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Peters

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[54] **MECHANISM FOR AUTOMATIC WINDING OF A CLOCK**

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[51] **Int. Cl.**[4] **G04C 21/00**

[52] **U.S. Cl.** **368/150**

[58] **Field of Search** 368/124, 136, 139, 147-152

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Primary Examiner—Vit W. Miska

Attorney, Agent, or Firm—Bean, Kauffman & Bean

[57] **ABSTRACT**

A mechanism for automatically winding a weight driven clock includes .a common traveler member mounted for reciprocating movement between a rest and reversal position, a pulling member associated one with each weight of the clock and adapted to exert a pulling force on its supporting chain, a latch mechanism for each pulling member for selectively coupling same for movement with said traveler member, a weight sensing mechanism for sensing the arrival of each weight of the clock in a clock unwound position thereof for operating the latch mechanism of the pulling member associated with such weight and for initiating movement of the traveler member from its rest position, whereby a pulling force is exerted by the pulling member on the chain of its associated weight when placed in the unwound position thereof for lifting such weight into a clock wound position thereof coincident to the arrival of the traveler member in its reversal position, and a device for sensing the arrival of the traveler member in its reversal position for initiating return thereof and the pulling member to rest position.

9 Claims, 3 Drawing Sheets

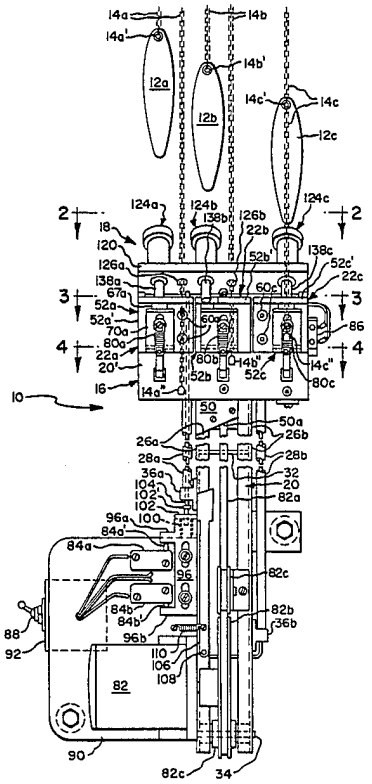


Fig. 1.

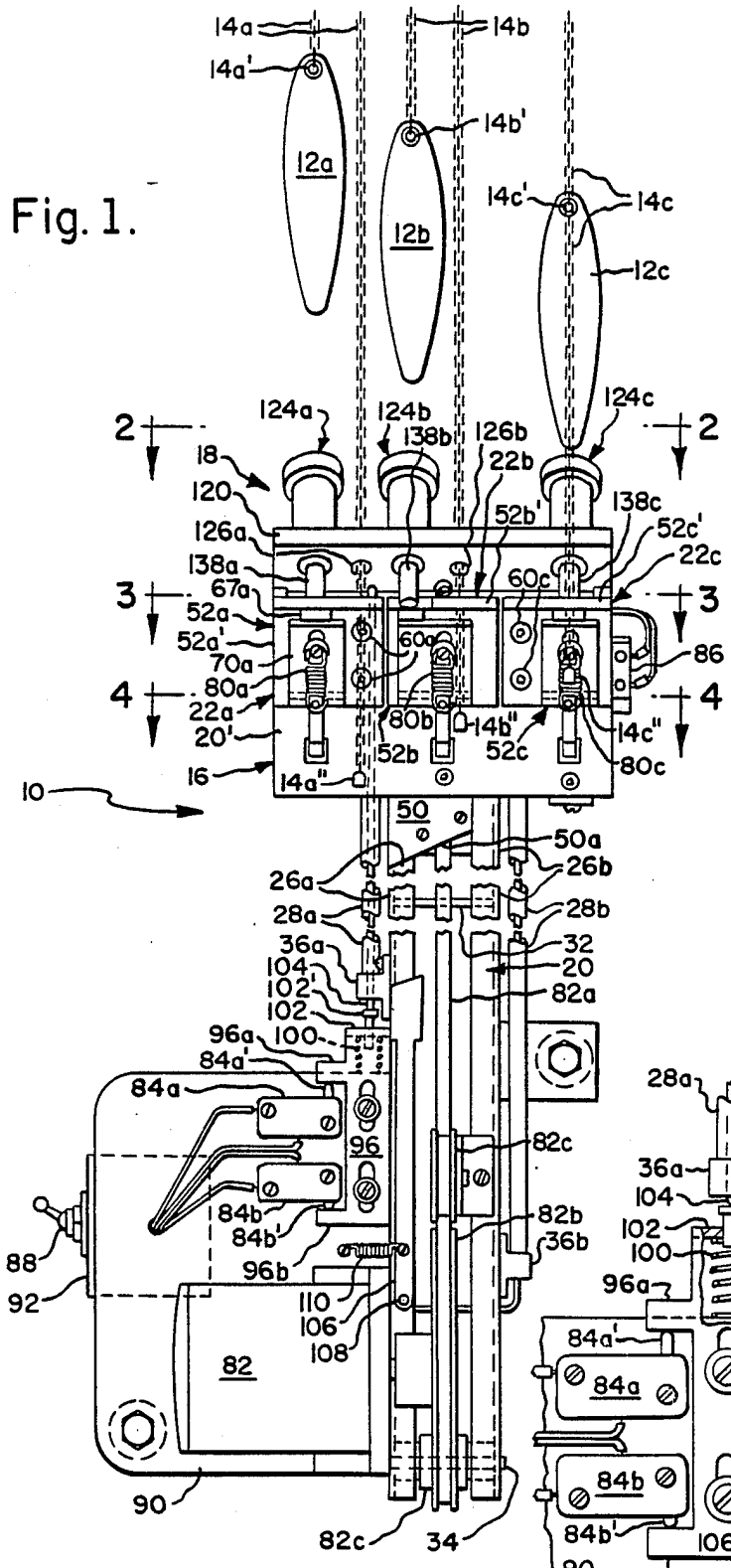


Fig. 9.

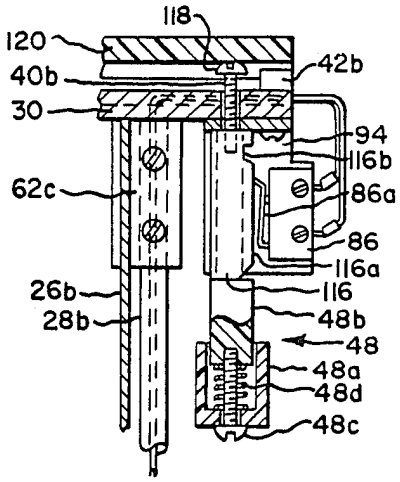
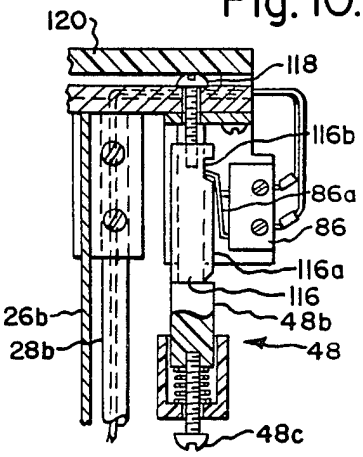


Fig. 10.



