Aug. 23, 1960 B. WIRKKALA 2,949,972

TOW STICKS

Filed Jan. 3, 1958

Fig. 1

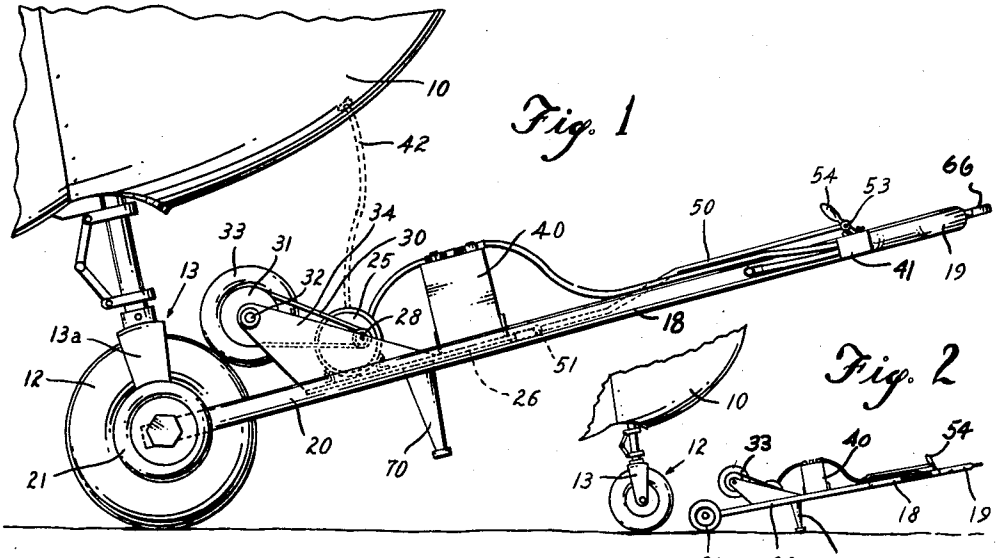


Fig. 2

Fig. 3

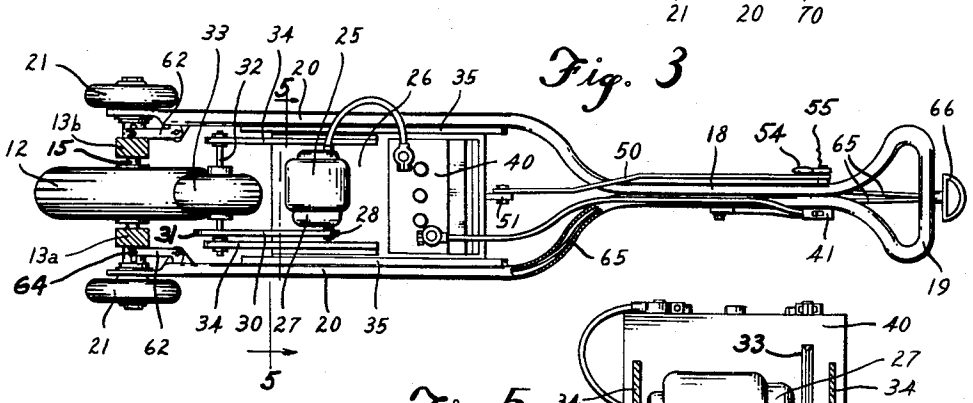


Fig. 5

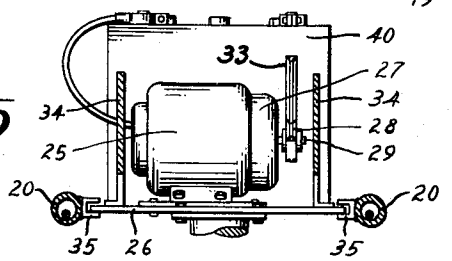


Fig. 4

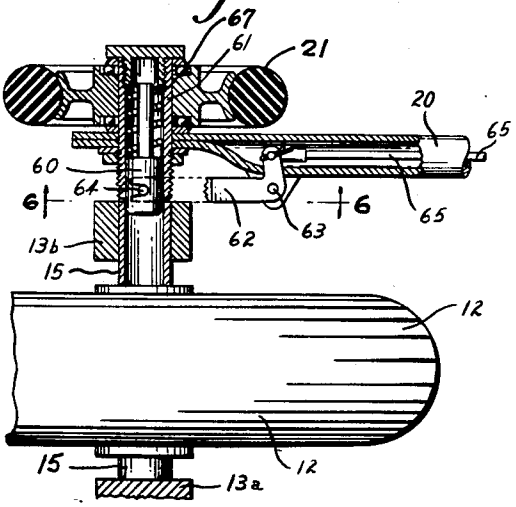
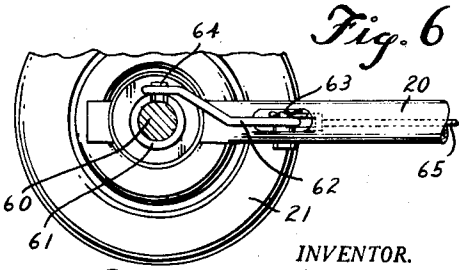


Fig. 6



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TOW STICKS

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2 Claims. (Cl. 180—19)

This invention relates to what are generally referred to as "tow sticks"; such sticks being used for the manual towing of small airplanes as, for example, from a hangar into or from a landing strip or from place to place in a hangar.

It is the principal object of this invention to provide a tow stick that is powered in such manner as to eliminate the requirement in its use for manual towing, as heretofore required.

Tow sticks, which are of that particular character to which the present improvement is applied, are primarily intended for the moving of those small airplanes which are equipped with a forward wheel, located approximately below the forward end of the fuselage and with two laterally spaced rear wheels; such airplanes having a weight that is within the range between 1500 and 3000 pounds. Tow sticks, as heretofore used, are equipped with means at one end for the quick and easy attachment to the hub member of the front wheel of the airplane and at the other end have a handle which is grasped by the workman for the towing operation.

In view of the fact that it is sometimes quite difficult to manually tow even a light weight airplane, especially against a wind, it has been the object of the present invention to provide a tow stick that carries a power driven means that can be caused, after a towing connection has been made, to drive the forward wheel of the plane thus to move the airplane forwardly, leaving it only necessary for the workman holding the stick to employ it as a means for guiding the airplane as thus moved.

