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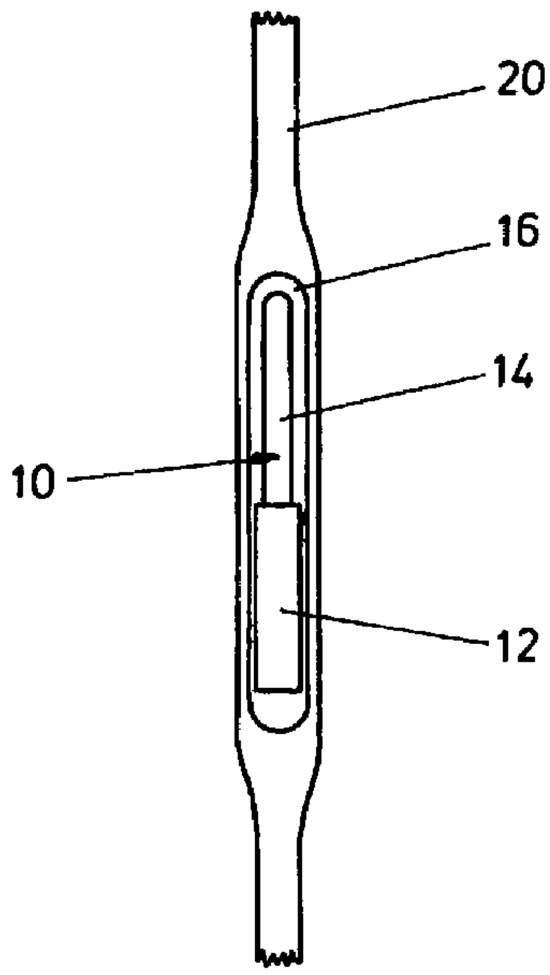
(54) **DISPOSITIFS D'IDENTIFICATION OU DE CONTROLE**
(54) **IDENTIFICATION OR CONTROL ARRANGEMENTS**



(57) On décrit une fibre ou un fil (20) renfermant un transpondeur électronique (10) dont le diamètre est si faible qu'il est difficile, voire impossible, de le distinguer visuellement ou par le toucher. Le transpondeur (10) peut être interrogé pour identifier la fibre ou le fil, ou encore une toile ou un autre article dans lequel la fibre ou le fil est incorporé(e).

(57) A fibre or thread (20) incorporates an electronic transponder (10), which is of sufficiently small diameter that it is difficult or impossible to discern either visually or by touch. The transponder (10) can be interrogated to identify the fibre or thread or to identify a fabric or other article in which the fibre or thread is incorporated.

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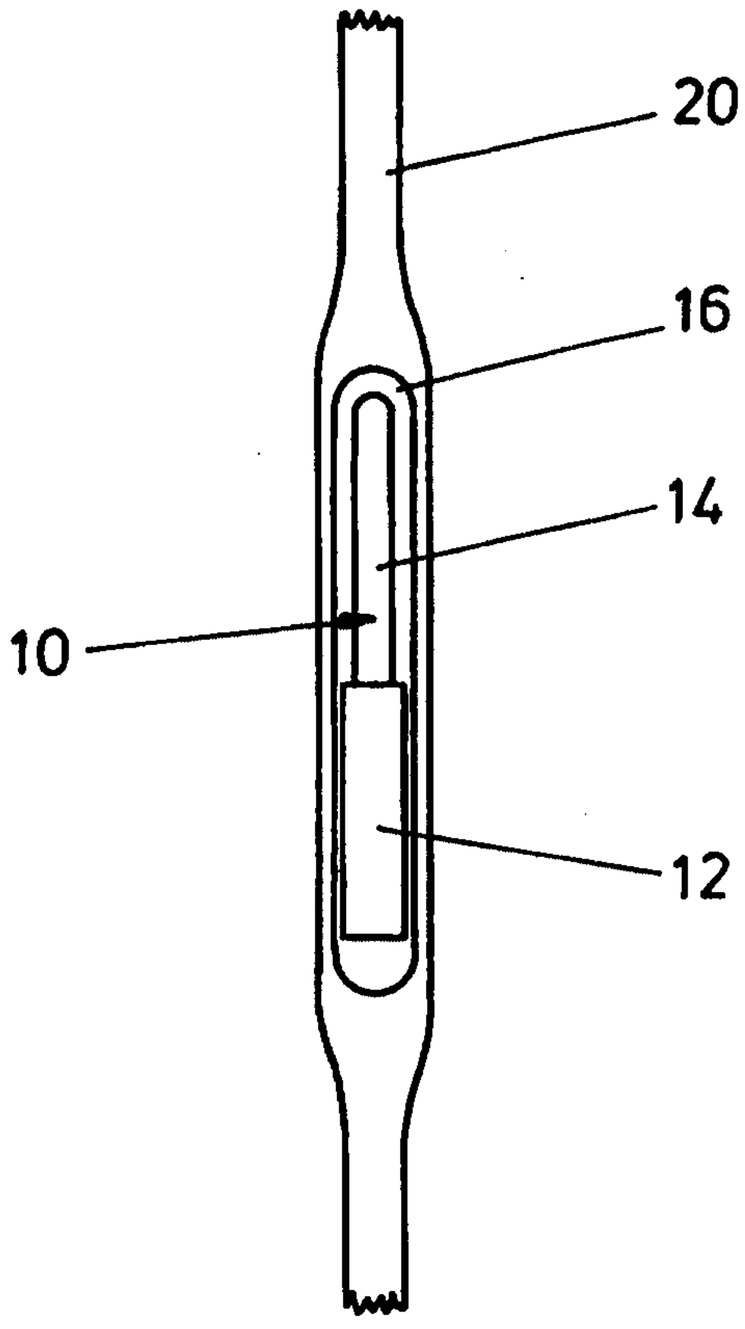
(57) Abstract

