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BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte CHRISTOPHER ZONIO, JONATHAN C. MCMILLEN, KEVIN C. SCHLOSSER, and THOMAS SPURA

Appeal 2018-008480
Application 15/337,943
Technology Center 3600

Before CYNTHIA L. MURPHY, KENNETH G. SCHOPFER, and ROBERT J. SILVERMAN, *Administrative Patent Judges*.

SILVERMAN, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

Pursuant to 35 U.S.C. § 134(a), Appellant[1] appeals from the Examiner's decision rejecting claims 1–20. We have jurisdiction under 35 U.S.C. § 6(b).

We AFFIRM-IN-PART.

[1] We use the word "Appellant" to refer to "applicant" as defined in 37 C.F.R. § 1.42. The Appellant identifies the real party in interest as LOCKHEED MARTIN CORPORATION. Appeal Br. 2.

CLAIMED SUBJECT MATTER

The claimed subject matter in this Appeal relates to "systems and methods for applying fire retardant using aerial vehicles." Spec. ¶ 1. Because the two independent claims (claims 1 and 14) are analyzed differently, herein, we reproduce both of these claims below:

> 1. A system, comprising:
>
> a plurality of sensors provided on an aerial aircraft to sense weather, terrain, and fire characteristics; and
>
> a controller to determine optimal location of application of fire retardant based on the weather, terrain and fire characteristics,
>
> wherein:
>
> the weather sensed by the plurality of sensors includes a prevailing wind and a wind speed, and
>
> the controller is configured to use the prevailing wind and the wind speed sensed by the plurality of sensors to determine a distance and direction of travel of the fire retardant, use the determined distance and direction of travel of the fire retardant in the determining of the optimal location of application of the fire retardant, and drop the fire retardant at the determined optimal location of application of the fire retardant.
>
> 14. A system, comprising:
>
> a plurality of sensors encompassing multi-spectral sensing capabilities of external environmental conditions, provided on an aerial aircraft; and
>
> a controller to determine optimal location of application of fire retardant based on the external environmental conditions as sensed by the plurality of sensors,
>
> wherein the controller is configured to use information sensed by the plurality of sensors to determine at least one of a distance and direction of travel of the fire retardant or a direction and growth rate of a fire, use the determined at least

> one of the distance and direction of travel of the fire retardant or the direction and growth rate of the fire in the determining of the optimal location of application of the fire retardant, and drop the fire retardant at the determined optimal location of application of the fire retardant.

REJECTION

Claims 1–20[2] are rejected under 35 U.S.C. § 103 as unpatentable over Hoffman (US 2009/0205845 A1, published August 20, 2009) and Akcasu (US 8,165,731 B2, issued April 24, 2012).

FINDINGS OF FACT

The findings of fact relied upon, which are supported by a preponderance of the evidence, appear in the following Analysis.

ANALYSIS

Independent Claim 1 and Dependent Claims 2–13

Among the features of independent claim 1, the recited "controller" is "configured to" do the following: "use the prevailing wind and the wind speed . . . to determine a distance and direction of travel of the fire retardant"; and "use the determined distance and direction of travel of the fire retardant in the determining of the optimal location of application of the fire retardant."

The Examiner's position (Final Action 4–5, 9–10; Answer 11, 16–17) is that the following portion of Akcasu discloses "us[ing] the prevailing

---

[2] "The Advisory Action indicates that, for purposes of appeal, the Amendment after Final Rejection under 37 C.F.R. § 1.116 filed on November 8, 2017, will be entered." Appeal Br. 1. The referenced Amendment incorporated limitations of claim 21 into independent claim 1, incorporated limitations of claim 22 into independent claim 14, and canceled claims 21 and 22. *See id.* at 5 n.2, 13 n.3.

wind and the wind speed" and "us[ing] the determined distance and direction of travel of the fire retardant":

> Drop Zone Calculation
>
> As shown in FIGS. 3, 5 and 6, the smart water bomb drop coordinates for a given target coordinate set depend on the altitude, drop speed, wing attack angle with respect to the air flow and wind conditions. Since the "Flight" program is basically an initial value problem solver, it cannot calculate the range directly. However, using the "Flight" program, a precalculated dataset as shown FIGS. 3, 5 and 6 is constructed for rapid calculation of the required safe and controllable drop coordinates of all of the smart water bombs with respect to the target coordinates and for a given delivery speed and set wing attack angles with respect to the air flow. After fire control at the control center 12 selects or decides the target coordinates, the altitude, speed and course of the delivery aircraft 14, 16 are calculated based on this data. Using the stored data and working backwards from the target coordinates, the drop coordinates for each smart water bomb will be obtained. The independent variable may for example be time separation between releases. The example is given in FIG. 8 for 300 mph drop velocity from 2,000, 4,000, 6,000 and 10,000 meters, where a first release is made at point 90, a second release at point 92, a third release at point 94 and each release point 90, 92, 94 follows its respective trajectory 96, 98, 100 to its respective target 102, 104, 106, in a tight cluster 108. Various release altitudes can achieve the same trajectory when released at the appropriate times for those altitudes. Similar trajectories can be determined for various drop velocities. Thus, the same target coordinate can be hit from various altitudes and distances from the target within a short time interval. In addition, smart water bomb so launched can all hit the same target and any other target coordinate in the range of $\Delta x = +/- 500$ meters of the target by mere elevator control while always being in the safe flight envelope.