More specifically stated, the present invention resides in providing a tow stick with a friction wheel that may be engaged with the front wheel of the airplane, after a towing connection has been made, and a motor or power device whereby the friction wheel can be driven to impart driving force to said front wheel of the airplane for moving it forwardly.

A further object of the invention is to provide the present powered tow stick with wheels whereby it can be easily and readily rolled from plane to place after the fashion of pushing a wheel barrow.

Still further objects and advantages reside in the details of construction of the various parts of the tow stick; in their combination and in their mode of use, as will hereinafter be fully described.

In accomplishing the above mentioned and other objects of the invention, I have provided the improved details of construction, the preferred forms of which are illustrated in the accompanying drawings, wherein:

Fig. 1 is a side view of an airplane to which a powered tow stick embodying the improvements of the present invention has been attached for a towing operation.

Fig. 2 is a side view of the tow stick when detached from the airplane and resting in rolling position on the surface.

Fig. 3 is a top or plan view of the tow stick.

Fig. 4 is an enlarged sectional detail showing the means

for connecting the tow stick to the axle of the front wheel for towing.

Fig. 5 is an enlarged cross-section taken on line 5—5 in Fig. 3.

Fig. 6 is a cross-section taken on line 6—6 in Fig. 4.

Referring more in detail to the drawings:

In Fig. 1, I have designated the front end portion of an airplane, which is typical of those with which the present tow stick is to be used, by reference numeral 10. The front supporting wheel which is here shown to be fitted with a rubber tire, is designated by reference numeral 12 while 13 designates the front wheel mounting yoke. The purpose of this wheel is to coact with rear wheels, not shown, for the support of the airplane for landing and in take-off and also when towed, as for example, into and from the hangar.

