



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication: **26.06.2013 Bulletin 2013/26** (51) Int Cl.: **G04C 23/08 (2006.01) H01H 43/06 (2006.01)**

(21) Application number: **12195418.4**

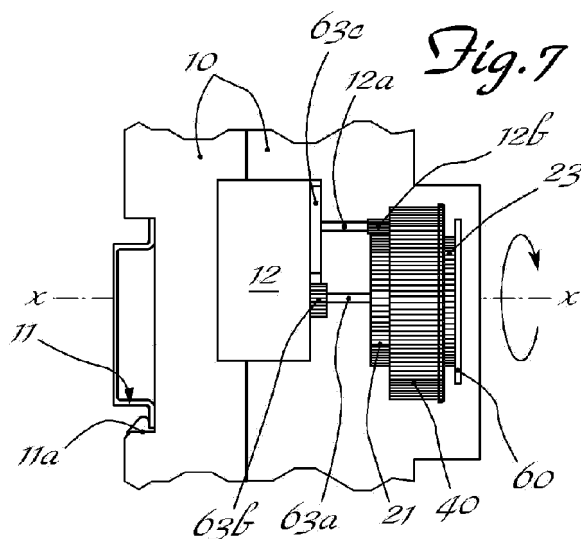
(22) Date of filing: **04.12.2012**

(84) Designated Contracting States: AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR Designated Extension States: BA ME (30) Priority: 21.12.2011 IT MI20112339	(71) Applicant: Fly S.R.L. 22070 Veniano (Como) (IT) (72) Inventor: Galimberti, Roberto 22070 VENIANO (CO) (IT) (74) Representative: Raimondi, Margherita Dott. Ing. Prof. Alfredo Raimondi S.r.l., Piazzale Cadorna, 15 20123 Milano (IT)
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(54) **Timer switch with riders having a greater subdivision of the timer program.**

(57) Timer switch with riders (40), comprising a housing (10) having a visible front end face (10a) and containing clock mechanisms (12) and electrical opening/closing contacts, a longitudinal axis (X-X) perpendicular to the visible front end face (10a), a multiple ring (20) rotating about said longitudinal axis (X-X) and in turn comprising an axially inner ring (21) having annular teeth (21b) for engagement with a gearwheel (12b) connected to the clock mechanisms (12) and an intermediate ring

(22) carrying riders (40), wherein said multiple ring (20) has an axially outer ring (23) with inset radial seats (23a) for guiding a corresponding part (41a) of the riders and wherein said intermediate ring (22) has an annular edge with radial recesses (22a) passing through axially and radially open inwards for connection to a corresponding through-hole (22b) in the axial direction angularly arranged on the same radius as the respective recess (22a) and on the inside thereof, said inset seats and holes being able to receive respective legs (42,43) of the riders (40).



Description

[0001] The present invention relates to a timer switch with riders able to provide a greater subdivision of the timer program.

[0002] It is known in the technical sector relating to the control of process cycles and/or the activation/deactivation of apparatus of various kinds to use programmable timer switches associated with actuating devices such as contactors, electrovalves or the like. The various constructional forms of said timer switches include, among others, timer switches with so-called "riders", i.e. mechanical elements which are mounted on a rotating ring connected to a clock mechanism and able to be operated manually in the axial direction by the user who, by moving the riders from/into a rest/working position, causes them to interfere or not with a lever which, in turn rotating, causes the opening/closing of an electrical contact for a time period which is predefined and controlled by the clock mechanism associated with the riders.

[0003] An example of these applications consists of the activation/deactivation of heating apparatus and/or plants during the daily time intervals which are preset for heating.

[0004] It is also known that the subdivision of the programming periods into weekly or hourly sub-periods is limited by the radial dimensions defined by the riders mounted on a ring which must have a diameter such as to be able to fit inside a DIN approved dual-module casing.

[0005] This geometrical constraint has always limited the possibility of reducing the hourly subdivision down to a quarter of an hour since the increase in the number of riders results in an increase in the diameter of the ring which no longer fits inside the two DIN modules.

[0006] In order to overcome this drawback, timers have also been developed where the rotating rider carrier ring is arranged with its axis of rotation parallel to the visible front face of the timer switch; although serving to ensure a greater subdivision of the programming this solution however prevents one from being able to view fully the programming which has been set since only a limited sector of the entire rotating ring remains visible on the front face of the switch.