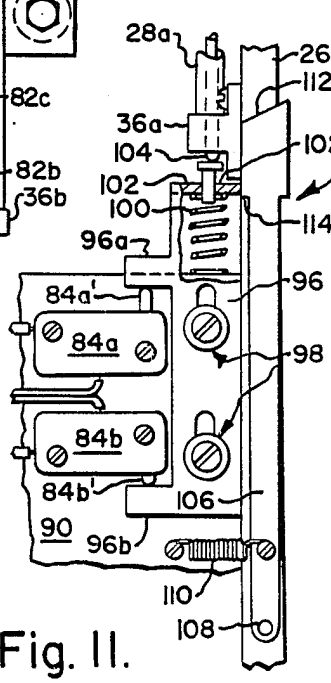


Fig. 11.

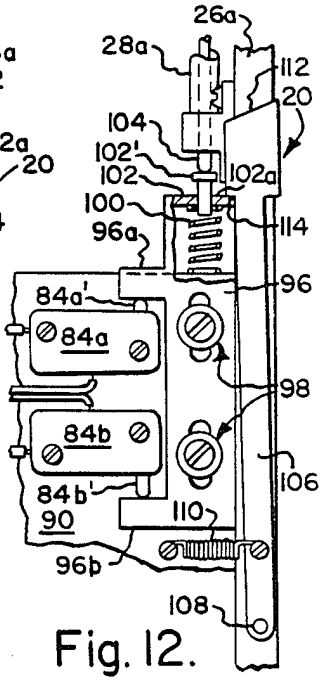


Fig. 12.

Fig. 2.

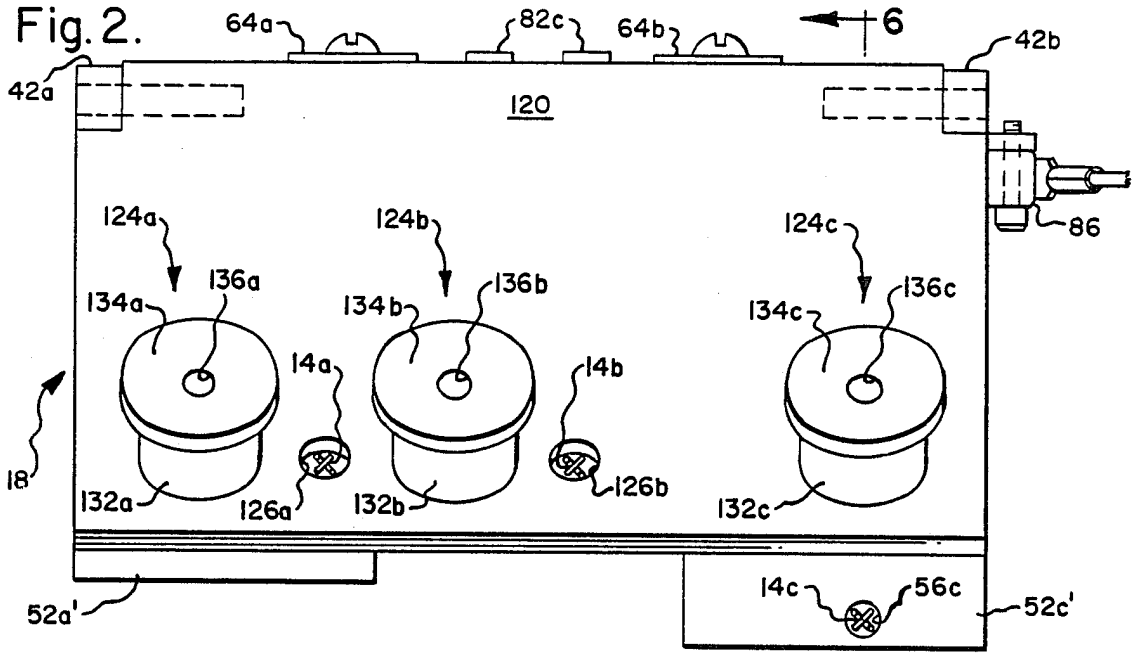


Fig. 3.

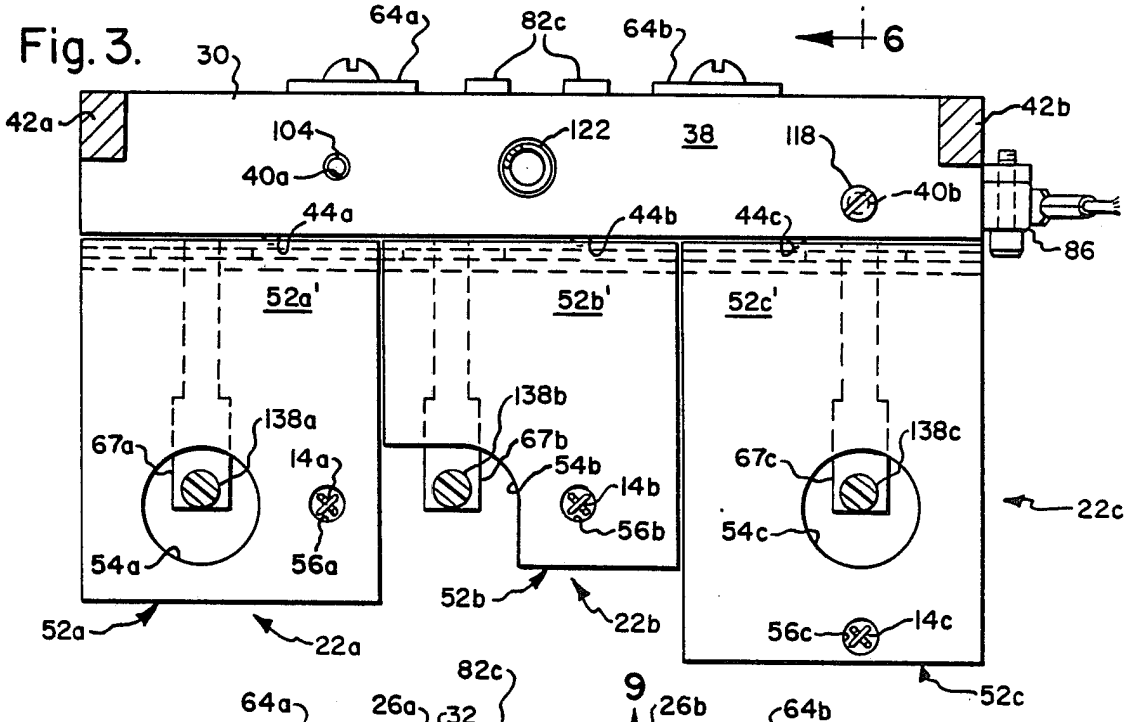


Fig. 4.

