Aug. 4, 1964 E. DALL'ASTA 3,143,173

AIR GIRANDOLE EQUIPPED WITH MECHANICAL SUSTAINERS

Filed May 11, 1962 2 Sheets-Sheet 1

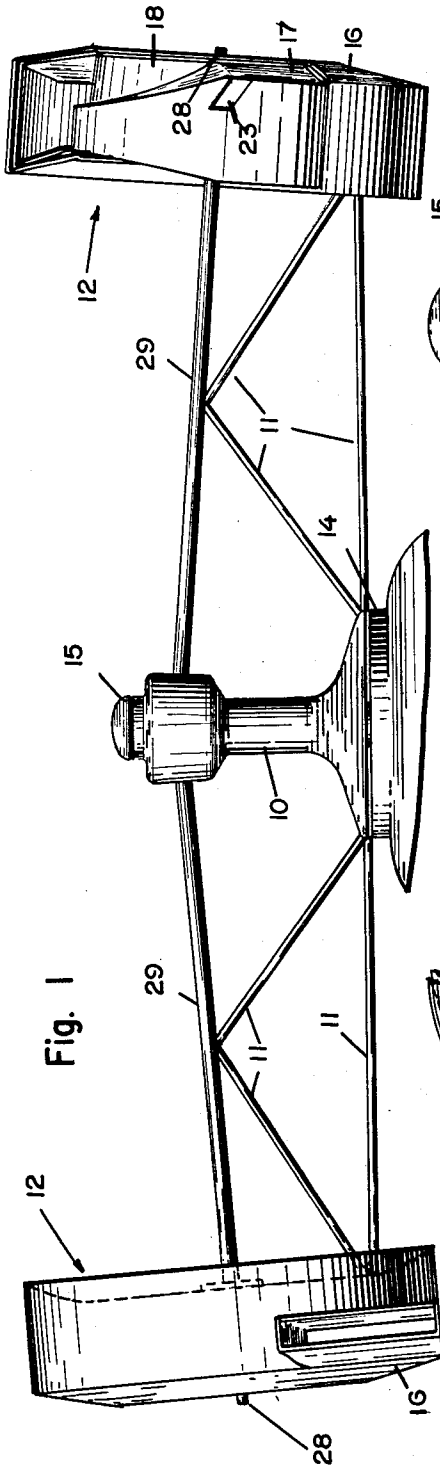

Fig. 1

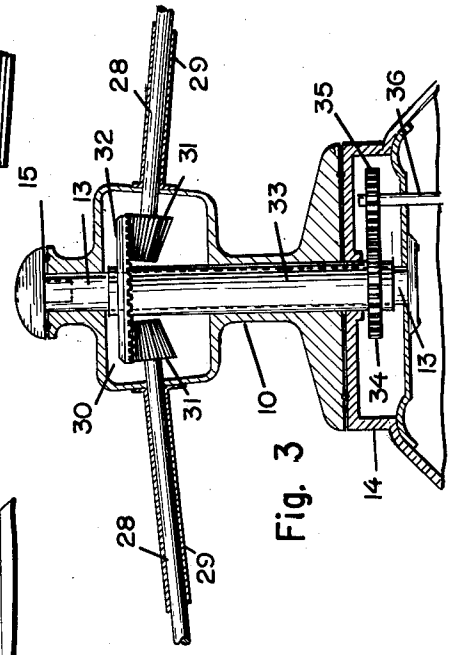

Fig. 3

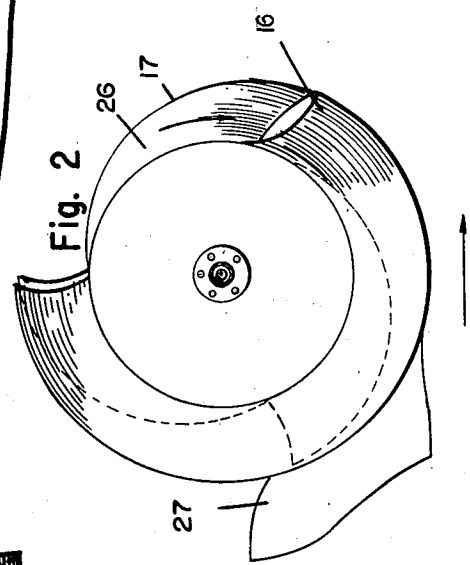

Fig. 2

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Fig. 4

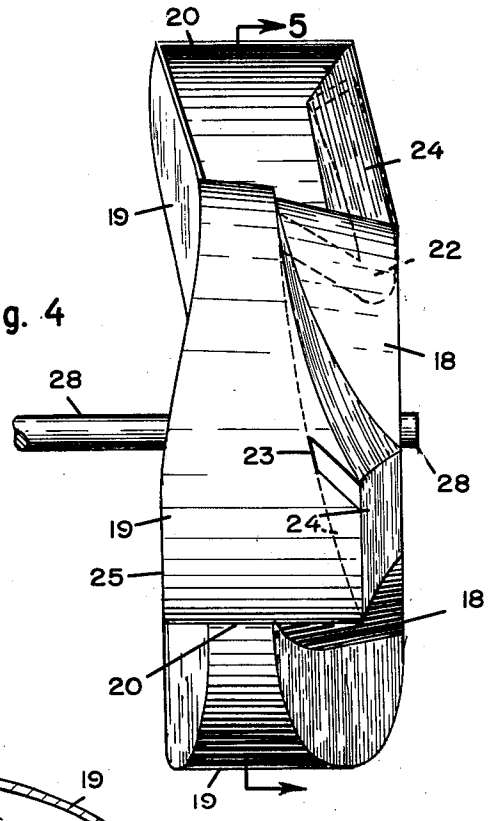
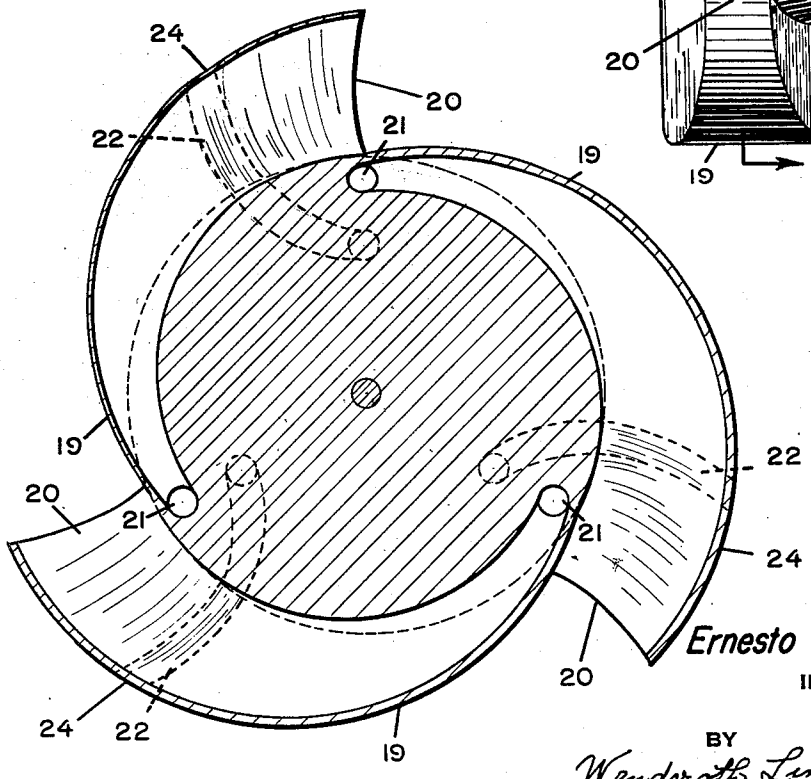


Fig. 5



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United States Patent Office 3,143,173 Patented Aug. 4, 1964

3,143,173

AIR GIRANDOLE EQUIPPED WITH MECHANICAL SUSTAINERS

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Filed May 11, 1962, Ser. No. 193,931
2 Claims. (Cl. 170—135)

The present invention is directed to a lifting apparatus more efficient and practical than the elevator used in helicopters at the present time.