A fibre or thread (20) incorporates an electronic transponder (10), which is of sufficiently small diameter that it is difficult or impossible to discern either visually or by touch. The transponder (10) can be interrogated to identify the fibre or thread or to identify a fabric or other article in which the fibre or thread is incorporated.



IDENTIFICATION OR CONTROL ARRANGEMENTS

The present invention relates to identification or control arrangements, including arrangements enabling the movements of individuals or articles to be tracked, or the access of individuals to restricted areas or premises to be controlled.

There are many situations in which it is desirable or necessary to be able to track the movements of individuals. There are many situations also where it is desirable or necessary to control the access of individuals to restricted areas or premises. It is known to provide individuals with electronic transponders (or tags), or with magnetically-encoded cards, which are "read" by interrogation units in order to identify each individual. Generally these require the individual to remember to carry his or her transponder or card, and the systems are therefore compromised if the individual loses or misplaces his transponder or card, or has it stolen.

I have now devised arrangements which can be used to overcome the above-described problems and in particular can be used to provide individuals, and a wide variety of articles, with an identifier which is difficult if not impossible to perceive, at least visually. The arrangements can also be used in many situations where previous arrangements have been unsuitable.

In accordance with the present invention, there is provided a fibre or thread which incorporates an electronic transponder.

Also in accordance with the present invention, there is provided a fabric or other article having at least one fibre or thread which incorporates an electronic transponder.

The electronic transponder may be embedded or encapsulated within a unitary fibre. Alternatively, the fibre may comprise a plurality of filaments stranded together and enclosing the transponder. The fibre may include a plurality of transponders spaced apart along its length.

Preferably the electronic transponder is elongate in shape and of such a diameter (or other cross-sectional size)

that it does not substantially increase the diameter of the fibre in which it is incorporated. In this manner, the presence of the transponder within the fibre, or its position within the fibre, is difficult or impossible to discern either visually or by touch.

The electronic transponder may comprise an integrated circuit having an aerial extending therefrom or incorporated therein. The transponder may include a battery power source: the transponder may be arranged so that an interrogation unit, with which it is to be used, will inductively couple power into the circuit via the aerial of the transponder in order to recharge the battery; instead, this inductive coupling may be used to power the transponder, in which case the battery power source is not required. In either of the latter cases, relative movement between the transponder and the interrogation unit may cause the necessary current to be generated and supplied to the transponder.

Preferably the transponder (except possibly its aerial) is wholly contained or encapsulated within a protective enclosure, for example of glass or ceramic material.

It will be appreciated that the transponder may be arranged, when interrogated by the interrogation unit, to transmit a reply signal which identifies the transponder, and therefore the fabric or other article having the fibre, or the individual wearing a garment or article, which incorporates the fibre. The movement of individuals wearing such a garment may be monitored, for example for the purpose of tracking individuals or for the purpose of limiting access to restricted areas or premises: alternatively, the transponder may be used to identify the fabric, garment or other article so that its movements can be monitored for security or stock control purposes, whether in the factory, or in a warehouse or the like, or in a retail outlet. The transponder may be arranged for interrogation by means of an electromagnetic signal of one frequency, and to transmit an electromagnetic reply signal of a different frequency, for example an optical signal.

