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Tuttle

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[54] **RF IDENTIFICATION SYSTEM WITH RESTRICTED RANGE**

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[73] Assignee: **Micron Communications, Inc.**, Boise, Id.

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[51] **Int. Cl.**[7] **H04Q 1/00**

[52] **U.S. Cl.** **340/693.9**; 340/572.7; 340/10.1; 342/42

[58] **Field of Search** 340/825.54, 572, 340/505, 432, 572.7, 572.8, 693.9, 10.1; 342/51, 42

[56] **References Cited**

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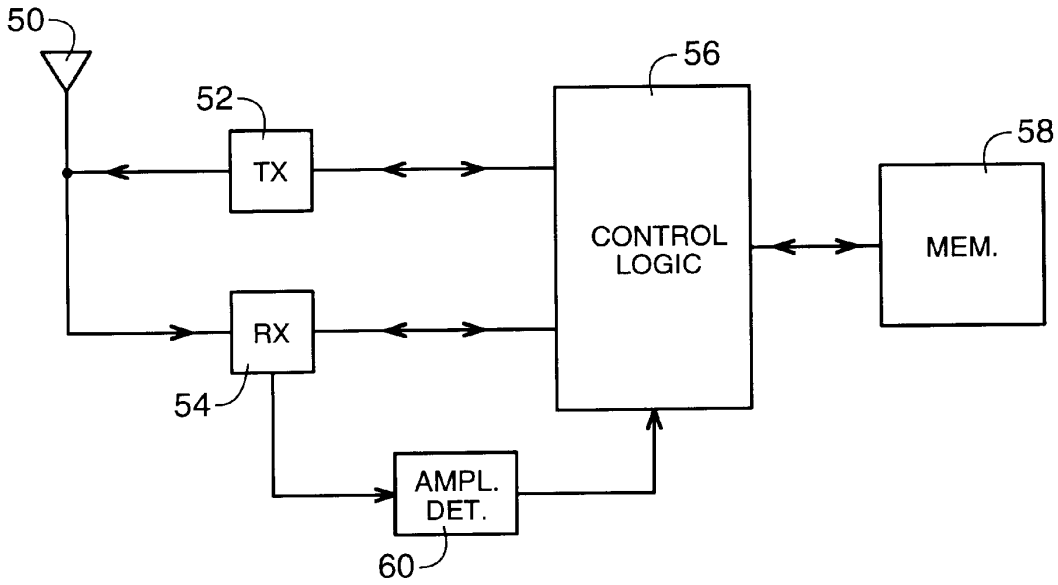
Primary Examiner—Brian Zimmerman
Attorney, Agent, or Firm—Robert J. Stern

[57] **ABSTRACT**

A method of adjusting the 2-way communication range of an RFID system to assist a human operator to individually handle and interrogate a plurality of tagged objects, such as suitcases, that each include an RFID tag transceiver. An RFID interrogator transceiver is mounted on the human operator. The 2-way communication range between the interrogator transceiver and the tag transceivers is adjusted to only slightly exceed the closest distance between the interrogator and the tag while the operator is handling the tagged object. Preferably, the 2-way communication range is short enough that other tagged objects will remain outside the communication range and will not respond to messages from the interrogator. Another aspect of the invention is a method of verifying whether an object to be transported has reached its intended destination. In this aspect, an interrogator transceiver at a first destination interrogates an RFID tag transceiver on the object, and in response the tag transmits its intended destination.

