July 14, 1970 S. MYERS 3,520,124

TIMER DEVICE

Filed Feb. 13, 1969

FIG1

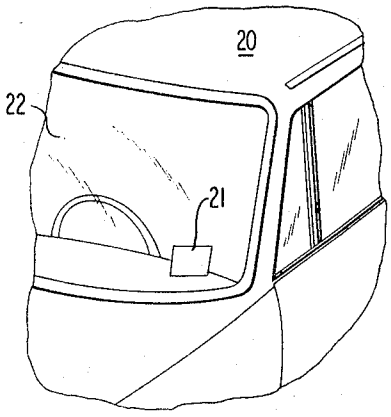


FIG2

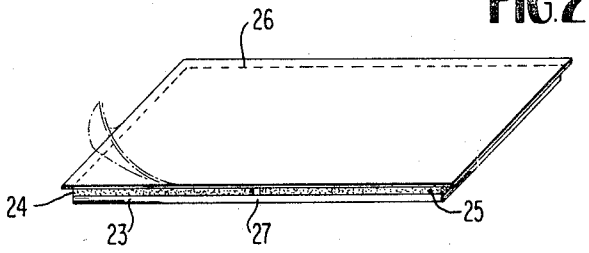


FIG2A

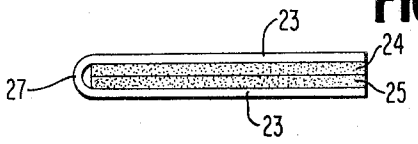


FIG3

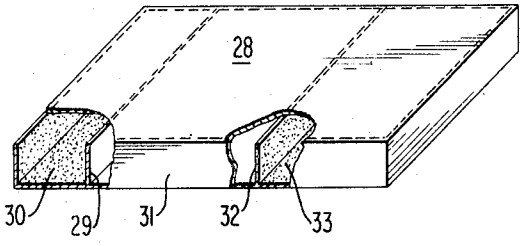


FIG4

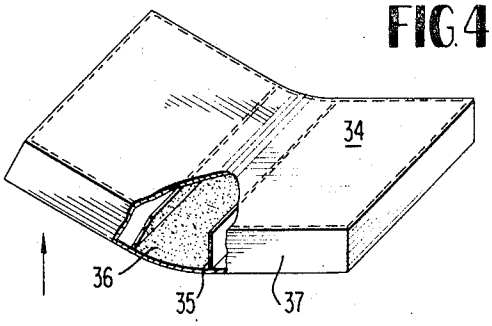
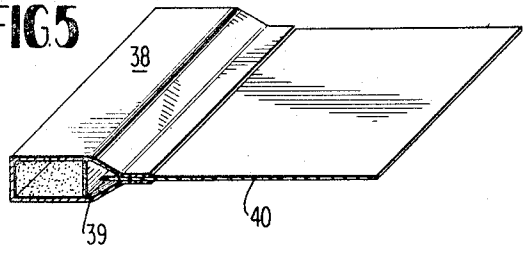


FIG5



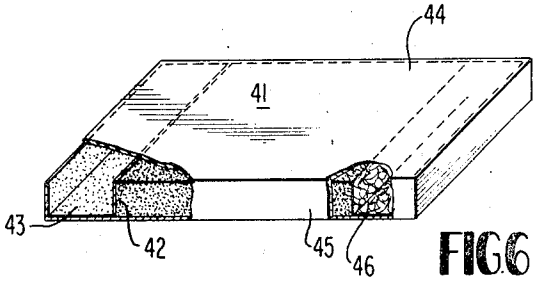


FIG6

FIG7

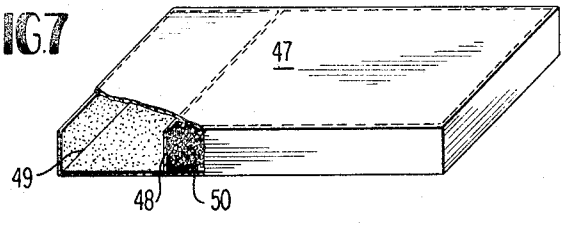
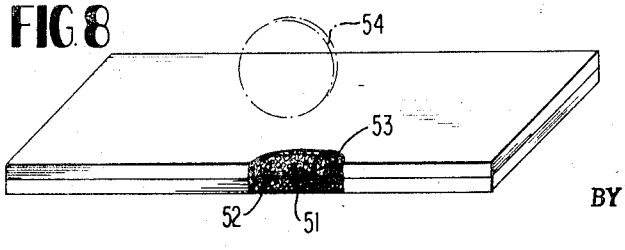


FIG8



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3,520,124

TIMER DEVICE

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U.S. Cl. 58—1 11 Claims

ABSTRACT OF THE DISCLOSURE

A device for indicating a predetermined time interval based on two or more materials which react, either chemically or physically over a predetermined period to produce a termination signal. The reacting materials are carried on a base member and are separated by a barrier preventing contact therebetween. Upon elimination of the barrier, a commencement signal is produced indicating the time reaction is underway. In preferred embodiments the commencement and termination signals involve abrupt color changes. The device finds particular utility as an elapsed time indicator for indicating motor vehicle parking time.