[0007] The technical problem which is posed, therefore, is that of providing a timer switch of the "rider" type which is equipped with a rider carrier ring having an axis of rotation at right angles to the visible front face of the switch itself and which is able to achieve a greater subdivision of the programming periods and in particular subdivision down to a quarter of an hour of the hourly programming in the case of dials which are divided into 24 hours, while keeping the entire rotating preset-programming ring on the switch frontally visible within a volume equal to two DIN approved modules.

[0008] In connection with this problem it is also required that the switch should be easy and inexpensive to produce and assemble and be robust.

[0009] These results are achieved according to the present invention by a timer switch with riders according to the characteristic features of Claim 1.

[0010] Further details may be obtained from the following description of a non-limiting example of embodiment of the subject of the present invention provided with reference to the accompanying drawings in which:

Figure 1: shows an exploded view of a timer switch with riders according to the present invention;

Figure 2: shows a perspective view of a rider carrier ring for a timer switch according to the present invention;

Figure 3: shows a cross-sectional view of a rider for a timer switch according to the present invention;

Figure 4: shows a partial perspective view of the ring according to Fig. 3 with rider mounted;

Figure 5: shows a partial schematic cross-section along the plane indicated by V-V in Fig. 4;

Figure 6: shows a front view of the timer switch according to the present invention in the assembled condition;

Figure 7: shows a side view of the timer switch according to Fig. 6 in the open condition;

Figure 8: shows a front view of a first example of synchronization of the time of the timer switch according to the present invention;

Figure 9: shows a front view of a second example of synchronization of the time of the timer switch according to the present invention.

[0011] As shown in Fig. 1 and assuming solely for the sake of simplification of the description and without any limitation of meaning a longitudinal axis X-X at right angles to the visible front end face and coinciding with the axis of rotation of the mechanisms of the timer switch according to the invention, the latter comprises substantially:

- a housing denoted overall by 10 and provided with a visible front end face 10a and rear means 11a for engagement with a support rail 11 normally fixed to electric panels of various kinds; the housing 10 contains the clock mechanisms and the electrical contacts with associated controlled actuating elements; since these devices are conventional per se they are only schematically denoted by 12 in Fig. 1;
- a longitudinal rotating spindle 12a connected to the said mechanisms 12 and schematically shown in Fig. 1 with the said longitudinal axis of rotation;
- a multiple ring 20 for carrying riders 40, which is mounted on said axis X-X and rotates together therewith;
- a plurality of riders 40 which can be axially mounted on said multiple ring;
- a dial ring 50 showing the subdivision of the time period unit by means of radial segments 51 of different length and numbers 52 corresponding to the said

subdivision (24 hours; 7 days and the like);

- a device 60 for synchronizing the switch with the real time.

[0012] In greater detail:

The multiple ring 20 carrying riders 40 is formed by:

- an axially inner ring 21 provided with annular teeth 21b for engagement with a gearwheel 12b mounted on the spindle 12a connected to the mechanisms 12 of the switch clock;
- an axially intermediate ring 22 which is rotationally integral with the inner ring 21 and has a diameter greater than the diameter of the inner ring 21.

[0013] The circumferential edge of the intermediate ring 22 is provided with radial recesses 22a passing through axially and radially open inwards for connection to a corresponding through-hole 22b in the axial direction angularly arranged on the same radius as the respective recess 22a.

[0014] According to a preferred embodiment the recesses 22b in the intermediate ring 22 have a substantially rectangular cross-section. - an axially outer ring 23 with a diameter smaller than the diameter of the intermediate ring 22 and provided with radial inset seats 23a arranged over the entire circumference and aligned along the same radii as the seats 22a and the holes 22b of the intermediate ring 22.

[0015] According to a preferred embodiment, the inset seats 23a of the outer ring 23 have a substantially triangular cross-section.

[0016] According to the present invention it is also envisaged that the riders 40 have:

- a radial arm 41, the free end of which terminates in a tapered part 41a with a substantially triangular cross-section corresponding to that of the inset seats 23a of the outer ring 23;
- a first radially outer leg 42 extending in the longitudinal direction and with a substantially rectangular cross-section;
- a second radially inner leg 43 extending in the longitudinal direction with a substantially circular cross-section and outer diameter substantially corresponding to the inner diameter of the holes 22b in the intermediate ring 22; at a suitable height in the longitudinal direction the inner leg 43 has a notch 43a for locking the rider in the working position;
- a gusset 44 connecting in the radial direction said outer leg and inner leg so as to fasten them together and ensure a greater mechanical strength; said gusset extends in the longitudinal direction X-X along a section having a length smaller than the length of the two legs 42, 43.