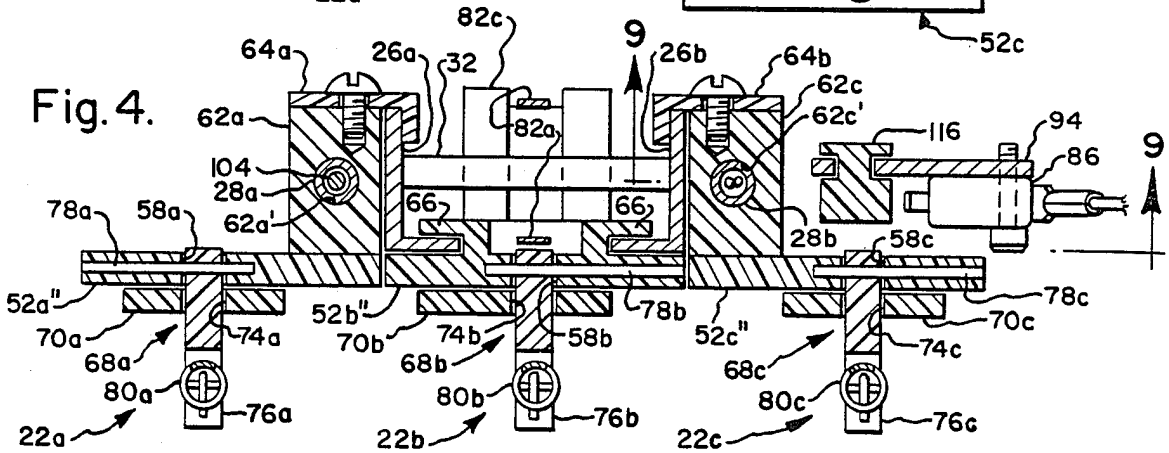


Fig. 6.

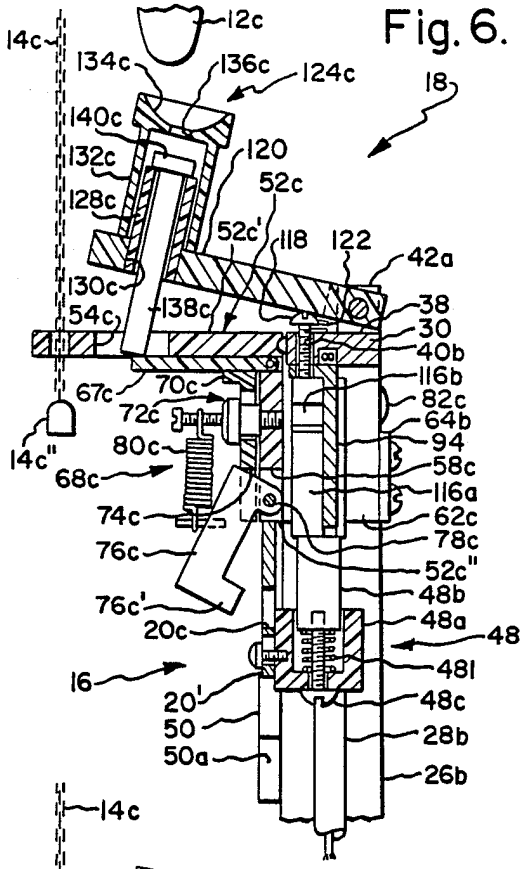


Fig. 7.

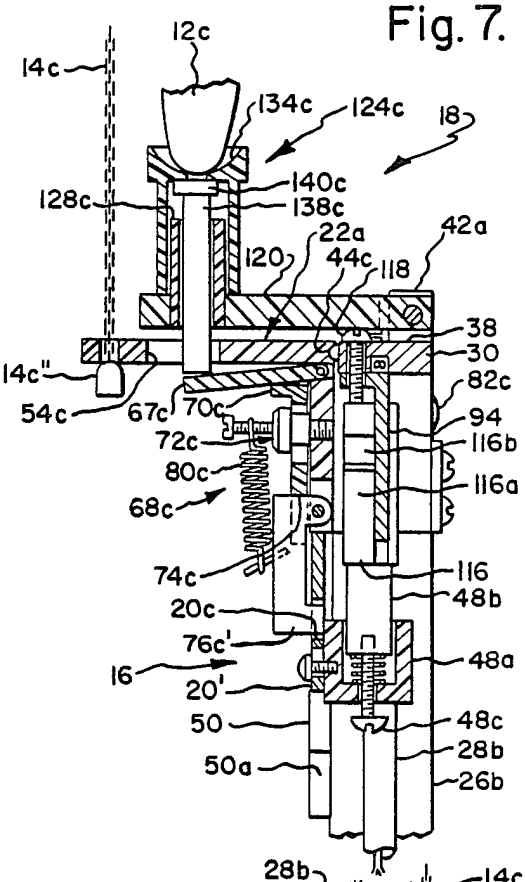


Fig. 5.

