

Dec. 5, 1944.

L. MOREY

2,364,233

REMOTE CONTROL STEERING AND PROPULSION MECHANISM

Filed April 12, 1939

Fig. 1.

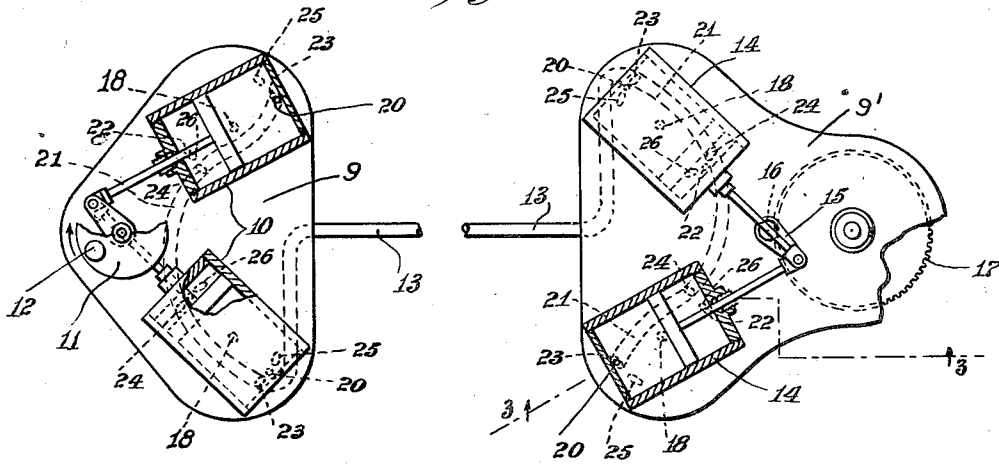


Fig. 2.

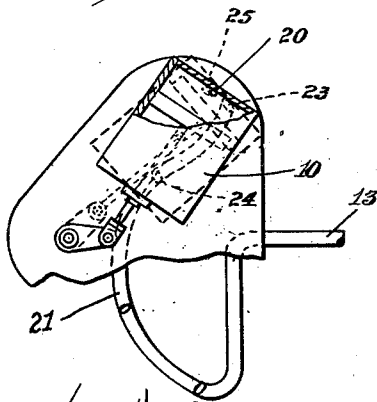


Fig. 3.

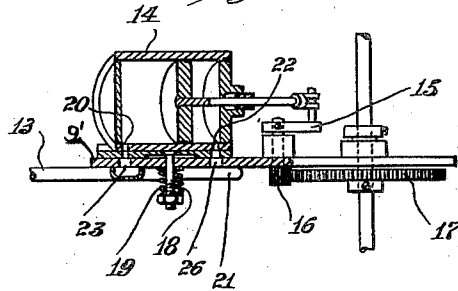
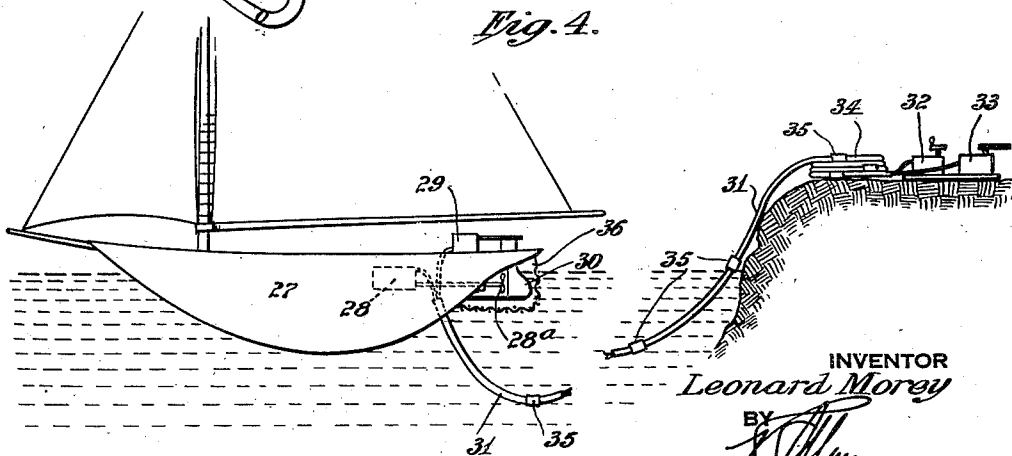


Fig. 4.