An object of the invention is to provide a horizontal fly-wheel equipped with mechanical sustainers which give to the fly-wheel the rotative movement and the raising impulse.

With the above and other objects in view which will become apparent from the detailed description below, one preferred embodiment of the invention is shown in the drawings in which:

FIGURE 1 is the view in elevation of a fly-wheel equipped with two sustainers. The sustainer in the right side is presented in front and that of the left side is seen from the back.

FIGURE 2 is a view in elevation of a sustainer on the side toward the inside part of the fly-wheel.

FIGURE 3 is a view of the hub of the fly-wheel in vertical section and showing the transmission system of the rotary impulse of the driving shaft to the shafts of the rotors.

FIGURE 4 is a view in elevation and in front of an isolated rotor.

FIGURE 5 is a section view of the rotor of FIG. 4 on section line 5—5.

The fly-wheel of this invention is constituted by a central hub **10** from which an irradiating frame **11** forms a structure on which are attached the sustainer devices **12**. The fly-wheel operates in a horizontal plane around an axial pivot **13** fixed in the upper part of an aerial vehicle. The hub of the fly-wheel seats on a platform **14** which is a part of the vehicle, and contacts at the upper part against the plate of a cap **15** crowning the axial pivot.

The sustainer devices mounted on the fly-wheel are placed symmetrically and equidistant on the peripheral line of its structure. In FIGURE 1, a fly-wheel is shown with only two sustainers but it should be understood that the fly-wheel may carry a larger number if it is conveniently required.

Each sustainer device is composed of a housing **16** and a rotor **17**. The housing is cylindrically shaped with parallel base walls concavo-convex in shape. The housing is fixed to the structure of the fly-wheel on its concave base wall with the face towards the center of same.

The rotor has a central hub **18** which is of a truncated cone shape and is placed with the large base upon the inner side. On this hub three funnels **19** in a reclined position rest with their collecting mouths **20** opening forwardly facing the direction of the rotating movement. The rotation of the rotor is forwardly to the direction of the revolving motion of the sustainer device. The funnels are situated on the periphery of the hub in a symmetrical way and equidistant to each other and with the collecting mouths comprising the whole width of the hub. Each funnel extends from its collecting mouth towards the back, gradually curving and narrowing until it totally penetrates into the hub. The funnel has its narrow end **21** located on the inner side of the hub, immediately before the following funnel comes.

The narrow end **21** of the funnel is connected to a conduit **22** transferring the outlet mouth of the funnel to a point situated on the periphery of the rotor. At the point of connection to the funnel, the conduit has a bend which goes up the opposite side, bending again and going in a radial direction to the periphery, describing

a backward sagging curve, crosses the funnel which is above and its outlet goes to the upper part of the latter.

To avoid the conduit interfering with the operative action of the funnel which it crosses, the conduit is placed embedded into the external wall **24** of the funnel which at this point has a thickness equal to the width of the conduit. Due to the larger thickness of the external wall the funnel deviates internally at this point on the opposite side and for this reason the side walls **24** and **25** continue externally parallel from the collecting mouth up to the height where the crossing is produced.

The housing facing the direction of the revolving movement leaves the rotor uncovered with a large opening **26** comprising the whole peripheral ring in approximately three fourths of its height from top to bottom and extends itself on the side walls up to the height of the rotor hub. The housing has another opening **27** at the back which is smaller and is situated on the lower and external side, just corresponding to the place of passage of the outlets **23** of the rotor. This opening is projected towards the back by means of a conduit which follows the curvature of the base walls of the housing.