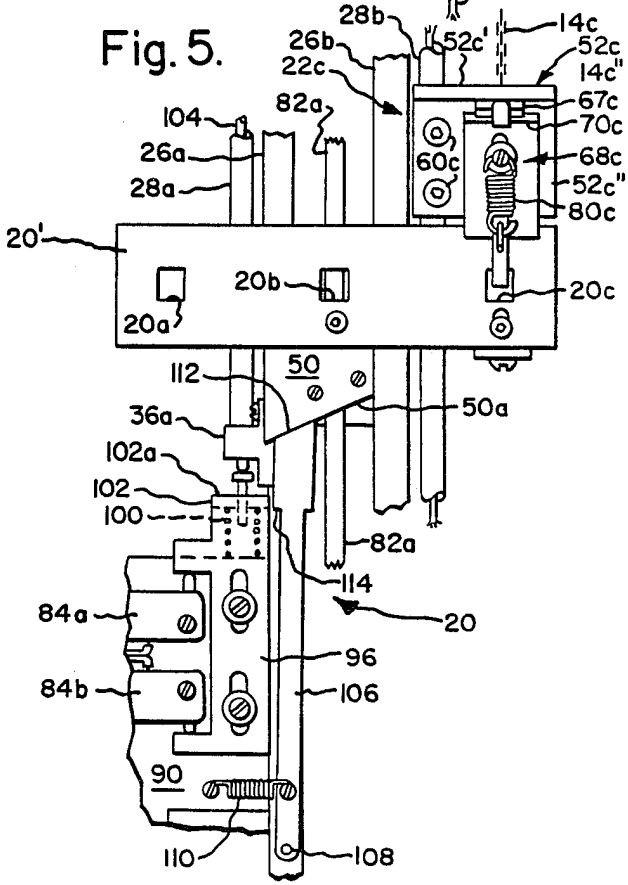
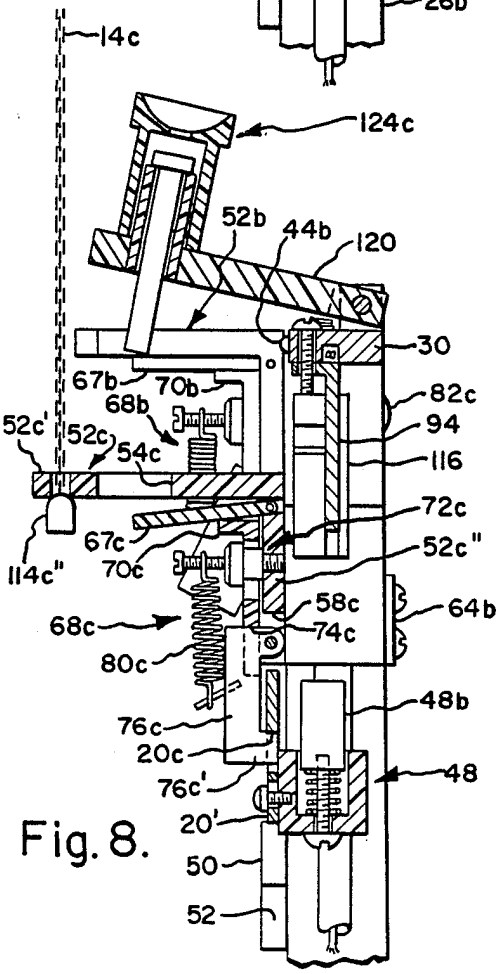


Fig. 8.



MECHANISM FOR AUTOMATIC WINDING OF A CLOCK

BACKGROUND OF THE INVENTION

Heretofore, various types of mechanisms have been proposed for use in effecting the automatic winding of weight driven clocks, as evidenced by U.S. Pat. Nos. 391,969; 1,037,643; 1,194,928; 1,705,025 and 4,165,606.

A drawback of the prior mechanisms of which I am aware is that same are incorporated as an integral part of clock structure or its drive mechanism, and thus such winding mechanisms are not readily adapted for use in the rewinding of existing clocks without requiring modification thereof.

SUMMARY OF THE INVENTION

The present invention relates to a mechanism for automatically winding weight driven clocks, and more particularly to a mechanism of this type, which can be employed to wind an existing weight driven clock without requiring modification of the clock or its drive mechanism.

The present winding mechanism generally includes a pulling means, which is engageable with a free end of a weight supporting chain and movable along a vertical path of travel for pulling down on the chain in order to raise the weight between unwound and wound positions; a weight sensing means responsive to lowering of the weight into its unwound position to effect operation of the pulling means; and sensing means for returning the pulling means to its original position after placement of the weight in its wound position.

The present mechanism is particularly adapted for use in winding of clocks having two or more weights, which may arrive out of phase at their respective unwound positions.

BRIEF DESCRIPTION OF THE DRAWINGS

The nature and mode of operation of the present invention will now be more fully described in the following detailed description taken with the accompanying drawings wherein:

FIG. **1** is a partial front elevational view of a clock winding mechanism of the present invention shown in association with the weights and chains of a multiple weight driven clock;

FIG. **2** is a top plan view of the mechanism;

FIG. **3** is a sectional view taken generally along the line **3—3** in FIG. **1**;

FIG. **4** is a sectional view taken generally along the line **4—4** in FIG. **1**;

FIG. **5** is a fragmentary front elevational view illustrating the traveler member and one of the pulling members in a lower reversal position thereof;

FIG. **6** is a sectional view taken generally along the line **6—6** in FIG. **2**;

FIGS. **7** and **8** are views similar to FIG. **6**, but showing subsequent steps in the operation of the mechanism;

FIG. **9** is a sectional view taken generally along the line **9—9** in FIG. **4**;

FIG. **10** is a sectional view similar to FIG. **9**, but showing a subsequent step in the operation of the mechanism;

FIG. **11** is an enlarged, fragmentary view of the lower end of the mechanism; and

FIG. **12** is a view similar to FIG. **11**, but showing a subsequent step in the operation of the mechanism.

DETAILED DESCRIPTION

Reference is first made to FIG. **1**, wherein a mechanism formed in accordance with the present invention is generally designated as **10** and shown in association with a plurality of weights **12***a*, **12***b* and **12***c* supported for vertical movement relative to a conventional weight driven clock mechanism, not shown, by flexible chains **14***a*, **14***b* and **14***c*. These chains have first ends **14***a'*, **14***b'* and **14***c'*, which are suitably attached to weights **12***a*, **12***b* and **12***c*, respectively, and second or free ends **14***a''*, **14***b''* and **14***c''*, which move in a direction opposite to the directions of movement of their associated weights in that intermediate portions of the chains, not shown, are trained over clock mechanism drive sprockets, also not shown. In many clocks, the chain free ends **14***a''*, **14***b''* and **14***c''* are enlarged, as by adding thimbles shown in the drawings, which engage with a suitable stop device to prevent such free ends from "running through" the clocks and allowing the weights to become uncoupled therefrom and fall to the floor. Where such thimbles are not originally provided with a clock intended to be wound by mechanism **10**, it would be necessary to add such thimbles in order to permit coupling of the mechanism to such clock.

In a typical three weight drive arrangement of the type shown in FIG. **1**, weights **12***a*, **12***b* and **12***c* and chains **14***a* and **14***b* are arranged such that they are essentially vertically bisected by a common vertical plane, and chain **14***c* is displaced through 90 degrees from chains **14***a* and **14***b* such that weight **12***c* and chain **14***c* are bisected by a vertical plane disposed essentially normal to the common vertical plane.

It will also be understood that weights **12***a*, **12***b* and **12***c* may be considered as each having an upper or clock wound position, not shown, which may be defined for example by a stop arranged for engagement by the weights and a lower or clock unwound position defined by engagement of chain free ends with a chain "run through" preventing stop mentioned above. In accordance with the present invention, an intermediate unwound position for the clock weights is defined by mechanism **10** and shown for instance in the case of weight **12***c* in FIG. **7**, which is disposed essentially midway between the wound and potential unwound positions of such weights. In clocks not provided with an automatic winding mechanism, it is necessary for a person charged with the maintenance of a clock to periodically lift its weights for return to their wound positions by manually pulling down on the chains adjacent their free ends **14***a''*, **14***b''* and **14***c''*. In that weights **12***a*, **12***b* and **12***c* typically drive different portions of a clock mechanism, e.g. the timing mechanism, the sound producing or striking mechanism and the visual display mechanism, such as in a cuckoo clock, the weights seldom occupy the same vertical position and/or arrive at their respective unwound positions at the same instant.

