INTELLECTUAL PROPERTY OFFICE OF SINGAPORE
PATENT AGENTS QUALIFYING EXAMINATION 2007

PAPER A: PREPARATION OF A PATENT SPECIFICATION
1 October 2007, Monday
1400 – 1800 hrs

Maximum Time: 4 Hours (includes reading time) Maximum Marks: 100

INSTRUCTIONS TO CANDIDATES

1. This Paper consists of 5 pages, including this cover page.

2. Write your answers in English. Answers in any other language will not be marked. Answers in illegible handwriting will not be taken into consideration.

3. Two copies of the question paper are provided, one is for your reading and the other is for your use (optional) when answering the question(s) in the Answer Booklet(s).

4. Only your answers and/or drawings to the question(s) written or glued in the Answer Booklet(s) provided by the Examination Secretariat will be considered. You are to write on one side of each sheet in the Answer Booklet(s).

5. Information provided in the question(s) may be obtained from actual situations or modified therefrom for the purpose of this examination. You should accept the facts given in the paper. Assume also that the prior art given is exhaustive.

6. The document provided in this question is:

   Document A – Client's write-up of his invention (3 pages of description and 1 page of drawings).

End

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Document A – Client's write-up of his invention (1/4)

Your client writes as follows:

You will no doubt be familiar with hand-held paper fans which have been in use since time immemorial. I have been working on a mechanical version of such fans, so that, for the first time, it will be possible for a user to be bathed in a mechanically-generated flow of air. Note that no mechanically powered fan has ever previously existed.

My first attempt at such a fan system is illustrated in Fig. 1 in a side view. The fan is a rigid square sheet 1 supported by a hinge 2 running along one of its edges. The hinge 2 is connected to a ceiling (not shown). The longitudinal direction of the hinge is the direction into the page in Fig. 1. A mechanical spring 3 has one end 9 connected to the ceiling and the other end connected to the sheet 1. The spring 3 urges the sheet 1 into a vertical configuration, i.e. hanging directly down from its edge which is connected to the hinge 2. A conventional motor (not shown) rotates a wheel 5 having a fixed centre 4. An edge point 6 on the wheel 5 is connected to the sheet 1 by a string 7. As the wheel 5 rotates, the sheet 1 is pulled to the side by a varying lateral force transmitted by the string 7, which tends to deflect the sheet 1 from the vertical. This displacement is opposed by the force of the spring 3. The result is that sheet 1 adopts a reciprocating (i.e. swinging) motion in an arc around the hinge 2. The motion of the lower edge of the sheet 1 is shown by the double-headed arrow. This motion generates a downward air motion 8 towards a user (not shown) seated below the mechanism.

This device has been widely displayed in Singapore, but the feedback I've had made me dissatisfied with its performance. For one thing, it is power-inefficient. For another, the flow of air is only generated at moments when the sheet 1 is moving most quickly; not at times when the sheet 1 is at either end of its arcuate trajectory. At the latter times, the fan is not moving, so these are "dead moments". The gusty result is irritating.

My first attempt to overcome this problem was by replacing the single sheet 1 with two rigid sheets. Each sheet was hinged individually to the ceiling, and I arranged for the motor to drive the sheets with a 90 degree phase difference (i.e. so that when either sheet was at rest the other was moving at maximum speed). This arrangement also was widely displayed and used

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publicly in Singapore. Unfortunately, this is mechanically more complex, and customers still complained about gustiness because the air beam changed direction according to which sheet was moving (though to minimize this I had arranged for the two hinges to be co-linear, so that in effect the upper edges of the sheets lay on a single line, spaced apart).

I have therefore devised the fan mechanism shown in Figs 2 to 5. Fig. 2 is a perspective view of the mechanism. A motor 20 (a readily-available conventional product which my customers may buy from the manufacturers directly) is fixed to the ceiling, and connected to a body 10, which is the product I intend to manufacture, and is made up of components 11, 12, 13, 14, 15, 16 and 17, which are named below.

As shown in Figs. 2, the motor 20 rotates a hub 17 of the body 10 about a vertical axis. The hub 17 is connected by spokes 14, 15, 16 to longitudinally-symmetric components 11, 12, 13. Thus, each of the longitudinally-symmetric components 11, 12, 13 moves horizontally in the directions labelled as A. Fig. 3 is a side view. The downward arrows of Fig. 3 show how the air moves. The longitudinally-symmetric components 11, 12, 13 together produce a reasonably constant beam of air in the downward direction towards a user 21.

Each of longitudinally-symmetric components 11, 12, 13 has a longitudinally-unvarying cross-section. This cross-section is shown in Fig. 4 (which shows any of the components 11, 12 or 13 viewed the direction shown on Figs. 2 and 3 as B).