[0017] With this mechanical embodiment it is possible to provide riders with a thickness sufficiently small to allow an increase in the number thereof such that rider carrier rings may be provided with a diameter able to carry up to 96 riders within a volume limited to a casing with only two DIN approved modules.

[0018] The particular form of the multiple ring 20 with an intermediate ring 22 provided with radial recesses 22a passing through axially and radially open inwards for connection to a corresponding through-hole 22b in the axial direction angularly arranged on the same radius as the respective recess 22a results in a annular contact area between the seats of the ring and the legs of the rider which preserves the mechanical strength of the latter despite its small thickness values.

[0019] In addition, the engagement between the inset radial seats 23a of the outer ring 23 with the tapered end 41a of the radial arm 41 of the rider helps maintain correct alignment of the rider which is prevented from rotating by said engaging connection.

[0020] According to a preferred embodiment the timer switch also has a device 60 for synchronizing the switch with the real time; this device comprises an outer wheel 61 coaxially mounted on the axis of rotation X-X and provided with recesses 62 on the outer face so as to allow rotational operation by the user; the wheel 61 is connected to the spindle 12 (Fig. 7) via a kinematic transmission with a high reduction ratio comprising a spindle 63a which carries a pinion 63b coupled to a gearwheel 63c mounted on the spindle 12 which causes rotation of the inner ring 23 which in turn causes rotation of the dial ring showing the time subdivision through angles which are much smaller so as to allow precise alignment of the radial division segments 51 with a fixed pointer 70 provided in a suitable position on the front face 10a of the switch.

[0021] It is therefore clear how with the timer switch according to the invention it is possible to obtain a temporal subdivision of the programming element by means of riders, with divisions as small as a quarter of an hour on dials which are divided into the 24 hours of a day, but with dimensions such that it can fit inside a casing with only two DIN approved modules and with full frontal vision of the entire programming element.