While a preferred form of mechanism **10** particularly adapted for use with a three weight clock mechanism will be described, it will be understood that such mechanism may be readily adapted for use in the automatic winding of clocks having any desired number of weights and is operable regardless of the number of such weights which might arrive at their unwound positions at any one time.

In its broadest aspect, mechanism **10** includes a chain pulling means **16**, which is movable along a vertical path of travel between an upper rest and a lower reversal position shown in FIGS. **1** and **5**, respectively, for purposes of exerting a downwardly directed pulling force on one or more of chain ends **14***a*'', **14***b*'' and **14***c*'' for purposes of raising their associated weights into their wound positions; a weight sensing means **18**, which is responsive to the arrival of any one or more of weights **12***a*, **12***b*, **12***c* in their unwound positions for initiating movement of the chain pulley means from its rest position towards its reversal position; and sensing means **20** responsive to the arrival of the chain pulling means in its reversal position for effecting return thereof to its rest position. Thus, the general overall mode of operation of mechanism **10** involves sensing the arrival of a weight in its unwound position, moving chain pulling means **16** downwardly for purposes of lifting such weight into its wound position and then returning the chain pulling means to its initial position to await return of such weight or another weight of the clock mechanism to its unwound position, whereupon a further cycle of operation is initiated.

More specifically, reference is now made to FIGS. **1** and **5–8**, wherein chain pulling means **16** is shown as including a traveler member **20**' and a plurality of pulling members **22***a*, **22***b* and **22***c*, which are arranged to operably engage one with each of chain free ends **14***a*'', **14***b*'' and **14***c*'', respectively. Traveler member **20**' and pulling members **22***a*, **22***b* and **22***c* are separately or individually mounted for vertically directed sliding movements by a guide track mechanism **24** consisting of a pair of parallel guide rails **26***a*, **26***b* and a pair of parallel guide tubes **28***a*, **28***b* interconnected adjacent their upper ends by a cross member **30**. An upper pin shaft, not shown, intermediate pin shaft **32** and lower pin shaft **34** assist in maintaining guide rails **26***a*, **26***b* in parallel relationship and the lower ends of guide tubes **28***a*, **28***b* are fixed thereto by mounting blocks **36***a*, **36***b*. Cross member **30** is provided with a generally planar upper surface **38** through which extend a first bore opening **40***a* arranged in alignment with the interior of guide tube **28***a* and a second bore opening **40***b* which is slightly offset from alignment with guide tube **28***b*; a pair of upstanding hinge devices **42***a* and **42***b*; and preferably three forwardly facing spring detent devices **44***a*, **44***b* and **44***c* arranged for cooperation one with each of pulling members **22***a*, **22***b* and **22***c* for purposes of normally retaining same in their normal rest position shown in FIGS. **1** and **6**.

Traveler member **20**' is shown in FIGS. **1** and **5–8** as being in the form of a generally rectangular plate formed with three rectangular slot openings **20***a*, **20***b* and **20***c*. Traveler member **20**' is slidably supported on guide rails **26***a* and **26***b* by a slide plate shown in part at **46** only in FIG. **4**, for vertically reciprocating movement between the upper rest position shown in FIGS. **1**, **6** and **7** and a lower reversal position shown in FIG. **5**. Traveler member **20**' also carries a plunger mechanism **48** shown in FIGS. **6–10** as including a barrel **48***a*, a plunger **48***b*, a plunger supporting/adjustment screw **48***c* and a coil spring **48***d*; and a depending cam device **50** having a downwardly facing, vertically inclined cam surface **50***a*.

Pulling members **22***a*, **22***b* and **22***c* are shown in FIGS. **1** and **3–8** as including inverted, generally L-shaped carrier brackets **52***a*, **52***b* and **52***c* having horizontally disposed flanges **52***a*', **52***b*' and **52***c*' provided with access openings or recesses **54***a*, **54***b* and **54***c* disposed for proximate vertical alignment with weights **12***a*, **12***b* and **12***c* and guide openings **56***a*, **56***b* and **56***c* sized to freely receive chains **14***a*, **14***b* and **14***c* without permitting passage of chain free ends **14***a*'', **14***b*'' and **14***c*'' upwardly therethrough; and vertically disposed flanges **52***a*'', **52***b*'' and **52***c*'' formed with downwardly opening mounting slots **58***a*, **58***b* and **58***c*. Carrier brackets **52***a* and **52***c* are fixed by means of fasteners **60***a* and **60***c* to slide blocks **62***a* and **62***c*, which have vertically extending bore openings **62***a*' and **62***c*' sized to slidably receive guide tubes **28***a* and **28***b*, respectively, and which mount slide plates **64***a* and **64***c* best shown in FIG. **4** as being arranged to slidably engage with the rear edges of guide rails **26***a* and **26***b*, respectively. Carrier bracket **52***b* is suitably slidably supported by guide rails **26***a* and **26***b*, such as by providing its vertically disposed flange **52***b*'' with integrally formed, generally L-shaped mounting slides **66** shown only in FIG. **4**.

By referring to FIGS. **3** and **6–8**, it will be understood that operating levers **67***a*, **67***b* and **67***c* are arranged to underlie carrier bracket flanges **52***a*', **52***b*' and **52***c*' with their rearwardly disposed ends pivotally supported on carrier bracket flanges **52***a*'', **52***b*'' and **52***c*'' by suitable pivot pins only one of which is shown in FIGS. **6–8** at **67***c*' and their forwardly disposed ends normally arranged in vertical alignment with access openings or recesses **54***a*, **54***b* and **54***c*.

Pulling members **22***a*, **22***b* and **22***c* are provided with latch devices **68***a*, **68***b* and **68***c* serving to releasably and individually couple the pulling members to traveler member **20**' for movement therewith between the rest position thereof shown in FIG. **1** and the reversal position thereof shown in the case of pulling member **22***c* in FIG. **5**. In that these latch devices are of identical construction, only latch device **68***c* best shown in FIGS. **4** and **6–8** will be described and like parts of latch devices **68***a* and **68***b* will be designated by like numerals bearing suffixes "a" or "b". Latch device **68***c* comprises an inverted, generally L-shaped slide plate **70***c*, which is mounted on carrier bracket flange **52***c*'' beneath operating lever **67***c* for vertically reciprocating movement by a guide pin/slot device **72***c* and is formed with a downwardly opening cam slot **74***c*; a generally L-shaped hook or latch member **76***c*, which has its upper end disposed within cam slot **74***c* and pivotally supported on the carrier bracket flange by pivot pin **78***c* and its lower or hooked end **76***c*' arranged for removable receipt within traveler member slot opening **20***c*; and a tension or return spring device **80***c*, which has its opposite ends connected to pin/slot device **72***c* and hook **76***c*, as shown in FIGS. **6–8** and tends to bias the hook, as well as operating lever **67***c*, into an inoperative or rest position best shown in FIG. **6**.