The wheel 12, as shown in Fig. 4, is mounted for rotation on a tubular axle 15, that is fixed at its opposite ends in and extends through the laterally spaced legs 13*a*—13*b* of the yoke 13. It is with these end portions of the axle 15 that the tow stick connections are made for towing, as presently will be explained.

The present tow stick comprises a rather elongated handle portion 18, preferably of tubular construction and equipped with a transverse handle bar or handhold 19 at its forward end. At its rearward end it terminates in two laterally spaced legs 20—20, and these are equipped at the outside of their end portions with paired wheels 21—21, of a size about one-half that of wheel 12, or smaller, on which the tow stick can be rolled from place to place as has been indicated in Fig. 3.

Mounted by the tow stick, near its wheel equipped, or rearward end portion is an electric motor 25. This is fixed upon a base plate 26 that is movably supported for limited forward and rearward movement between the spaced leg portions 20—20 of the tow stick. The motor 25 operates through a suitable reduction gear contained in a housing designated at 27 in Fig. 3, to drive a small belt wheel 28 that is fixed to a driven shaft 29 extended from the gear reduction housing, as seen in Fig. 5. A belt 30 operates about belt wheel 28 to drive a larger belt wheel 31 that is fixed on a cross-shaft 32 on which a friction wheel 33 is fixed. Wheel 33 is located in the central longitudinal plane of the tow stick, and its mounting shaft 32 is rotatably carried by the rearward ends of a pair of upwardly and rearwardly directed brackets 34—34 that are located at opposite sides of the motor in parallel, vertical planes and are rigidly fixed along their lower edges to the base plate 26, as best shown in Fig. 5. This wheel is about one-half the diameter of wheel 12. It is shown in Fig. 5 that the plate 26 is supported at its opposite longitudinal edges for limited forward and rearward sliding movement in channel bars 35—35 that are fixed to the inside surfaces of the leg portions 20—20 of the tow stick. This movement permits wheel 33 to be moved from contacting position with wheel 12 when this is desired, or to be pressed against the wheel for driving.

Also mounted on the base plate 26 as carried between the forward end portions 20—20 of the tow stick, is an electric storage battery 40 for powering the motor 25. Current from the battery to the motor is controlled by a switch 41 which, preferably, is fixed to the stick adjacent the handle bar where it is readily accessible to the user of the stick. Circuit connections would be made in conventional manner between motor and battery.

In lieu of drawing electrical energy from the battery 40 for driving the motor, the necessary electrical energy might be supplied from the storage battery of the airplane by plugging in a circuit connection therewith as indicated by the dotted line showing of parts at 42 in Fig. 1.

Under favorable conditions, the friction wheel 33, as

supported on the slidably mounted plate **26** and pressed under its own weight, aided by its tendency of crawl up on the wheel **12**, will maintain a non-slipping driving connection with the wheel **12**. However, to insure against slippage and also to serve as a means for drawing the friction wheel **33** clear of the wheel **12** to stop driving or to facilitate the making of a towing connection, I have provided a lever means for shifting plate **26** forwardly or rearwardly in its supports. This lever means comprises a stiff rod **50** that extends along the tow bar, and which at its rearward end has pivotal connection as at **51** with the near edge of the plate **26** and its forward end has pivotal connection, as at **53**, with a hand lever **54** that has a pivotal mounting **55** on the stick. The arrangement of parts is such that when the lever **54** is swung to its forward position, the plate **26** will be shifted forwardly and wheel **33** will be cleared from the wheel **12** and when swung rearwardly, the plate **26** will be shifted rearwardly and the wheel **33** pressed against wheel **12** for driving.

The means for and manner of connecting the rearward ends of the leg portions **20—20** of the tow stick with the axle **15** of the wheel **12** is best shown in Fig. 4, which shows the connection at one side; the other side being the same. It is here indicated that the ends of the laterally spaced legs **20—20** have pins **60** mounted therein in axial alignment, for limited endwise movement; the pins being slidably contained in tubular sleeves **61** that are fixed in the legs **20** in axial alignment. Bell crank levers **62** are pivoted, as at **63**, on the legs. One arm of each bell crank has pin and slot connections as at **64** with the inner end of the corresponding pin. Cables **65** extend from the other arms of these bell cranks into and along the tubular stick to its forward end and are there connected to an exposed knob or hand hold **66**. Springs **67**, contained under compression in the sleeves **61** which mount the pins, urge the pins inwardly to extend them into the ends of axle **15** to effect a towing connection.

