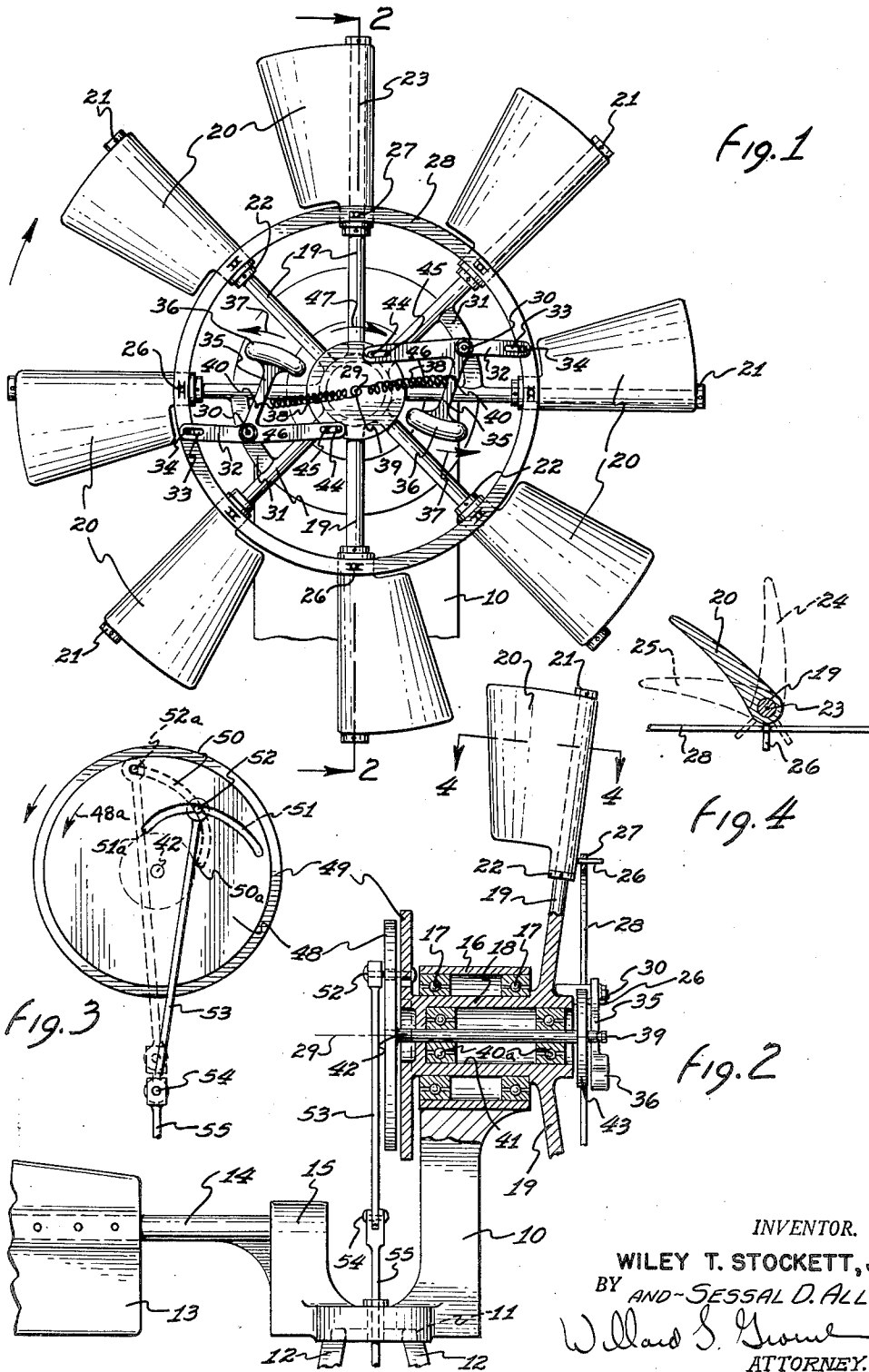


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VARIABLE STROKE CONTROL WINDMILL

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VARIABLE STROKE CONTROL WINDMILL

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This invention pertains to improvements in variable stroke control windmills, and is particularly directed to an improved windmill structure in which both the pressure of the wind on the blades and the speed of rotation of the fan of the windmill varies the stroke of the pump driven by the fan.

One of the objects of this invention is to provide an improved windmill fan structure in which the velocity of wind pressure against the blades and the speed of rotation of the blades simultaneously automatically vary the stroke of the reciprocating pump being driven by the fan.

Still another object of this invention is to provide an improved featherable fan or propeller for a windmill, the degree of feathering being automatically controlled by the wind pressure and speed of rotation of the propeller fan to vary the stroke of the reciprocating pump being driven.

Still another object of this invention is to provide an improved windmill structure for varying the stroke of a reciprocating well pump which has a series of counterweights actuated by the speed and centrifugal force of rotation of the propeller fan and in which the blades of the propeller fan are feathered by the position of said weights due to the rotation of the fan and also by the pressure of the wind on the blades of the fan in an automatic timed relationship to one another.