By making reference to FIG. **1**, it will be understood that chain pulling means **16** additionally includes a reversible drive motor **82** and driven means in the form of a drive belt **82***a* trained over motor driven pulley **82***b* and three guide rail mounted idler pulleys **82***c*; the driven means serving to couple the motor to traveler **20**' in order to effect vertical movement of the latter between its rest and reversal positions shown in FIGS. **1** and **5**, respectively. Operation of motor **82** is controlled by a control circuit including a first control switch **84***a*, which when closed serves to energize the motor to effect lowering of traveler member **20**', and a second control switch **84***b*, which when energized serves to energize the motor to effect lifting of the traveler mem-

ber; an "ON/OFF" power control switch **86**; and a manually operated circuit control switch **88**. A guide track mounted bracket **90** serves to support motor **82**, switches **84***a* and **84***b*, and a circuit wiring junction box **92** with which switch **88** is associated; and a bracket **94** depending from cross member **30** serves to support switch **86**.

The operating plungers **84***a'* and **84***b'* of switches **84***a* and **84***b* are arranged for engagement by legs **96***a* and **96***b*, respectively, of a switch control member **96**, which is slidably supported on bracket **90** by guide pin/slot devices **98** for vertically directed reciprocating movements between upper and lower positions shown in FIGS. **11** and **12** for purposes of alternatively closing switches **84***b* and **84***a*, respectively. Switch control member **96** is biased by a compression spring **100** disposed intermediate bracket **90** and a right angularly related upper end flange **102** of the switch control member to normally assume its upper position, but can be forced to assume its lower position upon downwardly directed movement of a control rod **104**, which is slidably supported for reciprocating movement within guide tube **28***a* and has its lower end arranged in engagement with a flange mounted abutment **102'**. The upper end of control rod **104** is arranged to extend through cross member opening **40***a* and project above cross member surface **38** under the bias of spring **100**.

By referring to FIGS. **11** and **12**, it will be apparent that switch control member **96** may be temporarily retained in its lower position by the presence of sensing means **20**, which in the presently preferred construction is defined by a latch arm **106** pivotally supported by a pivot pin **108** and biased by a spring **110** for pivotal movement in a counterclockwise direction, as viewed in FIG. **11**, for engagement with flange **102** of the switch control member. The upper end of latch arm **106** is provided with an upwardly facing cam surface **112** arranged for engagement with a cam member surface **50***a* and a downwardly facing and offset latch surface **114** arranged to removably overlie an upwardly facing latch surface **102***a* defined by flange **102**.

By referring to FIGS. **9** and **10**, it will be seen that ON/OFF switch **86** is provided with a pivotally supported operator arm **86***a* arranged to cooperate with a switch operator **116**, which is slidably supported for vertical reciprocating movement by bracket **94** and carries an adjustment screw **118** arranged to freely extend upwardly through cross member opening **40***b* with its upper end arranged to overlie cross member surface **38**. One edge of switch operator **116** is shaped to define a generally planar surface **116***a* arranged to engage operator arm **86***a* for purposes of forcing switch **86** into its "OFF" condition and an adjacently disposed recess **116***b* arranged to receive the operator arm to permit such switch to assume its "ON" condition. It will be understood that spring biased plunger **48***b* is arranged to underengage switch operator **116** for the purpose of resiliently biasing same upwardly to normally assume its rest or switch "OFF" condition, whenever traveler member **20'** is disposed in its upper or rest position, as best shown in FIG. **6**.

Weight sensing means **18** is best shown in FIGS. **1**, **2** and **6–8** as including a platform or plate **120**, which is supported above cross member **30** by hinge devices **42***a* and **42***b* for vertical pivotal movement between the normal or rest and weight sensing positions shown in FIGS. **6** and **7**, respectively; a suitable spring device **122** tending to normally bias the platform upwardly into its normal position. Platform **120** is fitted with three weight sensing plunger devices **124***a*, **124***b* and **124***c* arranged for cooperation with weights **12***a*, **12***b* and **12***c*, respectively, and bore openings **126***a* and **126***b* arranged to freely receive chains **14***a* and **14***b* respectively.

To facilitate description, only plunger device **124***c* will be described in detail with particular reference to FIGS. **2** and **6–8**, and like parts of plunger devices **124***a* and **124***b* will be designated by like numerals bearing the suffixes "a" and "b". Plunger device **124***c* is shown in FIGS. **6–7** as including a guide sleeve **128***c*, which is non-movably fixed within a bore opening **130***c* provided in platform **120**; an inverted cup-shaped weight engaging member **132***c*, which is slidably supported exteriorly of the guide sleeve and has its upper end formed with a weight receiving concave recess or pocket **134***c* disposed about a through bore opening **136***c*; and a drive plunger **138***c*, which is slidably supported interiorly of the guide sleeve and has an enlarged upper end **140***c*. It will be understood that recesses **134***a*, **134***b* and **134***c* are disposed in vertical alignment with weights **12***a*, **12***b* and **12***c*, respectively.

In the rest condition of mechanism **10** shown in FIG. **1**, weight engaging member **132***c* rests on the upper surface of platform **120**; and upper end **140***c* of drive plunger **138***c* rests against the upper end of guide sleeve **128***c* and the lower end of the drive plunger rests against or is in close proximity to the upper surface of operating lever **67***c*. Also in the rest condition of mechanism **10**, the upper ends of control rod **104** and adjustment screw **118** engage with or in close proximity to the lower surface of platform **120**.

Mechanism **10** is placed in operation by first mounting same beneath a clock to be rewound with plunger device recesses **134***a*, **134***b* and **134***c* disposed in vertical alignment with weights **12***a*, **12***b* and **12***c* and with the mechanism vertically positioned such that chain free ends **14***a''*, **14***b''* and **14***c''* are disposed closely adjacent the lower surfaces of bracket flanges **52***a'*, **52***b'* and **52***c'*, when the weights have descended sufficiently to force platform **120** to assume its downward pivotal position shown in FIG. **7**. During set up of mechanism **10**, the free ends of the chains would be temporarily removed in order to permit threading of the chains downwardly through openings **126***a* and **126***b* and through openings **56***a*, **56***b* and **56***c*.