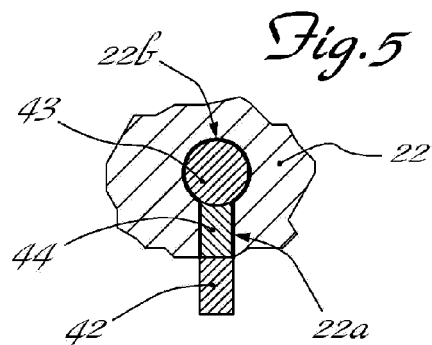
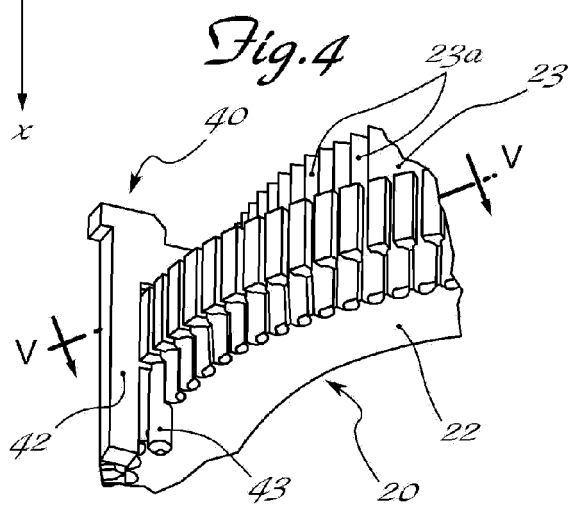
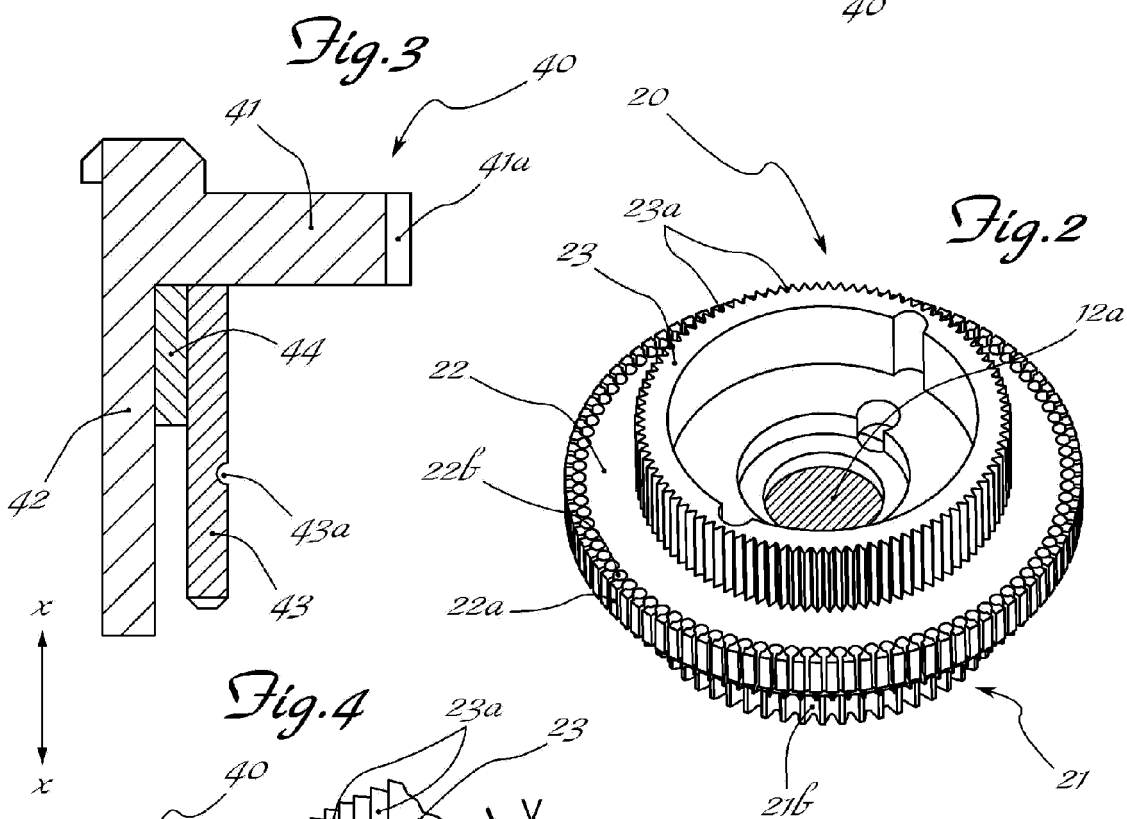
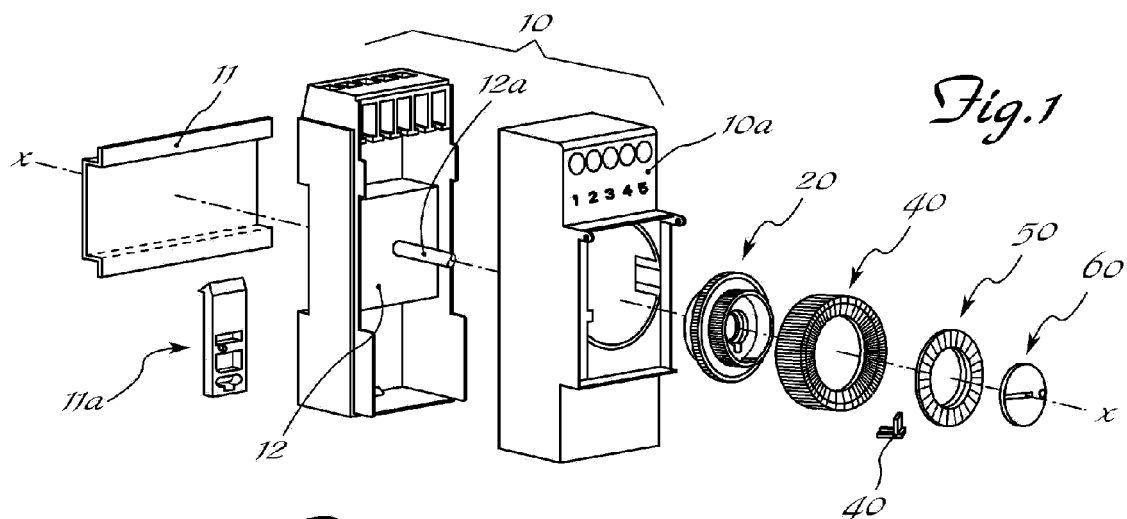
[0022] In addition, with the switch according to the invention it is possible to program minimum intervals of 0.625 min. between switching on and off of the connected load with a dial 50 subdivided into the 60 minutes of an hour or minimum intervals of 105 min. between switching on and off of the connected load in the case of the dial 50 divided into the 7 days of the week.