The transponder may include one or more sensors, e.g. microphones, thermometers, accelerometers, hygrometers, light sensors, pressure sensors, direction-finding sensors, to sense

and measure respective parameters: the measured values may be stored and the transponder arranged to transmit a signal representing the measured parameter.

It is also envisaged, in the manufacture of a fibre for a fabric of the invention, or in the manufacture of the fabric or of an article from the fabric, that data may be recorded in the transponder, this data representing information relating to the process or process conditions. For example, this information may include the date and time at which the processing took place, and the temperature or other processing parameters: in the latter case, where the fibre or fabric incorporates a transponder having a sensor (as mentioned above), the sensor may be arranged to sense and store the temperature or other processing parameter.

Whilst the fibres of the present invention may be combined with other fibres to form a fabric, they may be otherwise incorporated into an article. For example, the fibres or threads of the invention may be incorporated into stitching or the seams of fabrics or garments or of other articles, e.g. footwear, curtains, furniture etc. As further examples, the fibres or threads may be incorporated into articles used for wrapping, tying or reinforcing other articles.

In all of the above-described embodiments, it will be appreciated that an individual will automatically become identifiable, by appropriate interrogation units, upon donning an encoded garment or other article: the transponders which are incorporated in the fibres of the garment are difficult or impossible to perceive, at least visually. In some cases it will be necessary to position the transponder-containing part of the garment or other article in contact or close proximity to a reading head of the interrogation unit: however, in many cases this should not be necessary and in those cases the interrogation unit may be mounted to one side of a doorway or passageway through which the wearer of the garment passes.

For the purposes of this specification, the term "fabric" includes fabrics which are formed by weaving or any other process. Also, the fibres or threads may be of natural or synthetic materials, or a combination of natural and

synthetic materials.

An embodiment of the present invention will now be described by way of example only and with reference to the accompanying drawings, in which:

FIGURE 1 is a diagrammatic longitudinal section through a fibre which incorporates a transponder; and

FIGURE 2 is a schematic diagram illustrating a portion of a piece of fabric which includes some fibres as shown in Figure 1.

Referring to Figure 1 of the drawings, there is shown a miniature transponder 10 incorporated within a fibre 20 which, together with other fibres, is to be used to form a fabric. The transponder 10 comprises an integrated circuit 12 and an aerial 14, all encapsulated in e.g. glass or ceramic material (indicated at 16): the aerial 14 may however comprise an elongate filament extending from the transponder and incorporated in the respective fibre 20. The encapsulated transponder 10 is of elongate, preferably cylindrical shape and of a cross-sectional size preferably less than the diameter of the fibre itself, so that the overall diameter of the fibre is not enlarged (or not significantly enlarged) at the location of the transponder. The presence of the transponder is therefore difficult or impossible to discern either visually or by touch.

Referring to Figure 2 of the drawings, there is shown a portion of fabric which comprises fibres or threads 22, 24 woven together. The fibres 22 and 24 may be of any natural or synthetic material. Some of the fibres, e.g. fibres 22a, 22b, are fibres of the type shown in Figure 1 and incorporate respective transponders 10a, 10b. Alternatively, each of the fibres 22, 24 may comprise a plurality of filaments stranded together, one or more of the filaments incorporating a transponder. In general, one or more (or even all) of the fibres may include a transponder. One or more fibres may include a number of transponders spaced apart along its length.

It will be appreciated that when garments, formed at least in part of a fabric as described above, are worn, then the individual wearers of those garments can be identified by appropriate interrogation units. In this way, the movements

of the individuals can be tracked and/or the access by individuals to restricted areas or premises can be controlled.

Further, the fabric itself (and garments or other articles made from or incorporating a fibre as shown in Figure 1) can be identified, such that their movements e.g. within a manufacturing plant, warehouse or retail outlet, can be monitored, for the purposes of security and/or stock control. Although reference had been made particularly to garments made from the fabric, the principles of the invention are applicable to other articles of fabric, particularly where the identification of the fabric or article is for security or stock control purposes. For example, the fabric may comprise part only of an article, e.g. the woven backing of a carpet, mat or tapestry.

Also, as previously mentioned, the fibres or threads of this invention may be incorporated into stitching or the seams of fabrics or garments or of other articles, e.g. footwear, curtains, furniture etc. The fibres or threads may also be incorporated into articles used for wrapping, tying or reinforcing other articles.

Claims

1) A fibre or thread which incorporates an electronic transponder.