To facilitate description of the mode of operation of mechanism **10**, it will be assumed that the weights are disposed at some position thereof, such as those shown in FIG. **1**, which are intermediate their fully wound and unwound positions, such that chain free ends **14***a''*, **14***b''* and **14***c''* are spaced below bracket flanges **52***a'*, **52***b'* and **52***c'*. In this condition, mechanism **10** is in a rest or inoperative condition, wherein traveler member **20'**, pulling members **22***a*, **22***b* and **22***c* and platform **120** are disposed in their rest positions, as shown in FIGS. **1** and **6**; power control switch **86** is in its "OFF" condition as shown in FIG. **9**; switches **84***a* and **84***b* are in open and closed condition, respectively, as shown in FIGS. **1** and **11**; and switch **88** is closed to supply current to the control circuit of the mechanism.

We next will assume that weight **12***c* is initially positioned and descending at a speed relative to weights **12***a* and **12***b*, such that it engages plunger device **124***c*, while weights **12***a* and **12***b* are still spaced some distance from their associated plunger devices **124***a* and **124***b*. Thereafter, weight **12***c* will eventually engage with member **132***c* within recess **134***c* and initiate downwardly di-

rected pivotal movement of platform **120** against the bias of spring **122**, as chain end **14***c*'' moves upwardly into close proximity with the lower surface of bracket flange **52***c*'. As platform **120** pivots downwardly, each of drive plungers **138***a*, **138***b* and **138***c* is free to slide upwardly within its associate guide tube until their upper ends underengage with the closed ends of their associated weight engaging members **132***a*, **132***b* and **132***c*. When this occurs in the case of drive plungers **138***a* and **138***b*, further continued pivotal movement of platform **120** into its final position shown in FIG. **7**, will simply cause the weight engaging members to be temporarily lifted from engagement with the platform in that the weight of such weight engaging members is insufficient to effect downward pivotal movement of operating levers **67***a* and **67***b* against the bias of springs **80***a* and **80***b*. However, the presence of weight **12***c* within recess **134***c* prevents weight engaging member **132***c* from being lifted from engagement with platform **120** and as a result continued pivotal movement of the platform will cause drive plunger **138***c* to effect pivotal movement of operating lever **67***c*, which in turn drives slide plate **70***c* downwardly. Downward movement of slide plate **70***c* serves in turn to cam hook **76***c* downwardly against the return bias of spring **80***c* until its hooked end **76**i c' is positioned within slot opening **20***c* of traveler member **20**', as shown in FIG. **7**.

As an incident to downward pivotal movement of platform **120**, the upper end of control rod **104** is engaged and the control rod, together with switch control member **96**, is forced to move downwardly against the return bias of spring **100** until such time as the switch control member is displaced sufficiently to close switch **84***a* and open switch **84***b*. When this occurs, flange latch surface **102***a* is disposed relatively below arm latch surface **114** and spring **110** operates to pivot latch arm **106** sufficiently to place arm latch surface **114** in an overlying, aligned relationship with the flange latch surface, as shown in FIG. **12**. Upon release of pressure on control rod **104** by platform **120**, when the latter is freed for movement towards its rest position in the manner to be described, spring **100** tends to bias switch control member **96** and thus the control rod upwardly towards their original rest positions, but is temporarily prevented from doing so by the latching action of latch arm **106**.

Also, as an incident to downward pivotal movement of platform **120**, the upper end of screw **118** is engaged and forced to move downwardly against the bias of bias spring **48***d* of plunger **48***b* until switch operator **116** is displaced sufficiently to position recess **116***b* in alignment with switch arm **86***a*, so as to permit switch **86** to assume its "ON" condition. When this occurs, motor **82** is immediately energized and traveler member **20**' is caused to leave its rest position and descend towards its reversal position. Screw **118** is adjusted to insure that motor **82** is not energized before latch arm **76***c* has been placed in its latched position shown in FIG. **7** and switch control member **96** has been displaced sufficiently to permit latching thereof by latch arm **106** and the closing and opening of switches **84***a* and **84***b*, respectively, as shown in FIG. **12**.

Immediately upon initiation of movement of traveler member **20**', the upper end of latch slot **20***c* moves into frictional engagement with hook end **76***c*' of hook **76***c* with the result that the hook is frictionally captured within the latch slot and pulling member **22***c* coupled for conjunctive movement with traveler member **20**', as shown in FIG. **8**. Essentially simultaneously therewith, lower surface of carrier bracket flange **52***c*' engages with chain free end **14***c*'' with the result that a downwardly directed pulling force is exerted on such free end to initiate lifting of weight **12***c*. As lifting of weight **12***c* proceeds, platform **120** is freed for pivotal movement towards its initial or rest position shown in FIG. **6** under the bias of spring **122**, whereby to free control rod **104** and screw **118** for subsequent upwardly directed movements for return to their initial or rest positions.

Lifting of weight **12***c* continues until traveler member **20**' and pulling member **22***c* arrive at their reversal positions shown in FIG. **5**, whereupon cam operator surface **50***a* engages with cam surface **112** of latch arm **106** for purposes of effecting clockwise directed movement of the latch arm against the bias of spring **110** sufficiently to remove arm latch surface **114** from overlying engagement with flange latch surface **102***a*, which frees switch control member **96**, and thus control rod **104**, for return to their initial or rest positions under the bias of spring **100**. The return of switch control member **96** to its initial position serves to effect opening and closing of switches **84***a* and **84***b*, respectively, thereby to effect reversal of motor **82** for purposes of returning traveler member **20**' and pulling member **22***c* to their initial or rest positions. As traveler member **20**' approaches its rest position, plunger **48***b* effects return movement of switch operator **116** and screw **118** to their initial or rest positions, whereupon switch arm **86***a* is forced to ride out of recess **116***b* to effect return of switch **86** to its initial "OFF" condition to thereby deenergize motor **82**. Reversal of the direction of movement of traveler member **20**' serves to remove cam operator **50** from engagement with latch arm cam surface **112**, so as to allow spring **110** to again pivot latch arm **106** in a counterclockwise sense, as viewed in FIGS. **5**, **11** and **12**, until it is disposed in its initial position shown in FIG. **11**. It will also be understood that upon reversal of the direction of movement of traveler member **20**', both the downwardly directed pulling force exerted on chain free end **14***c*'' and the frictional force exerted by the upper edge of slot opening **20***c* on hook **76***c* on account of downward movement of the traveler member are released or removed. Removal of the pulling force serves to uncouple pulling member **22***a* and chain free end **14***c*'', so as to permit chain **14***c* to remain relatively stationary and simply slide within bore opening **56***c*, as the pulling member is returned to its initial rest position. Removal of the frictional force allows spring **80***c* to immediately return hook **76***c* to its initial or rest position, thereby to uncouple or unlatch pulling member **22***a* from traveler member **20**', such that the traveler member thereafter simply pushes the pulling member ahead of it as the traveler member returns to its initial or rest position. As an incident to the retraction of hook **76***c* from slot **20***c*, slide plate **70***c* is forced by the hook to return to its initial position, whereby it in turn serves to pivot operating lever **67***c* upwardly into its initial position shown in FIG. **6**.