Akcasu col. 6, ll. 6–38.

Although Akcasu refers, for example, to "calculation of . . . drop coordinates . . . with respect to the target coordinates and for a given delivery speed and set wing attack angles with respect to the air flow" (*id.* at col. 6, ll. 14–17), we agree with the Appellant, to the extent that the Examiner does not adequately explain how Akcasu would "use the prevailing wind and the wind speed . . . to determine a distance and direction of travel of the fire retardant" or "use the determined distance and direction of travel of the fire retardant in the determining of the optimal location of application of the fire retardant," as recited in claim 1. *See* Appeal Br. 6–9.

Accordingly, we do not sustain the rejection of independent claim 1 and dependent claims 2–13, under 35 U.S.C. § 103.

Independent Claim 14
and Dependent Claims 15 and 17–20

Although similar to claim 1, independent claim 14 has a different scope, including with regard to its recited "determining of the optimal location of application of the fire retardant," which may be achieved through the use of "at least one of the distance and direction of travel of the fire retardant or the direction and growth rate of the fire":

> 14. A system, comprising:
>
> a plurality of sensors encompassing multi-spectral sensing capabilities of external environmental conditions, provided on an aerial aircraft; and
>
> a controller to determine optimal location of application of fire retardant based on the external environmental conditions as sensed by the plurality of sensors,
>
> wherein the controller is configured to use information sensed by the plurality of sensors to determine *at least one of a distance and direction of travel of the fire retardant or a direction and growth rate of a fire*, use the determined *at least*

> *one of the distance and direction of travel of the fire retardant or the direction and growth rate of the fire* in the *determining of the optimal location of application of the fire retardant*, and drop the fire retardant at the determined optimal location of application of the fire retardant.

(Emphasis added). Therefore, the argument that is persuasive of error, in the rejection of independent claim 1 (i.e., pertaining to the limitation of "distance and direction of travel of the fire retardant"), is not dispositive for independent claim 14, in view of claim 14's alternative use of the "direction and growth rate of a fire," in the recited determinations.

The Examiner (*see* Final Action 9–10) sufficiently shows that Akcasu teaches the "direction and growth rate of a fire," which is manifest in the following excerpt from the reference:

> [A] fire control operator at the control center 12 should be able to designate a spray pattern around a fire by marking the region on the map displayed on a display screen 38 of the computer 36. Using input data derived from the marking, the computer 36 of the control center 12 can calculate the number of bombs needed and their target coordinates. In this calculation, wind data are also taken into consideration. From the aircraft availability data, usable air bases will be identified. Flight plans and drop zone for each aircraft, along with the flight plans of individual smart water bombs may be calculated. *Since there is time needed from the detection of a fire to deploying aircraft with their payload to their drop zones, weather data will be crucial in predicting the spreading of the fire during that response time*. Therefore the drop zones of the delivery aircrafts and the flight trajectory data for every smart water bomb might be updated as the delivery aircraft approaches the vicinity of their initially calculated drop zones to then current conditions.

Akcasu col. 3, l. 67–col. 4, l. 17 (emphasis added). Notably, the foregoing passage discloses both the spatial and temporal aspects of the recited "direction and growth rate of a fire," because Akcasu refers to updating the location of an upcoming delivery, in view of the response time.

The Appellant argues that the Examiner's rejection, based upon the combination of Hoffman and Akcasu, is erroneous, because "[t]he Hoffman reference does not teach or suggest the claimed onboard sensing and decision-making processes that are used to apply fire retardant in optimal locations." Appeal Br. 12. Yet, claim 14 does not require onboard decision making processes, as the Appellant contends. The claim language requires "sensors . . . provided on an aerial aircraft," a feature found in paragraph 34 of Hoffman (*see* Answer 15), but does not specify the location of the recited "controller."

The Appellant also argues that the "drop coordinates" disclosed in Akcasu are the location where smart water bombs are dropped and, therefore, do not teach the claimed "optimal location," where fire retardant is deposited. Appeal Br. 14–15 (citing Akcasu col. 1, l. 62 – col. 2, l, 5; col. 6, ll. 7–39).