A still further object of this invention is to provide an improved windmill fan structure with its blades normally bias for maximum angle of attack by the oncoming wind and which feathering may be varied to a zero angle of attack by a combination of the speed of rotation and wind pressure upon the blades.

Further features and advantages of this invention will appear from a detailed description of the drawings in which:

Fig. 1 is a front elevation of the propeller fan structure of the novel arrangement incorporating the features of this invention.

Fig. 2 is an axial vertical section thru the fan shown on the line 2—2 of Fig. 1.

Fig. 3 is a rear fragmentary view showing the cam structure for varying the stroke of the pump driven by the fan.

Fig. 4 is a section on the line 4—4 of Fig. 2.

As exemplary of one embodiment of this invention there is shown the windmill structure comprising the main casting member 10 which is journaled on a suitable bearing 11 for horizontal swinging movement on the usual windmill tower

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12. The rear portion of the casting 10 is provided with a tail pin 13 mounted on a supporting rod 14 connected to the rear portion 15 of the casting 10, so that the entire unit may be properly oriented parallel to the direction of wind flow for maximum application of air pressure to the fan structure.

The casting 10 has a bearing supporting portion 16 in which are mounted suitable ball bearings 17 upon which is journaled the hub portion 18 of the main fan structure. The front portion of the hub 18 has a series of integral blade supporting rods 19 upon which is pivotally mounted the fan blades 20 confined axially on the rods 19 by suitable collars 21 and 22. The blades 20 may be pivotally swung about the axis 23 of the rods 19 to a full feathered position 24, as shown in Fig. 4, or to a maximum angle of attack position such as shown at 25. Fixed to each of the fan blades 20 are the actuating pins 26 which project thru slots 27 in the annular actuating ring 28 so that when the ring 28 is rotated one way or the other about the main axis of rotation 29 of the fan structure all of the fan blades 20 may be simultaneously swung to the various positions shown in Fig. 4.

Pivotally mounted on a pin 30 fixed in the support members 31 formed integral with pairs of blade supporting rods 19 are the link members 32 which have slotted outer portions 33 engaging over pins 34 fixed to the ring member 28, as best seen in Fig. 1. Two pairs of such link mechanism above described are provided and to each of these links there is also fixed a counterweight lever arm 35 having counterweights 36 fixed on their outer ends so as to normally swing outwardly in a direction radially away from the axis 29 of the fan as indicated by the arrow 37 upon variations in the rate of speed of rotation of the hub 18 and fan structure. Thus with increase speed of rotation of the fan the weights 36 move outwardly in the direction indicated by the arrow 37 causing the lever arms 32 to rotate in a counterclockwise direction, Fig. 1, to similarly rotate the ring 28 and thru the actuating pins 26 to move the fan blades 20 from a position 25 to a more full feathered position 24, as shown in Fig. 4. The reverse, of course, is true when decrease in speed releases the outward centrifugal force on the weights 36 because of the biasing springs 38. The springs 38 are interconnected with a central pivot pin 39 and pins 40 fixed on the lever arms 35 to normally pull the weights 36 in the opposite direction indicated by the arrow 37. A pair of ball bearings 40a, Fig. 2, are supported in the bore

41 of the fan hub 18 and these bearings in turn rotatably support the control shaft 42 on the front end of which is fixed the disc 43 to the center of which is fixed the pin 39 which supports the biasing springs 38 described. Also fixed toward the outer periphery of the disc 43 are the pins 44 which operate in slotted openings 45 in the ends of the link members 46 connected integrally with the links 32 and 35 described. By this arrangement the disc 43 and shaft 42 is rotated relative to the hub portion 18 of the fan structure under the influence of the biasing springs 38 and the opposite movement provided by the counterweights 36 upon centrifugal force application to said weights by variations in the speed of rotation of the fan blades 20. Whenever the weights 35 swing outwardly to rotate the lever system 32—35—46 in a counter-clockwise direction, Fig. 1, the disc 43 and shaft 42 will be rotated in a clockwise direction as indicated by the arrow 47, the reverse being true of deceleration or slowing down of the fan structure. Thus there is provided an arrangement where both the speed of the fan thru the counterweights 36, and wind pressure upon the blades themselves, effect change in the feathering and also readjustment of the control shaft 42 relative to the varying conditions.