2) A fibre or thread as claimed in claim 1, which is of unitary form and has said electronic transponder embedded therein.

3) A fibre or thread as claimed in claim 1, comprising a plurality of filaments stranded together and enclosing said electronic transponder.

4) A fibre or thread as claimed in any preceding claim, which incorporates a plurality of said electronic transponders spaced apart along its length.

5) A fibre or thread as claimed in any preceding claim, in which the or each said electronic transponder is elongate in shape and of such a cross-sectional size that the diameter of the fibre or thread is not substantially increased at the location of said transponder.

6) A fibre or thread as claimed in any preceding claim, in which the or each said electronic transponder comprises an integrated circuit having an aerial extending therefrom or incorporated therein.

7) A fibre or thread as claimed in any preceding claim, in which the or each electronic transponder includes a battery power source.

8) A fibre or thread as claimed in any preceding claim, in which the or each electronic transponder is arranged for the inductive coupling of electrical power into it for powering it, or for recharging a rechargeable battery thereof.

9) A fibre or thread as claimed in any preceding claim, in which the or each transponder, except optionally an aerial

thereof, is encapsulated by protective material.

10) A fibre or thread as claimed in any preceding claim, in which the or each electronic transponder is arranged to receive an interrogation signal and, in response thereto, transmit a reply signal which identified the transponder.

11) A fibre or thread as claimed in any preceding claim, arranged to receive and respond to an electromagnetic said interrogation signal of one frequency, and to transmit an electromagnetic said reply signal of a different frequency.

12) A fibre or thread as claimed in any preceding claim, in which the or each electronic transponder includes one or more sensors for measuring respective parameters, the transponder being arranged to transmit a signal representing the measured value of the or each said parameter.

13) A fibre or thread as claimed in claim 12, in which the transponder is arranged to store data representing said measured value and to respond to a received enquiry signal to transmit said signal representing said measure value.

14) A fabric or other article having at least one fibre or thread as claimed in any preceding claim,