INVENTOR
Leonard Morey
BY *[Signature]*
ATTORNEY

UNITED STATES PATENT OFFICE

2,364,233

REMOTE CONTROL STEERING AND
PROPULSION MECHANISM

Leonard Morey, Salem Center, N. Y.

Application April 12, 1939, Serial No. 267,378

6 Claims. (Cl. 46—210)

This invention relates to air compressors and connected motors.

One object is to provide a compressor capable of supplying superatmospheric pressure to a motor on movement in one direction and capable of supplying subatmospheric pressure on movement in an opposite direction.

Another object is to provide an air motor capable of moving in one direction when supplied with superatmospheric pressure and moving in an opposite direction when supplied with subatmospheric pressure.

A further object is to provide a convenient means for operating vehicles such as small boats or toy planes and also for steering them pneumatically from a location outside the vehicle. Yet a further object is to provide a remote control fluid pressure operated mechanism which gives the effect of having a positive and relatively non-yieldable driving connection.

Referring to the drawing:

Fig. 1 shows one embodiment of this invention, the compressor being shown at the left and the motor at the right.

Fig. 2 illustrates one of the cylinders of the compressor of Fig. 1 in a different position.

Fig. 3 is a section on the line 3—3 of Fig. 1.

Fig. 4 illustrates a toy boat provided with both propulsion and steering means under this invention.

The compressor shown at the left in Fig. 1 has a base plate 9 on which are pivoted two oscillating cylinders 10, 10, each mounted on a pivot 18 and having a piston actuated by a disc crank 11 and handle 12. The base plate has two exhaust or atmospheric ports 25 and 26 for each cylinder. These are somewhat elongated circumferentially of the pivot 18 and both are arranged on the same side of the axis of the pivot 18. The plate 9 also has two elongated ports 23 and 24 for each cylinder, both of these latter ports for each cylinder being arranged on the same side of the axis of the pivot 18 and opposite the exhaust ports, said ports 23 and 24 for both cylinders being connected by a pipe 21. Each cylinder has a port 20 in one end and another port 22 in the other end, which ports are adapted to register with the respective ports in the base plate as the cylinder is oscillated.

The motor construction is substantially the same as the compressor having two cylinders 14, 14 mounted on pivots 18 and provided with ports which coact with ports in the base plate 9' as in the case of the compressor. A spring 19 may be employed to keep the cylinder pressed against the base plate.

In the case of the motor the piston rods are connected to a crank 15 which drives a pinion 16 in mesh with a gear 17.

The two pipes 21, 21 are connected by a pipe 13 which is preferably flexible to facilitate relative movement between the compressor and the motor.

5 The result of this construction is that each cylinder is compressing or forcing air into the tube 13 when the disk 11 moves in one direction and is extracting or exhausting air from the tube 13 when the disk 11 is moved in the opposite direction. The two pump cylinders illustrated have the effect of making the suction or compression more nearly uniform and free of the effect of puffs which might result from the use of only one cylinder. The result of this construction is that on turning the compressor disk 11 in one direction, the motor rotates in a given direction and on rotating the compressor disk 11 in the opposite direction, the motor also rotates in an opposite direction to what it previously did. 20 The drawing shows how on rotation of the disk 11 in a clockwise direction superatmospheric pressure is supplied to the tube 13 causing compressed air to be delivered to the head end of the lower cylinder of the motor and the crank end of the same cylinder to be connected with the atmosphere, thus causing the crank 15 to rotate in a counterclockwise direction. On rotating the disk 11 in a counterclockwise direction and with the pistons in the position illustrated in Fig. 1, air is sucked from the tube 13 by the suction produced at the head end of the top cylinder of the compressor in Fig. 1 causing air to be drawn into the lower cylinder of the motor through its atmospheric port 26 at the crank end of the lower cylinder of the motor in Fig. 1. Care should be taken to have the flexible tube 13 of the right size in order that there may not be any substantial lag and in order that movement of the compressor may cause a corresponding movement of the motor in a manner similar to the result of having a positive connection between the two.