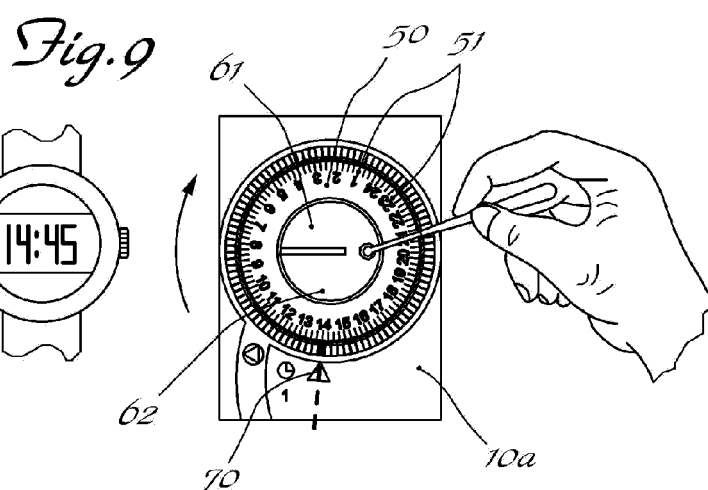
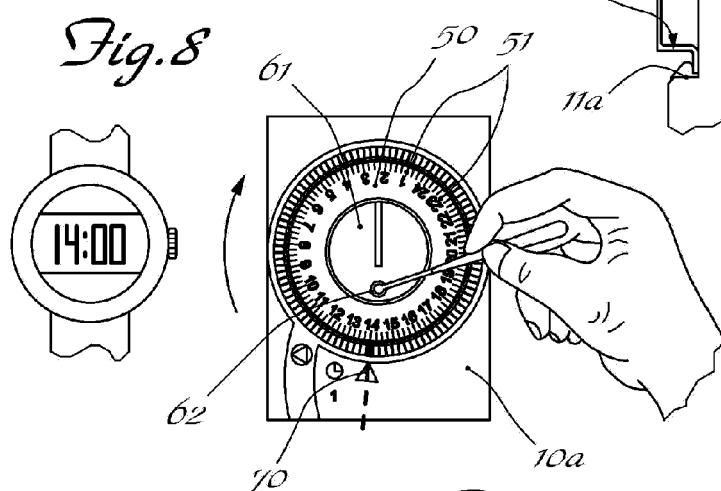
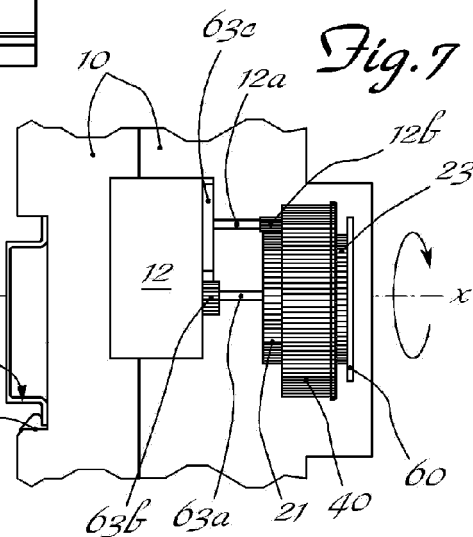
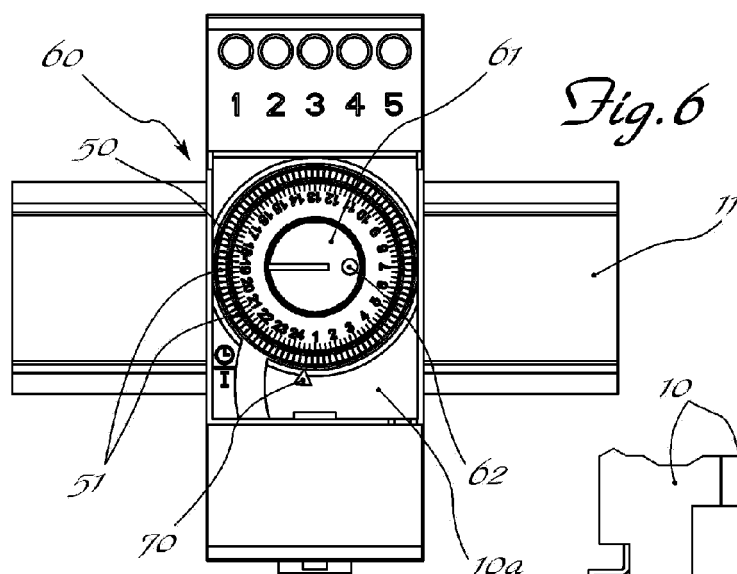
[0023] Although described in connection with certain constructional forms and certain preferred examples of embodiment of the invention, it is understood that the scope of protection of the present patent is defined solely by the following claims which are understood as embracing also variations of embodiment of the various parts of the switch such as, for example, different arrangements of the longitudinal axis X-X which may be parallel to, in-