The rotor of each sustainer device is mounted on a shaft **28** the extension of which, on both sides, goes through the center of the housing, thus giving to it a free support. The main portion of this shaft extends towards the center of the fly-wheel, crossing its frame within the cavity of one of its arms **29**, arriving at the hub **10** of the fly-wheel which gives it free admission until it reaches an inner chamber **30**. The rotor shaft **28** is connected within this chamber by means of a pinion **31**, which meshes with a gear **32** on the upper end of a vertical tubular shaft **33**. This tubular shaft is mounted on the fixed axial pivot of the fly-wheel which extends downwardly until it penetrates the aerial vehicle. This tubular shaft has mounted thereon a gear **34** meshing with another gear **35** mounted on a driving shaft **36**.

By means of these connections the rotative movement of the driving shaft **36** is transmitted to the rotors **17**, of the sustainers **12**. The rotors execute their rotative movement forwardly in the direction of their revolving movement imparted by the rotation of the fly-wheel. The action of the rotors is regulated by the housings which allow an admission of atmospheric air in the most appropriate way. The action developed by the rotors will create a combined force of impulsion forwardly and upwardly. The forward impulsion will make the fly-wheel move in rotative movement carrying with it the sustainers attached to its periphery giving to them a revolving movement. The upward impulsion will make the fly-wheel move upwardly too, carrying with it the aerial vehicle attached to it.

The above mentioned operation takes place as follows: The operative elements are the funnels of the rotors. Each funnel when moving from top to bottom at the frontal opening **26** of the housing catches the air found in its way. The air when penetrating in the funnel suffers a compression due to the gradual narrowing of the funnel, passing then to the conduit where momentarily it is slowed due to the curves and inclination of same. This slowing allows the air to accumulate in the inner part and when it increases takes a fresh impulse for passing the second elbow and passes to the next section of the conduit. In this section the air under the pressure of centrifugal force advances and is ejected out just when the outlet **23** of the conduit passes in front of the sector where the backward opening **27** of the housing is situated. Due to its impusion the air goes out through this opening. The resistance that the air will oppose due to its inertia property when it is compressed and transferred downwardly will produce the raising force and the resist-

ence that will oppose when it is transferred backwardly will create the advance force.

I claim:

1. A fly-wheel for a helicopter or the like comprising a plurality of sustainer devices symmetricaly placed at its periphery, each sustainer comprising a rotor, a cylindrical housing enclosing said rotor, said housing having parallel base walls of a concavo-convex shape and being fixed to said fly-wheel at its concave side, said housing having an opening at the top facing the direction of the revolving motion of the fly-wheel, said housing having side walls cut away corresponding to said opening, said housing having a second opening at its lower part and to the rear of the direction of the revolving motion of the fly-wheel, a conduit extending towards the back from said second opening, each rotor having three funnels symmetrically placed in a reclined position on a truncated cone which forms the hub, said funnels having collecting mouths extending the whole width of said hub facing the direction of rotation of the fly-wheel, each funnel extending toward the back, curving and narrowing gradually until it totally penetrates into said hub on the internal side, intermediately before the following funnel, the narrow end of such funnel connecting with a conduit which bends and passes to the opposite side where it bends again and goes radially to the periphery of the rotor, describing a sagging line backwardly, crossing the funnel above, and ending in the upper side thereof, said conduit being embedded in the external lateral wall, a shaft on which said rotor is mounted extending through the center of said housing, said shaft extending to the center of the fly-wheel and means for driving said shaft.

2. A fly-wheel as set forth in claim 1 wherein said means for driving said shaft comprises a vertical pivot, a tubular shaft upon said pivot, intermeshing gears upon said shaft upon which said rotor is mounted and said tubular shaft and means for driving said tubular shaft.

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