To aid in moving the tow stick from place to place, it is equipped at the end of its leg portions **20—20** with the small supporting wheels **21—21**. These wheels, as seen in Fig. 4, are revoluble on the extended outer ends of the tubular sleeves **61—61** in which the pins are slidably contained.

Also, to aid in the attaching of the stick to the wheel axle, it is equipped beneath the frame structure or rearwardly thereof with a short leg **70**. By swinging the forward end of this tow stick downwardly from the normal rolling position after the stick has been positioned for connection, this leg can be engaged with the ground. Then by farther downward movement, the rearward end of the tow stick will be swung upwardly and the pins as carried therein can thus be easily brought to proper level and moved into alignment with the axle ends.

To connect the tow stick with the axle, the cables **65** are first pulled forwardly by grasping the knob **66**. This rocks the bell crank levers **62** and pulls the inner ends of the pins into the sleeves **61**. The stick is moved to a position that will bring the legs **20—20** along opposite sides of wheel **12** and the pins into alignment with the open opposite ends of the tubular axle **15**, as indicated in Fig. 3. The knob is then released allowing the springs **67** to actuate the pins inwardly into the open ends of the tubular axle. Thus, the towing connection is made.

After this connection has been made the lever **54** is swung rearwardly, thus through the connecting rod or link **50** to move the wheel **33** against wheel **12** in a friction engaged driving connection. The motor **25** is then energized to drive the wheel **33**, thus to move the airplane forwardly. As the plane moves forwardly, it is guided by means of the tow stick which has fixed steering connection with the wheel axle.

To release the stick, the lever **54** is pulled forwardly to disengage the friction wheel **33** from the wheel **12**. Then the pins **60—60** are released from the ends of axle **15** by pull on the hand hold or knob **65**. The stick then drops for rolling support on wheels **69—69** and can be wheeled clear of the airplane.

Devices of this kind may employ various other means for driving the friction wheel **33**, and various other means than hereinshown for making the towing connection without departing from the spirit of the invention. What is believed to be the essence of the invention is the application of power to the stick itself for driving the wheel **12** regardless of other features of the invention.

A small engine might be substituted for use in lieu of an electric motor.

It is anticipated that the mounting axles **15** of different airplanes might not all conform to the tubular form herein shown. For example, the axle might be solid. In such instances, the pins **60** would be formed at their ends with suitable means for effecting holding connections with the axle ends. This might require that the pins be equipped with open sockets to receive the axle ends, or it might be required that they have adapter fittings of various kinds applied thereto to accommodate the pins. Therefore, the present invention is not to be restricted to use with the specific form of axle **15** illustrated.

These devices also may be made applicable to larger types of airplanes merely by provision of adequate power and suitable means for effecting the towing connection between stick and wheel axle.

What I claim as new is:

1. A tow stick for an airplane having a tow wheel mounted on a tubular axle; said tow stick having hand hold means at its outer end, and having laterally spaced leg portions at its inner end adapted to receive said airplane towing wheel and axle between them; said leg portions being equipped with adjustable means whereby releasable towing connections may be made with the opposite end portions of said tubular axle, a motor driven friction wheel mounted on said stick and a manual means at the forward end of the stick for causing said friction wheel to be shifted into and from driving contact with the airplane wheel, and ground wheels of lesser diameter than said airplane wheel mounted on the inner end of the tow stick coaxial of the means for making the towing connections for rolling support of the tow stick in moving it into and from place of use; said adjustable means for making said towing connections comprising means mounted by said leg portions and movable into and from the end portions of said tubular axle and manual means operable from the forward end of said stick for effecting adjustment of the connecting means.

2. The device of claim 1 wherein fulcrum members, in the form of supporting legs are fixed to the tow stick in transverse alignment, between its ends for ground contact in positioning the connecting means in alignment with the axle ends for connection therewith.

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