Fig. 2 shows the position of one of the cylinder pistons and ports when the crank is at a different position from that shown in Fig. 1.

As previously explained, a single cylinder and its drive are sufficient to constitute a complete compressor or exhauster, the function varying according to the direction in which the pump is rotated. Similarly the motor can be constituted by a single cylinder and driven shaft. The gear 17 may be used when reduced speed and greater torque are required of the motor but the power output may be taken directly from rotary element 16, if the relatively higher speed thereof be suitable for the desired purposes.

Succinctly stated, a compressor or exhauster cylinder is oscillatingly moved through a limited arc of revolution as the piston travels between the respective ends of the cylinder. The crank

arm attached to the drive shaft simultaneously reciprocates the piston and causes the oscillatory motion of the cylinder as a whole.

When the cylinder lies in one portion of the arc over which it oscillates, one end of the cylinder is put into communication with the connecting tube between this cylinder and the motor cylinder by the juxtaposition of cylinder and stationary ports. At the same time the other end of the cylinder is similarly vented to the atmosphere. If now the crank 11 be rotated in one direction so as to lessen the volume of space between the piston head and the cylinder end which connects to the tube, air will be compressed and forced through the tube, while the atmospheric opening allows air to enter therethrough and maintain normal pressure upon the other side of the piston head, the pump then acting as a compressor. If the crank 11 be rotated in the reverse direction, subatmospheric pressure will be produced in the tube and air will be vented freely from the other side of the piston, the pump then acting as an exhaustor.

When the piston reaches the end of its stroke, the oscillation of the cylinder reverses the respective connections of the two cylinder ends, so that although the piston now moves in the reverse direction, yet the flow of air exhausted out of, or forced into the tube maintains the same direction of flow. In other words, the tube is always connected to the end of the cylinder which delivers either pressure or suction, this latter factor being determined solely by the direction of drive of the pump.

The motor is exactly analogous to the pump, merely converting super- or sub-atmospheric pressure into kinetic energy.

At both pump and motor, two or more cylinders can be connected to a common crank shaft at various angular positions, so as to overcome the dead-end effect familiar to those skilled in the art. All these pump and motor cylinders are connected to a common single connecting tube since all the cylinders act simultaneously as compressors or exhaustors, with pulses of air overlapping one another.

In Fig. 4 is illustrated a small boat 27 carrying a pair of motors 28 and 29 each connected through a flexible tube with a compressor on shore. Each motor and compressor is preferably of the type illustrated in Fig. 1 though for small rudder movements a single cylinder compressor and motor has been found suitable. The motor 28 drives the propeller 28a while the rudder 30 is shifted by the motor 29. The flexible tube 31 includes two separate passages, one for each of the motors and these passages may be concentric or not. The compressors 32 and 33 are arranged one for supplying each of the passages. The tube 31 is wound on an appropriate reel or coiled as shown at 34. Weights 35 for the tube 31 are spaced at an appropriate distance apart in order that the tube 31 though filled with air may not float but be kept submerged and out of sight, thus enabling the movement and steering of the boat to be apparently free of any mechanical connection with the shore.