A directed air flow is produced in the downward direction. Since the body 10 is always turning, there are no “dead moments” in which there is no air flow. If the components 11, 12, 13 are properly spaced apart, a substantially constant vertical air-flow is produced, and there is little horizontal force on the hub 17.

In an alternative version of the fan, the cross-section of each of the longitudinally-symmetric components 11, 12, 13 is as shown in Fig. 5. That is, the surface of the component 11, 12, 13 is nearly parallel to the direction A at its leading edge 22. This form of the body 10 has a higher mechanical efficiency because it “scoops” the air downwards. This version of the components

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11, 12, 13 encounters less drag than the components 11, 12, 13 shown in Fig. 4. In another version, the components 11, 12, 13 may each have a cross-section like Fig. 4 where they meet the spokes 14, 15, 16, and gradually become more like Fig. 5 near their other ends.

With the designs for the body 10 I've come up with so far, I find that if the body 10 rotates in the opposite sense to that shown, unsatisfactory air flow is generated to a user below the fan. That is, the device only works well in a "blowing" mode in which the air is pushed down towards the user 21; not in a mode in which air is "sucked" upwards from the user 21. The reason is in the latter case is that sucking only generates a mild flow of air up from below, since it also tends to draw air in from the sides of the body 10. But I'm working on this.

I have thought of many variants of this mechanism. For example, though Figs. 2 and 3 show three longitudinally-symmetric components 11, 12, 13, the number may be higher (though less than two blades doesn't work, because it causes a varying horizontal force which makes the device unstable, and a beam of air which constantly changes direction). In another variant, the fan mechanism may not be provided on a ceiling, but instead may be a self-contained commercial product. The product can sit on an item of furniture holding the fan mechanism to generate air flow straight towards a user's face. It may be covered with a shield having holes which allow the air to flow through but prevent a user's fingers from contacting the moving components 11, 12, 13, so that a user's fingers are not inadvertently damaged.

Please draft me a patent application for my fan mechanism.

Assume that the prior art referred to in the paper is comprehensive.

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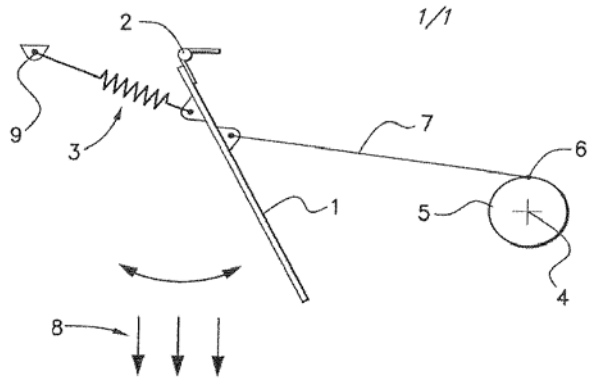


FIG. 1

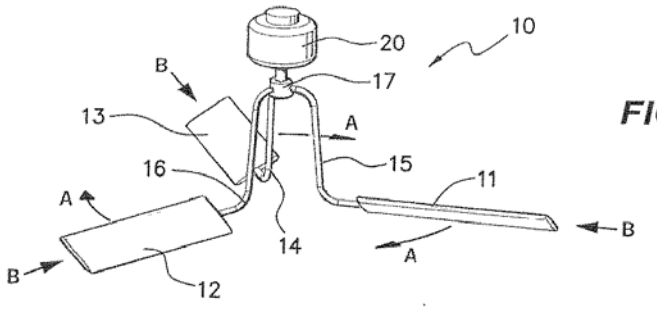
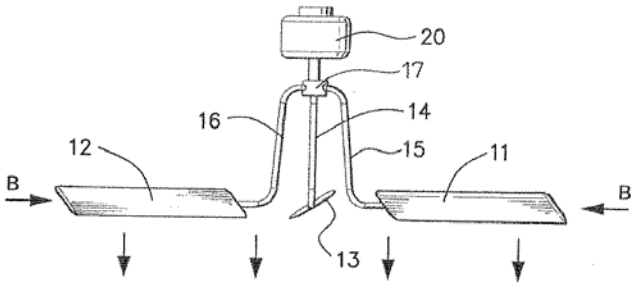


FIG. 2



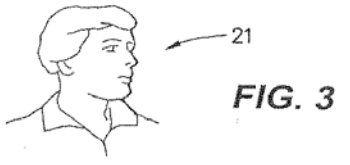


FIG. 3

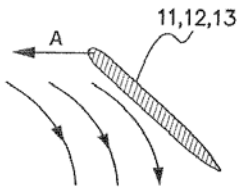


FIG. 4

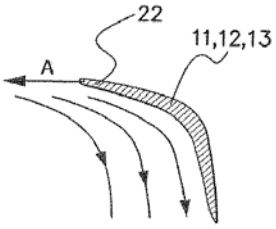


FIG. 5