lining 22*b* surrounding it. One end of the brake band is fastened as by rivets to the end portion of the brake arm which is bent at right angles as at 20*a*. At the opposite end of the brake band is fixed a bracket 23 consisting of a metal bar bent to form two sections at right angles to each other, one end of the bracket being riveted to the free end of the brake band and the other at a point some distance inwardly therefrom. As thus mounted, one section of the bracket assumes a position parallel with and spaced a short distance from the brake arm 20, and passing from one to the other is the adjusting mechanism, consisting primarily of a rod 24 fixed at one end to the bracket and having a threaded end portion passing at right angles through a threaded boss 25 of the brake arm 20 intermediate its ends. Surrounding the rod between the brake arm and the bracket 23 is a coil spring 26, bearing at one end against the bracket and at the other end against a collared nut 27 threaded on the rod. Also threaded on the rod and bearing against the brake arm is an adjusting nut 28. By turning the nut 28 the rod may be lengthened or shortened, thus increasing or decreasing the frictional contact of the brake band against the cable drum, and similarly by adjusting the spring adjacent nut 27 the action of the spring against the free end of the brake band may be varied. For convenience a gage arm 29 is provided on the brake arm, which extends parallel with the threaded end of the rod. This gage arm is suitably graduated so that the adjustment may be accurately made.

The operation of picking up an object by the use of the device thus described will be understood from the following: As the plane approaches the point where the load is waiting to be picked up, the operator releases the pawl 15 and by means of the crank 14 mounted directly upon the main shaft, unwinds a sufficient length of cable to bring the hook close to the ground, the length being governed by the altitude at which the plane is flying. He then allows the pawl to lock the gear plate against further rotation and removes the crank handle. As the hook engages the load, its weight plus the sudden strain on the cable will cause the drum to turn in a direction to unwind more of the cable, but since the shaft is held against turning by the pawl 15, the unwinding of the drum is resisted by the braking force of the brake. Thus at the instant of contact with the load, the strain on the cable will be the greatest and hence the slippage between the cable drum and the brake band will relieve the sudden strain of a dead weight being lifted, with the result that the cable continues to unwind against the braking force on the drum in direct proportion to the weight of the load and until the inertia of the load has been overcome and it has acquired the speed of the plane. As soon as the unwinding of the cable has stopped, the crank handle is applied to the stub shaft 12 and the operator now reels in the cable and the load is taken aboard.

The maneuvering of the plane in making contact with the load is clearly illustrated in Figure 1. In order that the load may clear the ground as soon as possible, the plane immediately moves upwardly and the load trails to the rear as it gains speed and altitude.

Up to this point the load has been referred to generally as any object which may be retrieved by a plane in flight. As a preferable arrangement a container is provided for the purpose, consisting of a tubular bucket-like receptacle 30 (Figures 1 and 7), having a bail 30*a* to be caught by the hook at the end of the cable. The receptacle may be of a flexible material so that it can be partially collapsed while resting on the ground, and extended to full length as it is lifted. Moreover, the receptacle can be provided with wings 31 and a fin 32, the former tending to lift the load as it travels through the air, and the latter to keep the receptacle from twisting.

If desired, an auxiliary hand-operated brake may be employed for use in emergency (Figures 4 and 6). This brake is mounted near one end of the frame 2 and consists of

two upright links 33, 33, one pivotally connected to brackets 34, 34 mounted on each longitudinal side frame member 2*a* adjacent the flanges 1*d*, 1*d* of the cable drum 1. Connected to these links near their lower ends are brake shoes 35, 35 adapted to bear against the outer faces of the drum flanges 1*d*, 1*d*. Pivotally connected with the end of one of the links 33 is a cross link 36, and with the other a bell crank lever 37, the longer arm thereof forming the operating handle 37*a* and the shorter arm 37*b* being connected with the free end of the cross link 36. By pressing downwardly on the handle 37*a* the shoes 35 are brought into braking contact with the drum, as clearly appears from Figure 6.

In disclosing the invention I have shown a comparatively simple application of the principles involved. However, it is to be understood that the apparatus may be variously modified and elaborated, depending on the particular use to which it is to be put. For instance, motive power may be utilized for the unwinding and reeling in of the cable and various types of ground rigging may be employed, depending on the character of the load and the nature of the surface from which the load is to be retrieved. These are all matters of experimentation and development and therefore it is to be understood that the invention is not limited to the specific features shown.

I claim as my invention:

1. In a device for the purpose described, the combination of a frame, a driven shaft journalled in said frame, a cable drum loosely journalled on said shaft, brake mechanism mounted on said shaft and comprising an expanding and contracting brake band having frictional engagement with the drum, means for adjusting said brake band to exert predetermined frictional resistance to the rotation of said drum on the shaft, and a releasable member for locking said shaft against rotation in one direction.

2. In an apparatus for the purpose described, the combination of a shaft, a cable drum loosely journalled on said shaft, brake mechanism fixed to said shaft and having frictional engagement with said drum and normally acting to contact the same with said shaft, means for adjusting said brake mechanism to permit slippage of said drum when a predetermined load is exerted upon said cable, and means for positively locking the shaft against rotation in one direction.

3. In an apparatus of the character described, the combination of a rotative shaft, a cable drum journalled to rotate freely on said shaft, a brake-band fixed to said shaft and having frictional contact with said drum whereby the same normally rotates with said shaft and adapted to permit a predetermined relative rotation of said drum when a load is applied to said drum through its cable, and means for locking said shaft against rotation with said drum during the relative rotation of the latter under said load.

4. In an apparatus for the purpose described, the combination of a rotative shaft, a drum journalled to rotate freely on said shaft and having a cable adapted to be wound thereon, a brake fixed to and rotative with said shaft and having an adjustable band in frictional contact with said drum and adapted to normally connect said drum with said shaft, and to permit relative rotation therebetween under a load suddenly applied through said cable, and means for holding said shaft against rotation with said drum under said load.

5. In an apparatus for the purpose described, the combination of a shaft, means for rotating said shaft, a cable drum loosely journalled in said shaft, brake mechanism carried by shaft and having a predetermined frictional contact with said drum whereby said shaft and drum normally rotate as a unit in the winding and unwinding of the cable, and means for releasably locking said shaft and drum against rotation in a direction to effect the unwinding of the cable from said drum by said shaft rotating means and against rotation during the rotation of said drum under a load applied to said cable in excess of the frictional resistance of said brake mechanism.

6. In an apparatus of the character described, the combination of a rotative cable drum, a driven shaft, brake mechanism fixed to said shaft and normally acting to frictionally connect said drum to said shaft when there is less than a predetermined load exerted on said cable, but permitting said drum to revolve during the exertion of more than said predetermined load thereon, and means for holding said shaft against rotation under said load.

7. In an apparatus of the character described, the combination of a frame, a shaft journalled in said frame, a cable drum journalled to rotate freely on said shaft, brake mechanism fixed to said shaft and adapted to exert a constant frictional resistance against said drum whereby the latter normally rotates with said shaft, and means for releasably holding said shaft against rotation by a load exerted on said drum sufficient to overcome the frictional resistance of said brake mechanism and permit said drum to rotate until said load becomes less than the frictional resistance of said brake mechanism.

Signed at San Diego this 24th day of Sept., 1928.

JACOB H. WALLACE,