The present invention is adapted for embodiment in various types of vehicles such as toy boats, toy airplanes and toy automobiles. When embodied in a toy boat the pneumatic motors may be used for both propulsion and steering as shown in Fig. 4. In order to keep the tubing 31 from getting in the way of the propeller, a mesh

guard or enclosure 36 preferably surrounds the propeller. In short, this invention is adapted for vehicles of many types, boats and airplanes being included in the term "vehicle." Instead of having the pneumatic motor for propulsion, it will be understood the boat or other vehicle may carry its own self-contained propulsion means and use the pneumatic motor of this invention only for steering. For example, lifesaving boats may be launched and directed where desired by means of steering mechanism actuated under this invention. In a toy fireboat, for example, in addition to providing the propulsion and steering means, another motor or motors may control the water pump and means for directing the play of the nozzle. A single cylinder, compressor and motor may be used but are open to the objection of possibly stopping on dead center if not operated substantially continuously, and this is why the preferred embodiment shown in Fig. 1 contemplates at least two cylinders, both the compressor and the motor. However, where limited translation is desired, a single cylinder compressor and motor will be found appropriate.

A motor and compressor according to Fig. 1 has been constructed with the cylinder of one inch (1") diameter, one and one-quarter inch (1¼") stroke, and supplied by tubing three-sixteenths of an inch (⅜") inside diameter for lengths up to about seventy five feet (75'). With smaller diameter tubes connecting the motor and compressor, results have not been as satisfactory as with a tube of the dimensions mentioned. Due to the fact that this connecting tube carries air, it will tend to float in water and only enough weights need be added to keep it below the surface, thus to be out of sight for use with toy boats. However, with a lifeboat this tube need not be kept off the surface. Such a lifeboat may carry its own gasoline motor and need the pneumatic motor only for steering. When toy boats are propelled by a pneumatic motor as disclosed in Fig. 4 rotation may be reversed in order to move the boat rearward when desired. If the tube connecting the motor and compressor is too small, friction losses may be substantial and also there may be the necessity for either higher pressures or a longer time needed to transmit a given amount of pressure fluid compared to what is possible with a larger tube. However, too large a tube should not be used because it would be too much in the nature of a storage reservoir and considerably more pressure increase might be needed before the motor would be turned the desired amount. In other words, too large a connecting tube would provide the effect of lost motion in the connection whereas a feature of this invention resides in having the tube near enough the right size so that the connection between the motor and compressor serves functionally similar to the way in which a positive flexible connection would act.

Another use for this invention is believed to reside in connection with sail boats of a type used in races and having a stern which is high enough out of the water to preclude the use of ordinary outboard motors propelling the boat to the start of a race or away from the finish. With sail boats of this type a tow to the start of the race is preferable in order that the sails may be kept dry. Under this invention an ordinary outboard motor may be mounted between a pair of small buoyant supports which are just large enough to support a gasoline motor and be steered

by a pneumatic motor for a rudder connected to such buoyant means. This small towing device may be carried by the sailboat in an out of the way part of the cabin and for towing purposes may be put overboard and the outboard motor started, the tow line used being of any suitable length. Under this invention such a compact towing device may be steered at will from the tow by a flexible tube leading from a compressor on the boat being towed to a motor on the buoyant device and connected to the rudder of the tow.

Where the towing element is light in weight, as described previously for sailboats, the tow line should preferably be attached near the axis of the propeller if possible to avoid any tendency for the towing device to turn by its own torque in either the horizontal or vertical planes. For this purpose a mesh enclosure around the propeller as shown in Fig. 4 may be desirable and such enclosure made strong enough in its central portion for the tow line to be attached.

Instead of the weights 35 for keeping the flexible tubing below the surface of the water, there may be floats spaced along the tubing for the purpose of either raising the tubing to the surface of the water or keeping the tubing off the bottom, regardless of whether or not they may be sufficient to float the tubing.

A flexible tube having a diameter of about three-sixteenths of an inch has been found best suited for transmitting air pressure to the motor. However, for transmitting pressure to the steering mechanism or the like it has been found a much smaller diameter tube is adequate. For example, one having a diameter of only about one-sixteenth of an inch has been suitable.