5 Claims, 3 Drawing Sheets



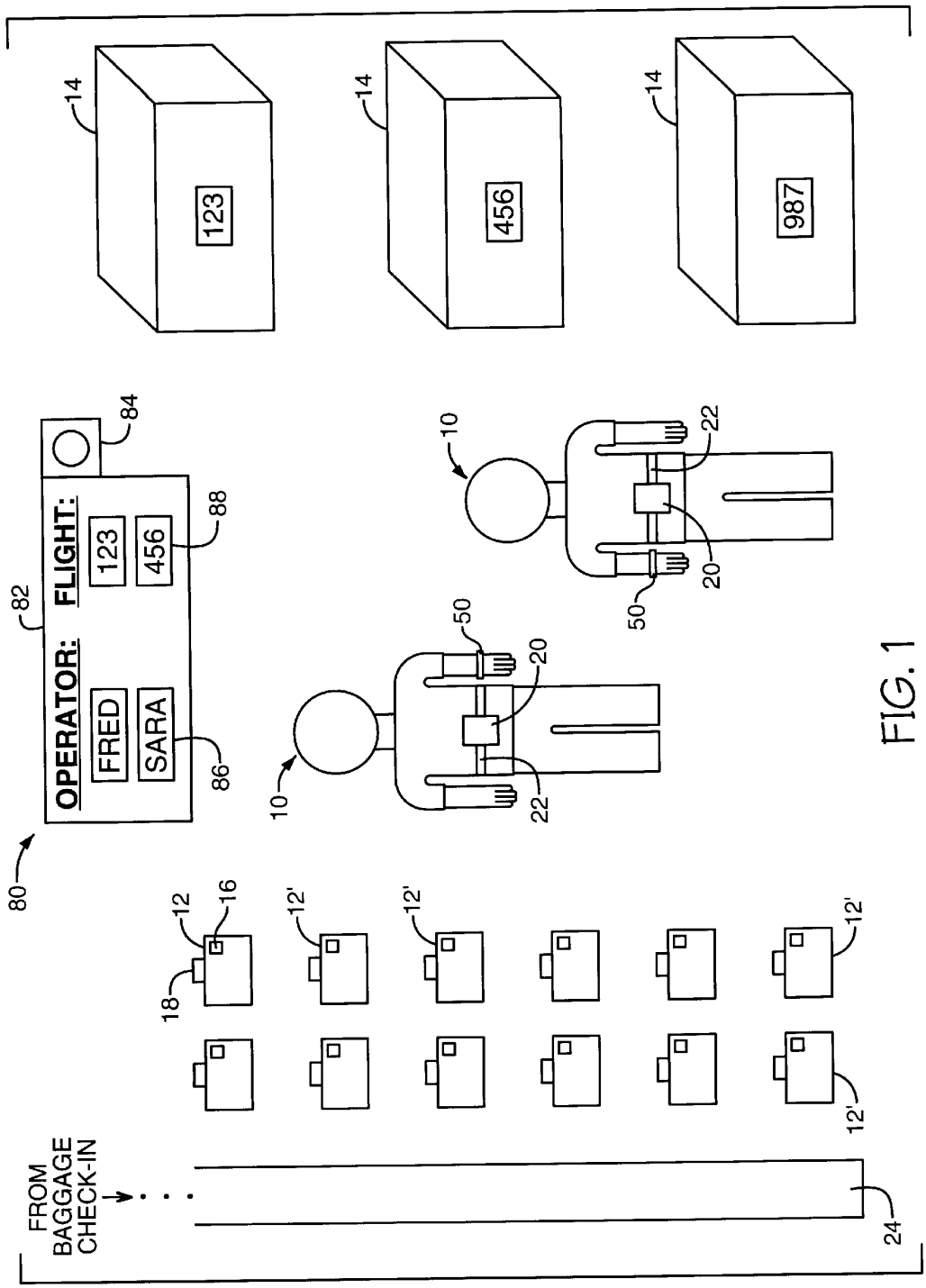


FIG. 1

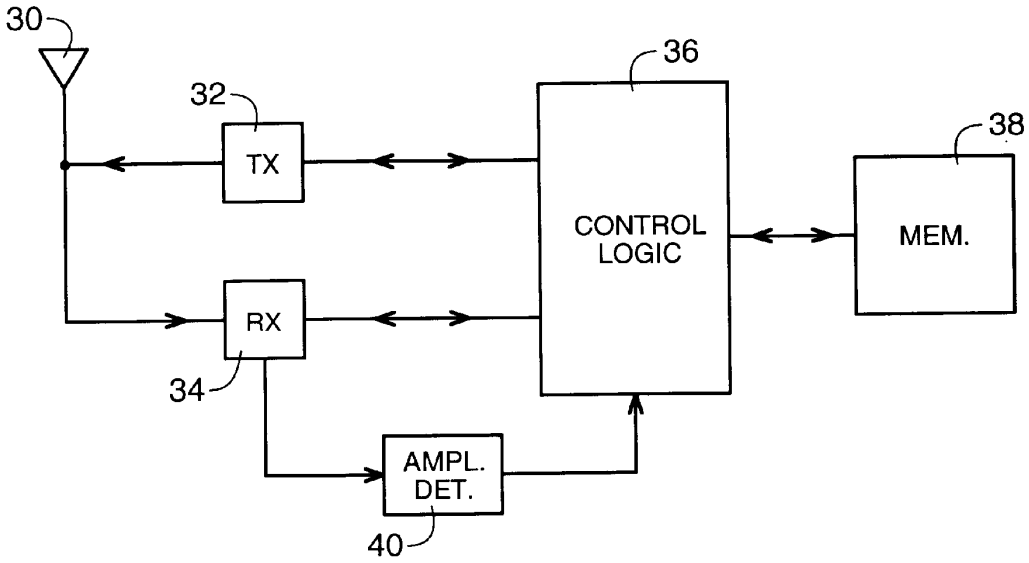


FIG. 2

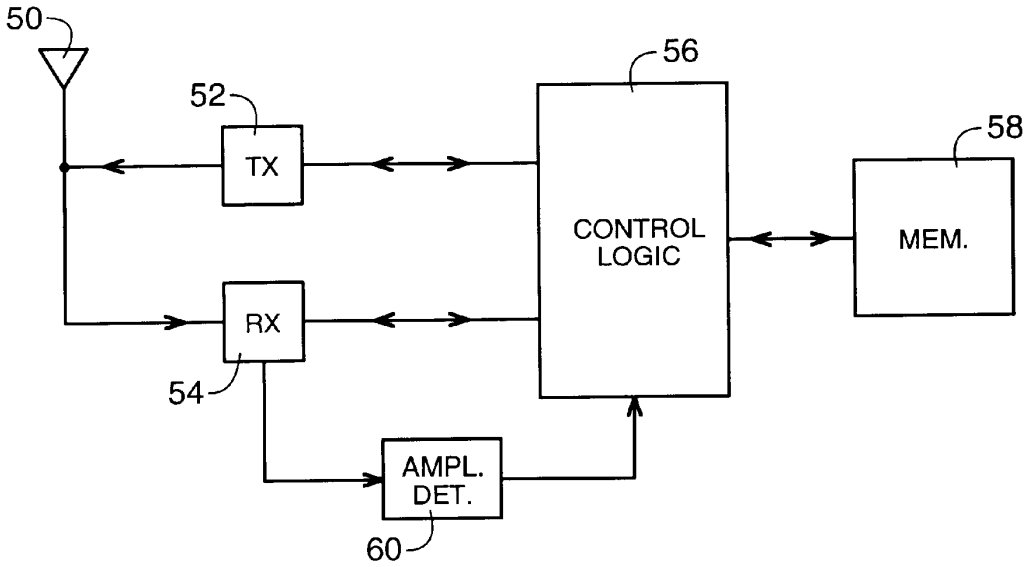


FIG. 3

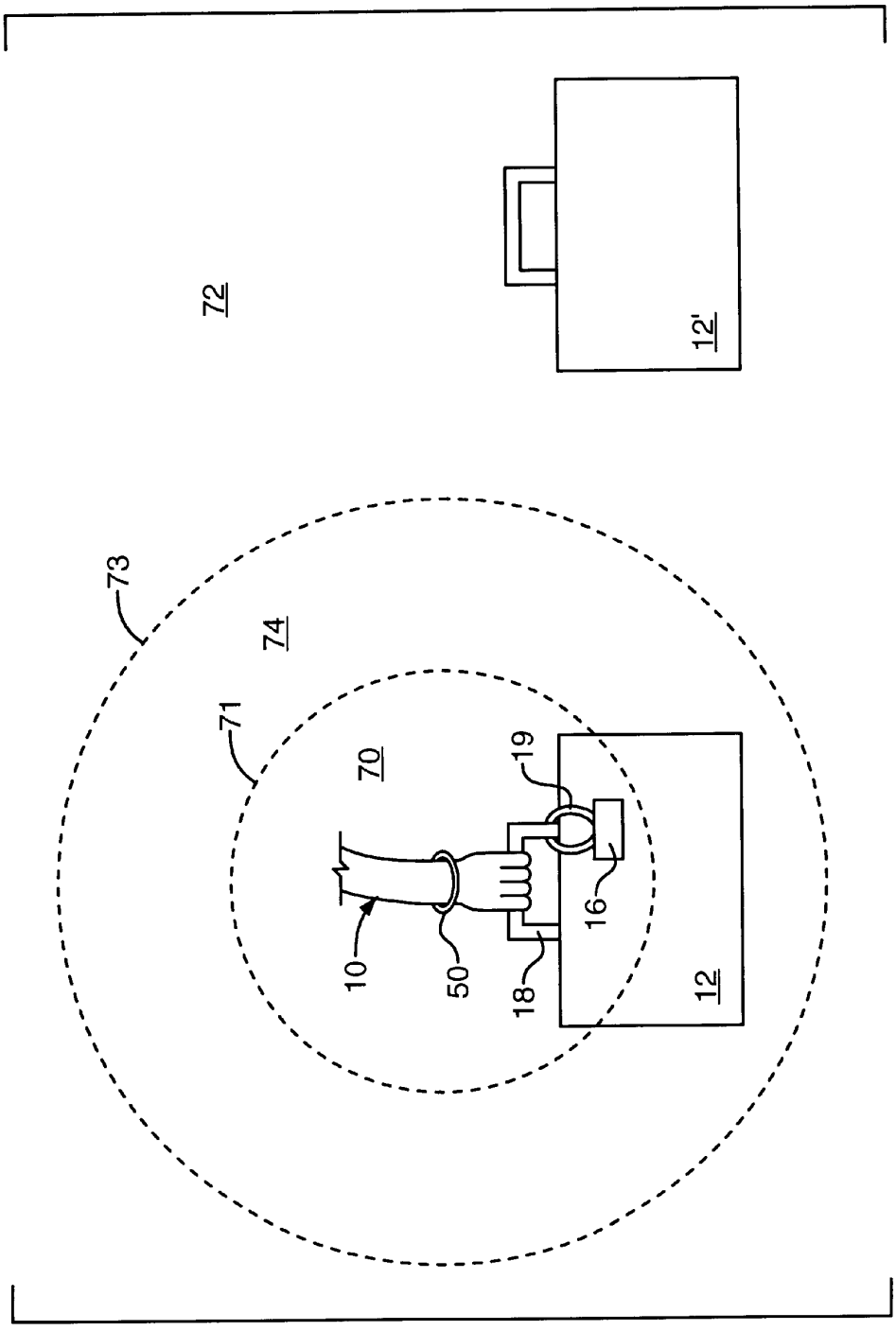


FIG. 4

RF IDENTIFICATION SYSTEM WITH RESTRICTED RANGE

FIELD OF THE INVENTION

The invention relates generally to RF identification tags and interrogators, that is, to systems for identifying objects by communication between a radio frequency transceiver mounted on each object (RF identification "tag") and a radio frequency transceiver "interrogator". More specifically, the invention relates to such a system in which one or more human operators each has his own interrogator, and in which the 2-way communication range between each operator's interrogator transceiver and the tags is adjusted so as to prevent communications between the interrogator and more distant tags.

BACKGROUND OF THE INVENTION

Radio frequency identification (RFID) systems have been proposed for identifying tagged objects for such purposes as taking inventory or tracking movements of objects being transported. Examples are described in commonly assigned U.S. Pat. Nos. 5,300,875; 5,365,551; and 5,448,110.