This invention relates to timing devices for measuring a predetermined time interval. More specifically, it relates to a self cancelling time ticket or device based on a reaction system of two or more components. The device is preferably in the form of a ticket or the like which provides a signal that the reaction is underway (a commencement signal) and a termination signal indicating that the reaction is complete and that the predetermined time period has elapsed. The commencement signal and termination signal may be in the form of color changes, although other signals are within the scope of the invention.

It is among the objects of this invention to provide a simple, inexpensive, fool-proof timing device for indicating a predetermined time period. Other objects and advantages will be apparent from the description herein.

The device has utility in indicating elapsed time in a wide variety of applications. An important application is in indicating motor vehicle parking periods. For example, a motorist would purchase or otherwise be provided with time tickets containing a reaction system having a two hour reaction time. Upon parking the vehicle in a two hour parking zone, the motorist would activate the reaction system on the ticket and affix the ticket to the windshield of his vehicle. Upon activating the system, the commencement signal is produced, indicating that the reaction is underway. After two hours the reaction is complete and an abrupt termination signal is produced. Thus, law enforcement officials can readily detect vehicles which have been parked longer than the parking limit. The device thus serves the same function as a parking meter but at much less cost, particularly the initial investment, meter maintenance, and collection costs. Other applications include elapsed time indicators for indicating expiration times on drugs, chemical, photographic film and the like.

The term "reaction system" as used in the specification and claims includes both chemical reactions and purely physical reactions. Examples of chemical reactions which may be employed are so-called "clock reactions" such as the iodine clock reaction, the formaldehyde clock reaction, the methylene blue-sugar reaction or reactions indicating pH change. Example of physical reactions include the disintegration by a solvent of time capsules which may contain a dye, for example, or which contain a material chemically reactive with the solvent to produce a termination signal.

The reacting components forming the reaction system

are physically separated by barrier means. To activate the system, the barrier is eliminated or broken, and the commencement signal is produced indicating the reaction is underway.

Referring to the drawing:

FIG. 1 is a partial view of a motor vehicle having the timer device displayed on the windshield of the vehicle.

FIGS. 2–8 illustrate various forms of the invention, to be described in detail herein.

In FIG. 1, a motor vehicle **20** is shown having a time ticket **21** displayed on the windshield **21**.

In FIG. 2, a transparent base **23** of plastic film or cellophane or the like is coated in separate areas with a reactant **24** and a second reactant **25**. A strippable cover sheet **26** covers both reactants. To activate the device, the cover sheet **26** is removed and the coated base **23** folded at **27** to place the reactants in contact. FIG. 2A illustrates the device after the reacion has commenced. In practice the cover sheet could be opaque and colored green, for example. The reactants **24** and **25** are coated on the base in the form of clear or white gels. Thus upon activating the device as shown in FIG. 2A the ticket now appears clear or white, the commencement signal. After the reaction is complete the device abruptly turns red, for example, the termination signal, indicating the predetermined time period has elapsed.

The following examples illustrate reaction systems utilizable in the embodiment shown in FIGS. 2 and 2A:

EXAMPLE I

Reactant **24** comprised potassium iodate contained in aqueous gelatin gel.

Reactant **25** comprised the following in aqueous gelatin gel: starch, sodium sulfite, salicylic acid, and sulfuric acid.

The above system is the iodine clock reaction. The reactant coatings are translucent white. After the reaction is complete, the device abruptly turns blue. By suitable manipulation of concentration of the reactants, elapsed times of from 30 minutes to two hours can be measured.

EXAMPLE II

Reactant **24** comprised 0.1 N HCl and 1% phenolphthalein in ethyl alcohol in aqueous gelatin gel, a clear gel.

Reactant **25** comprised finely powdered trisodium phosphate microencapsulated in polyvinyl alcohol, forming a white coating.

When the aqueous medium disintegrates the polyvinyl alcohol coating on the phosphate particles, the material turns red. By way varying the thickness of of the polyvinyl alcohol coating, elapsed times of from one to eight hours can be measured.

EXAMPLE III

Reactant **24** comprised 0.1 N HCl in aqueous gelatin gel.

Reactant **25** comprised finely divided ultramarine blue microencapsulated in polyvinyl alcohol, forming a white coating. By varying the thickness of the polyvinyl alcohol coating, elapsed times of from one to eight hours can be measured. The system turns deep blue upon completion.

FIG. 3 illustrates another embodiment of the invention. A transparent plastic envelope **28** is provided with a frangible barrier **29** separating compartments **30** and **31**. An alkali soluble barrier **32** separating compartments **31** and **33**. Compartment **30** contains 0.1 N NaOH which is colorless. Compartment **31** contains water containing a drop of 1% phenolphthalein in ethanol. Barrier **29** is ruptured by squeezing compartment **30** and the resulting solution turns red, the commencement signal. Barrier **32** is formed of maleic anhydride methyl vinyl ether copoly-

mer which is alkali soluble. Compartment **33** contains a drop of 2% methyl green in ethanol. When barrier **32** is disintegrated by the alkali, the solution escapes into compartment **33** and turns violet. By varying the thickness of barrier **32**, predetermined times of 30 minutes to 4 hours can be measured.