I claim:

1. The combination with a vehicle and drive shaft therefor, of an air motor carried thereby, a single-passaged flexible conduit leading from the motor, an air compressor connected to the conduit and actuated remotely from the vehicle, for driving the motor, said compressor being of a type adapted to supply a continuous flow of superatmospheric pressure to the conduit on actuation thereof in one direction and to extract air from the conduit causing a continuous flow of subatmospheric pressure within the conduit on actuation of the compressor in the opposite direction, the motor being of a type adapted to cause rotation of said shaft in one direction in response to superatmospheric pressure in the conduit and in the opposite direction in response to subatmospheric pressure in the conduit.

2. The combination with a vehicle, of a pneumatic motor carried thereby for controlling at least a portion of the vehicle, a flexible conduit leading from the motor, and a pump actuated at a point remote from said vehicle in a plurality of directions for supplying a continuous flow of either super-atmospheric or sub-atmospheric pressure to the motor automatically in response to the direction of its movement, the motor being of a type for moving in one direction under super-atmospheric pressure and in the reverse direction under sub-atmospheric pressure, the pump and motor each having a cylinder and piston of such size in relation to the piston displacements that a given displacement in the pump effects a substantially equal displacement in the motor, whereby the motor functions generally as though it were positively connected to the pump by a flexible and solid tension or com-

pression connection or by a flexible drive shaft.

3. A toy including a body capable of translatable motion in a plurality of directions, a control station remote from said body, a single-passaged fluid-confining conductor linking said body and control station, said body including a fluid motor responsive to an increase of fluid pressure so as to move said body in one direction and responsive to a decrease of fluid pressure so as to move the body in another direction, said control station including a pump movable in a plurality of directions and being capable of supplying a continuous flow of fluid and of increasing or decreasing said fluid pressure in accordance with the direction in which said pump is operated, and control means for reversibly operating said pump.

4. The combination with a vehicle and a drive shaft therefore, of a pair of pivotally mounted cylinders having pistons adapted to move in response to super-atmospheric air pressure and sub-atmospheric air pressure, said pistons being operatively connected to said shaft, and means remote from said vehicle for alternately causing movement of said cylinders on their pivots and simultaneously causing movement of their respective pistons for supplying a continuous flow of air pressure for driving said shaft including another pair of pivotally mounted cylinders having pistons adapted to move in response to super-atmospheric air pressure and sub-atmospheric air pressure, manual means for alternately moving said latter cylinders and simultaneously operating the pistons thereof and a flexible conduit between said last named cylinders and said first named cylinders for communicating the fluid pressure created by said last-named cylinders to said first named cylinders.

5. The combination with a vehicle and a drive shaft therefor, of a motor on the vehicle for driving said vehicle including a cylinder and piston therein operatively connected to said shaft, an air compressor for supplying a continuous flow of fluid to said motor including a cylinder and piston therein, a flexible conduit between said compressor and motor, mechanism remote from the vehicle for actuating said air compressor including a manually operated device adapted to be moved in opposite directions, means for reversing the operation of the motor including a pair of openings in each cylinder at a point on each side of its piston head, one opening of each pair communicating with said flexible conduit whereby upon movement of the compressor piston in one direction super-atmospheric pressure is supplied to the conduit, the other opening of each pair communicating with the atmosphere whereby upon movement of the compressor piston in the opposite direction air is exhausted from the conduit causing sub-atmospheric pressure within said conduit.

6. A toy comprising a vehicle member, a drive shaft therefor, a steering device, and separate mechanical units for driving said shaft in different directions and for actuating said steering device, each unit including a fluid motor on the vehicle, an air compressor remote from said vehicle for supplying fluid to said motor, said motor and compressor each consisting of a pair of oscillating cylinders having pistons connected to a common crank shaft, each cylinder having admission ports at each end connected by a common duct and exhaust ports and a single flexible pipe line connecting the ducts of said cylinders.

LEONARD MOREY.