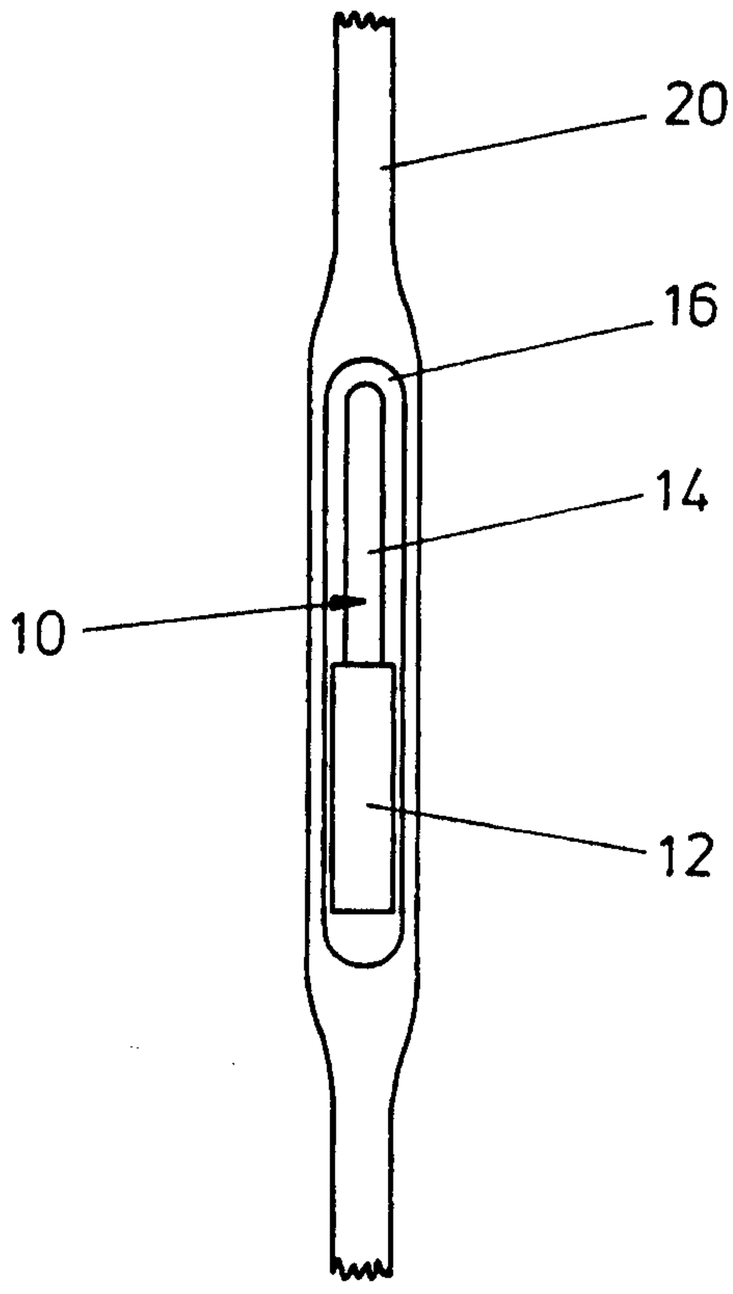


FIG. 1

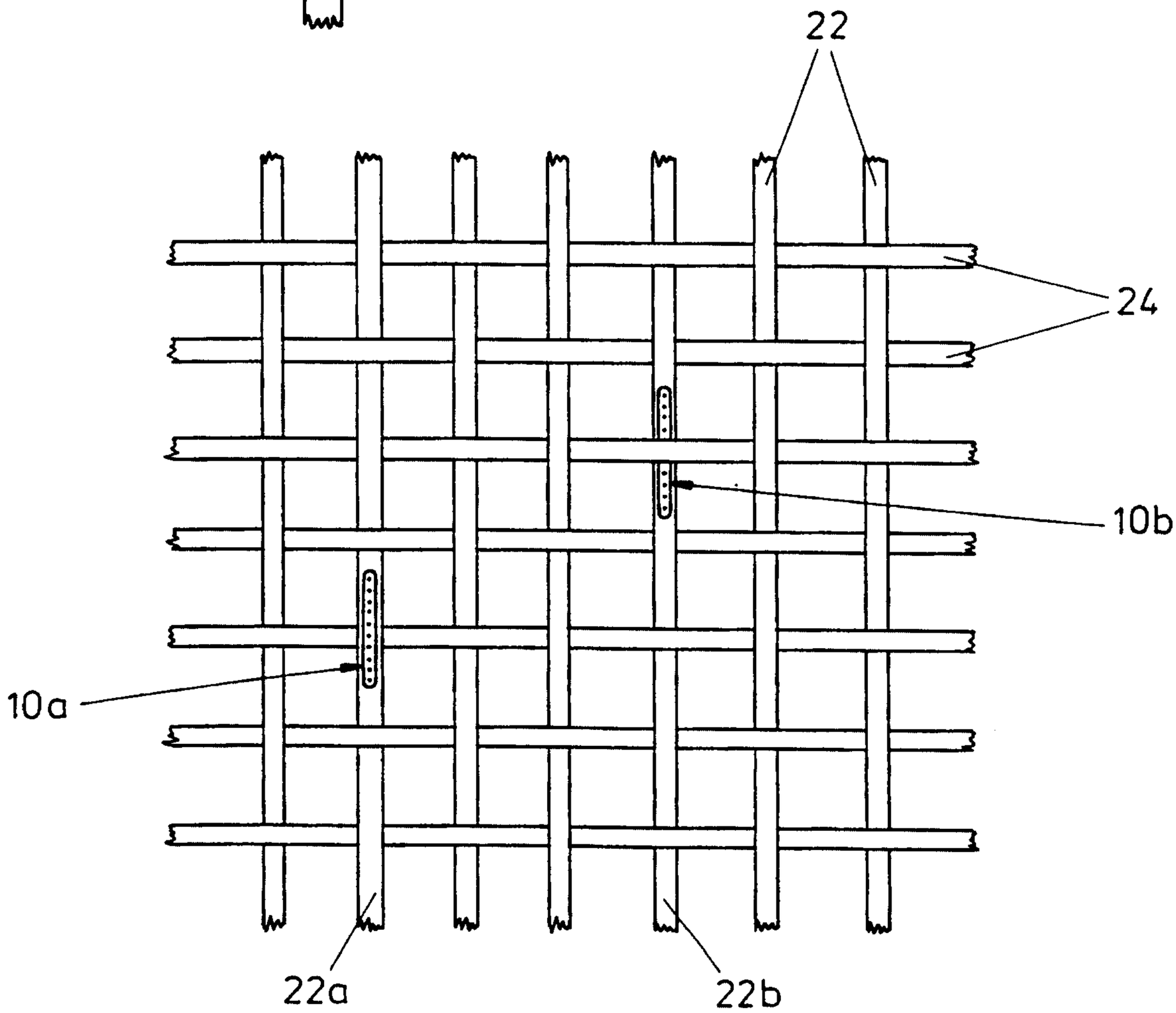


FIG. 2