On the rear portion of the control shaft 42 is fixed a control disc 48 which is presented in front of a disc 49 formed integral with the hub 18 of the fan structure. In the disc 48 is formed a cam slot 51 and in the disc 49 is formed a similar cam slot 50 oriented in the opposite position from the slot 51 so that the two slots at all times intersect one another in an angular relationship so as to provide a supporting position for a crank pin 52 fixed to the outer end of a connecting rod 53 in turn connected thru a wrist-pin 54 to the reciprocating pump rod 55 of the well pump. The crank pin 52 thus rides in both of the cam slots 50 and 51 and depending upon the relative position of rotation of the disc 48 with regard to the disc 49 as effected by the lever mechanism 32—35—46 described, determines the relative position of the crank pin with respect to the axis of rotation 29 of the fan. For example, referring to Fig. 3, when the disc 48 is rotated in a counterclockwise position, as indicated by the arrow 48a, relative to the disc 49, the cam slots will intersect at point 52a to give maximum stroke to the pump rod 55, and when the disc 48 is rotated in a clockwise direction relative to the disc 49 the portions 50a and 51a of the respective cam slots 50 and 51 will intersect to give a minimum of stroke position for the crank pin 52. The cam slots are so arranged that preferably with increased fan speed due to increased wind velocity, the discs 48 and 49 will be adjusted relative to one another to increase the pump stroke so as to give maximum flow of water and maintain a substantially constant speed of fan rotation. Thus a relatively maximum output from the pump with constant fan speed may be thus readily effected in an automatically controlled manner.

While the apparatus herein disclosed and described constitutes a preferred form of the invention, it is also to be understood that the apparatus is capable of mechanical alteration without departing from the spirit of the invention and that such mechanical arrangement and commercial adaptation as fall within the scope of the appendant claims are intended to be included herein.

Having thus fully set forth and described this invention what is claimed as new and desired to be obtained by United States Letters Patent is:

1. In a variable pitch windmill structure having a rotatable fan, a series of fan blades pivotally mounted about radially disposed axes, means connected to said fan blades for simultaneously varying the degree of pitch of said blades including, a pump rod, a connecting rod mechanically connected to said pump rod, a crank pin and cam mechanism supporting the outer end of said connecting rod, and mechanical means interconnecting said crank pin supporting structure and said fan blades so that the change of relative pivotal position of said blades varies the position of said crank pin relative to an axis of rotation of said fan structure.

2. In a variable pitch windmill structure having a rotatable fan, a series of fan blades pivotally mounted about radially disposed axes, means connected to said fan blades for simultaneously varying the degree of pitch of said blades including, a pump rod, a connecting rod mechanically connected to said pump rod, a crank pin and cam mechanism supporting the outer end of said connecting rod, and mechanical means interconnecting said crank pin supporting structure and said fan blades so that the change of relative pivotal position of said blades varies the position of said crank pin relative to an axis of rotation of said fan structure, and counterweight means responsive to the speed of rotation of said fan for simultaneously varying the pitch of said blades and adjusting the relative position of said crank pin to the axis of rotation of said fan.

3. In a windmill fan structure having, a rotatable fan hub, a plurality of featherable fan blades pivotally mounted about radially disposed axes on said fan hub, a control shaft journaled on said fan hub, means interconnecting said blades and said control shaft so that variations in the pitch of said blades effects relative rotation of said control shaft relative to said fan hub, a pump rod, a connecting rod connected to said pump rod having a crank pin, and cam means on said control shaft for positioning said crank pin relative to the axis of rotation of said fan.

4. In a windmill fan structure having, a rotatable fan hub, a plurality of featherable fan blades pivotally mounted about radially disposed axes on said fan hub, a control shaft journaled on said fan hub, means interconnecting said blades and said control shaft so that variations in the pitch of said blades effects relative rotation of said control shaft relative to said fan hub, a pump rod, a connecting rod connected to said pump rod having a crank pin, and cam means on said control shaft for positioning said crank pin relative to the axis of rotation of said fan, and counterweight means associated with said fans, and said control shaft operable to move said fans and control shaft to various positions depending upon the speed of rotation of said fan.

5. In a windmill structure having a main casting member, means for pivotally mounting said casting member for swinging movement about a vertical axis, a tail fin for maintaining said casting in a predetermined direction relative to wind movement, a fan hub journaled in said casting for rotation about a horizontal axis, a series of radially disposed blade carrying arms, variable pitch blades pivotally mounted on the

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outer ends of said arms, actuating means connected to said blades including a ring member rotatable about the axis of rotation of said hub for simultaneously swinging said blades to vary their pitch relative to the direction of wind flow, counterweight means supported on said fan hub operable to swing outwardly with increased speed of said fan and connected to said ring member to vary the pitch of said blades relative to the direction of air flow, bias spring means for normally moving said blades to a maximum angle of attack position, a control shaft including a control disc connected to said operating ring for said blades, a vertically reciprocable pump rod, a connecting rod connected thru a wrist-pin to said rod, a crank pin fixed on the outer end of said connecting rod, a disc on said fan hub, a disc fixed on said control shaft, and cam slot means cooperatively supporting said crank pin in the outer end of said connecting rod so that relative adjustment of said control shaft

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by the movement of said counterweights and wind pressure on said fan blades varies the distance of said crank pin from the axis of rotation of said fan hub and control shaft to change the stroke of movement of said vertically reciprocable pump rod.

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