FIG. 4 illustrates a further embodiment. A transparent envelope **34** is provided with a frangible barrier **35** separating compartments **36** and **37**. Compartment **36** contains 0.1 N HCl. Compartment **37** contains a single crystal of methyl orange plus the microencapsulated ultramarine blue of Example III. The barrier **35** is ruptured by bending the device as shown, whereupon the solution turns red. After the polyvinyl alcohol coating has disintegrated, the solution is blue.

FIG. 5 shows another embodiment. Envelope **38** has a frangible barrier **39** and is sealed to absorbent filter paper **40**. The absorbent paper **40** is impregnated with aqueous potassium iodate plus 0.01% methyl yellow and is dried. The paper is yellow. Envelope **38** contains the remaining iodine clock reagents, as set forth in Example I, in aqueous solution, Envelope **38** is squeezed, rupturing the barrier **39** and saturating paper **40**, which now turns red. Upon completion of the reaction, the paper turns blue.

FIG. 6 illustrates a further embodiment. Transparent envelope **41** is provided with a frangible barrier **42** forming compartment **43** which contains 0.1 N acetic acid and litmus extract, producing a red color. Compartment **44** is filled with a microporous material **45** such as polyurethane foam, for example, compartment **46** contains cotton or the like impregnated with 0.1 N sodium hydroxide and subsequently dried. Upon breaking the barrier **42**, the acetic acid and litmus solution move by capillary action through the microporous material progressively turning it red. When the solution migrates to the compartment **46** the caustic impregnated absorbent material turns blue, indicating the termination. By proper selection of pore size of the microporous material, elapsed times of from 10 minutes to one hour can be measured.

A further embodiment is illustrated in FIG. 7. Transparent envelope **47** is provided with a frangible barrier **48** forming compartments **49** and **50**. Compartment **49** contains a solution of one reactant. Compartment **50** is filled with the second reactant microencapsulated in a slowly soluble material and an indicator. Examples of suitable reactants are those described in connection with FIG. 4. The reaction is commenced by squeezing compartment **49**, thereby fracturing barrier **48**.

Another embodiment is shown in FIG. 8. A base member **51** is coated with frangible microcapsules **52** containing one reactant. A second coating of frangible microcapsules **53** containing a second reactant and a dye is superposed on the first coating. The reaction is initiated by fracturing the microcapsules, as by rubbing with a coin **54**. Microcapsules **52** and **53** are, for example, white before being fractured. Upon fracture, the dye and the reactants are released, signalling the commencement of the reaction. The reactants may be the iodine clock reactants of Example I, the encapsulated potassium iodate containing, for example, a yellow dye.

It will be apparent to those skilled in the art that many other chemical or physical reaction systems may be employed in the present invention. By suitably controlling the concentrations of the reactants, in the case of chemical reaction systems, or by control of soluble barrier thickness, reaction times varying from a few minutes to several days may be obtained.

I claim:

1. A device for indicating a predetermined time interval comprising a base carrying two materials which upon contact comprise a reaction system requiring a predetermined time interval from commencement to termination, said reaction system producing a termination signal upon termination, barrier means preventing contact of said two materials and means for producing a signal coincident with elimination of said barrier means for signaling commencement of the reaction.

2. The device set forth in claim **1** wherein said commencement and termination signals involve abrupt color changes.

3. The device set forth in claim **1** wherein said reaction system comprises a chemical reaction having a predetermined induction period whereby an abrupt termination signal is produced.

4. The device set forth in claim **3** wherein said reaction is the iodine clock reaction.

5. The device set forth in claim **1** wherein one of said reaction materials comprises a solvent which attacks and disintegrates a coating covering the second reactant.

6. The device set forth in claim **1** wherein said reactant materials are separately encapsulated in frangible microcapsules coated on said base.

7. The device set forth in claim **6** wherein the separately encapsulated reactant materials comprise the reactants for the iodine clock reaction, one of said encapsulated reactants including a dye for signaling commencement of the reaction.

8. The device set forth in claim **1** wherein the reactant materials produce a pH change and contain an indicator responsive to said pH change to produce the commencement signal.

9. The device set forth in claim **1** wherein the reactant materials produce a pH change and contain an indicator responsive to said pH change to produce the termination signal.

10. The device set forth in claim **1** wherein said reactant materials are coated on separate areas of said base and said barrier means is a strippable sheet covering said coated base whereby the reaction is commenced by contacting said separately coated areas together.

11. The device set forth in claim **1** wherein said barrier means comprises a frangible wall separating the reactant materials.

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U.S. Cl. X.R.

23—253; 116—114