Yet, the Examiner (Answer 16–18) addresses how Akcasu accounts for this distinction and explains how water bombs reach the target coordinates:

> [U]sing the "Flight" program, a precalculated dataset as shown FIGS. 3, 5 and 6 is constructed for rapid calculation of the required safe and controllable drop coordinates of all of the smart water bombs with respect to the target coordinates and for a given delivery speed and set wing attack angles with respect to the air flow. After fire control at the control center 12 selects or decides the target coordinates, the altitude, speed and course of the delivery aircraft 14, 16 are calculated based on this data. Using the stored data and working backwards from the target

> coordinates, the drop coordinates for each smart water bomb will be obtained.

Akcasu col. 6, ll. 12–22. *See also* Answer 18 (citing Akcasu col. 4, ll. 3–6).

In view of the foregoing analysis, the Appellant does not persuade us of error in the rejection of independent claim 14. The Appellant relies upon the arguments presented for independent claim 14, with regard to dependent claims 15 and 17–20, but presents an additional argument for dependent claim 16 (discussed below). *See* Appeal Br. 16. Accordingly, we sustain the rejection of claims 14 and 17–20 under 35 U.S.C. § 103.

Dependent Claim 16

Claim 16 recites:

> 16. The system of claim 14, wherein the plurality of sensors include fire hot spot sensors comprising at least one of infrared (IR) cameras and Electro Optical Sensors (EO) onboard the aerial vehicle.

According to the Examiner (Answer 19–20), the following excerpt from Hoffman discloses the features added in claim 16:

> The UAV [unmanned aerial vehicle] may also include sensors for monitoring and determining conditions, including weather conditions and its flight conditions. . . . The UAV may also include *sensors for determining conditions relating to the fire*, such as *heat sensors, infrared sensors* and the like. Other sensors may include angle-of-attack and side slip vanes, barometric pressure measurement systems, pilot-static systems for speed and altitude determination and the like. The sensors or other processors to locate a target may include, but are not limited to *infrared detectors, light contrast detectors or pattern recognition from video pictures, laser detectors, optical equipment and cameras*, embedded radio transmitters/trackers, and the like.

Hoffman ¶ 34 (emphasis added).

In response, the Appellant argues:

> While Hoffman does teach heat sensors and infrared sensors, there is no teaching or suggestion in Hoffman that these sensors are structured to sense fire hot spots. Instead of sensing fire hot spots, the infrared sensors disclosed by Hoffman are guidance sensors that guide the UAV. Accordingly, these sensors are not the same as the claimed fire hot spot sensors that include at least one of infrared (IR) cameras and Electro Optical Sensors (EO) onboard the aerial vehicle.

Reply Br. 8.[3]

The Appellant's argument is not persuasive.

To begin with, Hoffman (¶ 34) refers to "sensors for determining conditions relating to the fire" including "heat sensors." Therefore, Hoffman's sensors identified above are not strictly *guidance* sensors, as the Appellant contends.

Additionally, the Appellant does not provide any explanation for the assertion that the disclosed sensors of Hoffman would not "sense fire hot spots." Reply Br. 8. Indeed, the Appellant's assertion is contrary to the preponderance of the record evidence, because Hoffman specifically refers to "heat sensors." Hoffman ¶ 34.

Finally, the Appellant ascribes no structural features to the particular role of the "sensors" for detecting hot spots. Rather, the term "hot spot" in the claim is an intended use for the "sensors" — which have a structure described in subsequent claim language. Such an intended use, which bears

[3] The quoted portion of the Reply Brief (page 8) does not refer to claim 16, but only to dependent claim 3 (depending from claim 1), which contains language substantially identical to that of claim 16. We understand the Appellant's argument (in the Reply Brief) to apply also to claim 16, because the Appellant elsewhere addresses claims 3 and 16 in identical fashion. Appeal Br. 9–10, 16.

no structural meaning, does not limit claim scope. *See Arctic Cat Inc. v. GEP Power Prods., Inc.*, 919 F.3d 1320, 1328 (Fed. Cir. 2019); *In re Schreiber*, 128 F.3d 1473, 1477 (Fed. Cir. 1997).

Accordingly, we sustain the rejection of claim 16 under 35 U.S.C. § 103.

CONCLUSION

In summary:

Claims Rejected	35 U.S.C. §	Reference(s)/Basis	Affirmed	Reversed
1–20	103	Hoffman, Akcasu	14–20	1–13

TIME PERIOD FOR RESPONSE

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a). *See* 37 C.F.R. § 1.136(a)(1)(iv).

AFFIRMED-IN-PART