RFID systems generally employ a passive or active RF transceiver, called a "tag", mounted on each object to be identified or tracked. An interrogator transceiver periodically transmits RF interrogation signals. Upon receiving an interrogation signal, a tag responds by transmitting a response signal containing data which identifies the object and contains any other information which may have been stored or programmed in the tag.

Conventional RFID systems provide little or no interactive feedback in response to actions performed by handling personnel. Specifically, conventional RFID systems lack any means for discriminating in favor of an individual tagged object a human operator is working with at any given moment; instead, conventional RFID systems generally would confuse the operator by providing information regarding all the tagged objects in the vicinity. Furthermore, if a number of personnel are working close to each other, conventional RFID systems cannot direct information about a tag to the specific individual who is handling the tagged object.

For example, suppose a number of airport baggage handler personnel are sorting or routing tagged suitcases according to the airline flight destination encoded in a tag attached to each suitcase. Conventional RFID systems lack any means for detecting which individual suitcase a human operator or baggage handler is about to pick up so as to provide to the operator only the destination or routing information for the suitcase that person currently is handling, to the exclusion of information about other nearby suitcases. Presumably because of this and other shortcomings of conventional RFID systems, RFID tags never entered commercial use for tagging airline baggage.

SUMMARY OF THE INVENTION

The present invention is a method of adjusting the 2-way communication range of an RFID system to assist a human operator to individually handle and interrogate a plurality of tagged objects, such as suitcases, which each include an RFID tag transceiver. An RFID interrogator transceiver, preferably mounted on the operator, periodically broadcasts interrogation messages. Any tag transceiver which is within 2-way communication range of the interrogator receives the broadcasted message and responds by transmitting an identifying message containing data identifying the tagged object. The interrogator transceiver receives the response message from the tag and presents to the operator the identifying data contained in the response message, typically via an aural transducer or visual display.

In a first embodiment of the present invention, the 2-way communication range between the interrogator transceiver and the tag transceivers is adjusted to only slightly exceed the closest distance between the interrogator and the tag while the operator is handling the tagged object. Consequently, other tagged objects will remain outside the communication range and will not respond to interrogation messages. Therefore, the operator can be confident that the identifying information he receives from the interrogator pertains to the individual tagged object which the operator currently is handling, rather than pertaining to other tagged objects nearby.

The interrogator transceiver can be mounted anywhere on the operator's person so as to leave both of the operator's hands free for handling the tagged objects. For example, the interrogator can be mounted on the person's belt. Furthermore, the interrogator can have an antenna mounted separately, preferably on the operator's wrist band or similarly near the person's hand, so that the operator can extend his hand toward a tagged object to bring the antenna within close communication range of the RFID tag on the object. This allows reducing the communication range so as to minimize the possibility of responses from RFID tags other than the one associated with the individual tagged object which the operator currently is handling.

A second embodiment of the invention does not necessarily limit the interrogator to communicating with a single tag as in the first embodiment. Instead, an objective of the second embodiment is to prevent one operator's interrogator from communicating with tagged objects being handled by other operators working nearby in the same facility. In this embodiment, the 2-way communication range between one operator's interrogator and the tags is adjusted so that all tagged objects being handled by other operator personnel are outside the range. Unlike the first embodiment, the 2-way communication range between the interrogator and the tags need not be so short that only one tagged object at a time can be within the range.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a schematic depiction of an airport baggage sorting facility employing the present invention.

FIG. **2** is a block diagram of an RFID tag transceiver used in the present invention.

FIG. **3** is a block diagram of an RFID interrogator transceiver used in the present invention.

FIG. **4** is a schematic depiction of the reliable, unreliable, and zero two-way communications zones surrounding an interrogator transceiver.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

1. Overview

The invention will be described in the context of an exemplary implementation, depicted in FIG. **1**, in which the human operators **10** are baggage handler personnel working in an airport baggage sorting facility, and the tagged objects **12** are airline baggage. However, the invention is equally applicable to any other objects to which RFID tags may be attached.

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