stead of coinciding with, the axes of rotation of the gear-wheels of the clock; likewise the clock is understood as being an example of any equivalent timing device.

Claims

1. Timer switch with riders (40), comprising a housing (10) having a visible front end face (10a) and containing clock mechanisms (12) and electrical opening/closing contacts, a longitudinal axis (X-X) perpendicular to the visible front side, a multiple ring (20) rotating about said longitudinal axis (X-X) and in turn comprising an axially inner ring (21) having annular teeth (21b) for engagement with a gearwheel (12b) connected to the clock mechanisms (12) and an intermediate ring (22) carrying riders (40), **characterized in that** said multiple ring (20) has an axially outer ring (23) with inset radial seats (23a) for guiding a corresponding part (41a) of the riders and **in that** said intermediate ring (22) has an annular edge with radial recesses (22a) passing through axially and radially open inwards for connection to a corresponding through-hole (22b) in the axial direction angularly arranged on the same radius as the respective recess (22a) and on the inside thereof, said inset seats and holes being able to receive respective legs (42,43) of the riders (40).
2. Timer switch according to Claim 1, **characterized in that** the riders (40) have a radial arm (41), a first radially outer leg (42) extending in the longitudinal direction and with a substantially rectangular cross-section and a second radially inner leg (43) extending in the longitudinal direction with a substantially circular cross-section and outer diameter substantially corresponding to the inner diameter of the holes (22b) in the intermediate ring (22).
3. Timer switch according to Claim 2, **characterized in that** the free end of the arm (41) terminates in a tapered part (41a) with a substantially triangular cross-section.
4. Timer switch according to Claim 2, **characterized in that** the inner leg (43) has a notch (43a) at a suitable height in the longitudinal direction for locking the rider in the working position.
5. Timer switch according to Claim 2, **characterized in that** each rider (40) has a gusset (44) connecting in the radial direction the said outer leg (42) and inner leg (41).
6. Timer switch according to Claim 5, **characterized in that** said connecting gusset (44) extends in the longitudinal direction X-X over a length smaller than the length of the two legs (42,43).
7. Timer switch according to Claim 2, **characterized in that** the recesses (22b) in the intermediate ring (22) have a substantially rectangular cross-section.
8. Timer switch according to Claim 3, **characterized in that** the inset seats (23a) of the outer ring (23) have a substantially triangular cross-section.
9. Timer switch according to Claim 1, **characterized in that** the dimensions of the riders (40) are such as to limit the diameter of the multiple ring (20) to a volume corresponding to a DIN approved dual-module casing for division of the programming into at least 96 time intervals.
10. Timer switch according to Claim 1, **characterized in that** it comprises a device (60) for synchronizing the switch with real time.
11. Timer switch according to Claim 9, **characterized in that** said device (60) for synchronizing the switch with real time comprises an outer wheel (61) coaxially mounted on the axis of the rotation (X-X) and having incisions (62) on its outer face, the wheel (61) being connected to the clock mechanisms (12) via a reducing kinematic transmission comprising a spindle (63a) carrying a pinion (63b) meshing with a toothed wheel (63c) mounted on a spindle (12a) of the mechanisms (12).







EUROPEAN SEARCH REPORT

Application Number
EP 12 19 5418

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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 10 January 2013	Examiner Pirozzi, Giuseppe
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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EPO FORM 1503 03/82 (P04C01)



EUROPEAN SEARCH REPORT

Application Number
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CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

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The members are as contained in the European Patent Office EDP file on
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