Upon return of the components of mechanism **10** to their initial positions shown in FIG. **1**, a normal operational cycle of mechanism **10** is completed, and the mechanism is in condition to await the next cycle of operation to be initiated by the lowering of weights **12***a* or **12***b* into engagement with weight sensing means **18**.

What is claimed is:

1. A mechanism for automatic winding of a clock driven by at least one weight supported by a chain for movement vertically between an upper clock wound position and a lower clock unwound position, wherein said chain has a first end attached to said weight and an opposite free end movable in a direction opposite to said weight as said weight moves between said clock wound and unwound positions, said mechanism comprising:

chain pulling means movable along a vertically extending path of travel between an upper rest position and a lower reversal position, said pulling means having means engageable with said free end of said chain for pulling down on said free end during movement of said pulling means from said rest position towards said reversal position;

weight sensing means responsive to the lowering of said weight into said clock unwound position for initiating movement of said chain pulling means from said rest position into said reversal position, whereby said free end of said chain is pulled downwardly to effect lifting of said weight from said unwound position into said wound position coincident to placement of said pulling means in said reversal position; and

means responsive to placement of said chain pulling means in said reversal position for effecting return of said pulling means to said rest position.

2. A mechanism according to claim 1 and adapted for automatic winding of a clock driven by at least two weights independently supported by separate chains, wherein said pulling means includes common traveler means driven for movement along said path of travel and at least two chain pulling members having means individually engageable with the free ends of said separate chains, and said weight sensing means is responsive to the lowering of each of said weights into said clock unwound position for individually coupling said chain pulling members to said traveler means for movement therewith between said rest and reversal positions.

3. A mechanism according to claim 1, wherein said pulling means includes traveler and chain pulling members independently supported by a guide track for movement between said rest and reversal positions, said chain pulling member defining said means engaging with said free end of said chain, latch means for releasably coupling said chain pulling member to said traveler member for movement therewith from said rest position towards said reversal position, and operation of said latch means is controlled by said weight sensing means.

4. A mechanism according to claim 3, wherein said weight sensing means includes a platform movable vertically between first and second positions, spring means for biasing said platform into said first position, a plunger mechanism movably supported by said platform and having a first end arranged to be engaged by said weight upon movement thereof into said unwound position and a second end releasably engageable with said latch means to effect coupling of said chain pulling member to said traveler member.

5. A mechanism according to claim 1 and adapted for automatically winding a clock driven by at least two weights independently supported by separate chains, wherein said pulling means includes a common traveler member driven for movement along said path of travel and at least two chain pulling members individually engageable one with each of the free ends of said separate chains, each of said chain pulling members having an individually operable latch means for releasably coupling said chain pulling members to said traveler member for movement therewith from said rest position towards said reversal position, and said weight sensing means includes at least two weight sensing mechanisms disposed in vertical alignment one with each of said weights and one with each of said chain pulling members, and said weight sensing mechanisms are responsive to the lowering of the weight with which they are aligned for operating said latch means of the chain pulling member with which they are aligned.

6. A mechanism according to claim 5, wherein said weight sensing means additionally includes a platform supported for vertical movement between first and second positions and spring means for normally biasing said platform into said first position, said platform carrying said weight sensing mechanisms and being movable thereby to assume said second position upon engagement of said weights with said weight sensing mechanisms with which they are aligned; said chain pulling means additionally includes a reversible motor drivingly coupled to said traveler member, an ON/-OFF switch for energizing said motor, alternatively operable switch means for reversing the direction in which said motor is driven to effect movement of said traveler member in a first direction extending from said rest position towards said reversal position and in a second direction extending from said reversal position towards said rest position, means operable in response to movement of said platform into said second position for placing said ON/OFF switch in an ON condition and responsive to return of said traveler member to said rest position for placing said ON/OFF switch in an OFF condition, switch operating means supported for movement between first and second positions thereof and including spring means tending to maintain said switch operating means in said first position thereof to place said alternatively operable switch means in a first condition for causing said motor when energized to drive said traveler member in said second direction and opposing movement of switch operating means into said second position thereof to place said alternatively operable switch means in a second condition for causing said motor when energized to drive said traveler member in said first direction, said platform upon movement between said first and second positions thereof effecting movement of said switch operating means between said first and second positions thereof; and said means responsive to placement of said chain pulling means in said reverse position includes a latch device arranged to releasably engage with said switch operating means for releasably retaining said switch operating means in said second position thereof and cam means carried by said traveler member and arranged to engage with said latch device upon placement of said traveler member in said reversal position to effect release of said latch device from said switch operating means to permit said spring thereof to move said switch operating means into said first position thereof.

7. A mechanism for automatic winding of a clock driven by at least one weight supported by a chain for movement vertically between an upper clock wound position and a lower clock unwound position, wherein said chain has a first end attached to said weight and an opposite free end movable in a direction opposite to said weight as said weight moves between said clock wound and unwound positions, said mechanism comprising:

a vertically extending guide means;

a traveler member supported by said guide means for movement therealong between upper rest and lower reversal positions;

reversible drive means;

driven means for coupling said drive means to said traveler member to effect movement thereof along said guide means between said rest and reversal positions;

first switch means for operating said drive means when energized to effect movement of said traveler member from said rest position towards said reversal position;

second switch means for operating said drive means when energized to effect movement of said traveler member from said reversal position towards said rest position;

power control switch means having ON and OFF conditions for energizing and deenergizing said drive means, respectively;

a chain pulling member provided one in association with each said weight and mounted by said guide means for movement between rest and reversal positions thereof corresponding to said rest and reversal positions of said traveler member, each said pulling member having means arranged for engagement with said free end of said chain of its associated weight for pulling down on said free end during movement of said pulling member from said rest position thereof towards said reversal position thereof to effect lifting of its associated weight from said unwound position into said wound position, each said pulling member additionally having latch means for removably coupling said pulling member for movement with said traveler member from said rest position thereof into said reversal position thereof;

weight sensing means operating in response to the lowering of said weight into said unwound position thereof for operating said latch means of said pulling member associated therewith to couple same to said traveler member, for operating said first switch and for placing said power control switch in said ON condition whereby to energize said drive means and effect movement of said traveler member from said rest position thereof towards said reversal position thereof;

means responsive to the presence of said traveler member in said reversal position thereof operating said second switch means to effect movement of said traveler member and said pulling member releasably coupled thereto from said reversal positions thereof towards said rest positions thereof; and

means operable in response to return of said traveler member to said rest position thereof for returning said power control switch to said OFF condition.

8. A mechanism according to claim 7, wherein said latch means upon operation thereof by said weight sensing means is maintained in an operated condition for coupling said pulling member to said traveler member during movement from said rest positions thereof into said reversal positions thereof by a pulling force exerted on said free end of said chain by said pulling member, said pulling force being released incident to initiation of return movement of said traveler member from said reversal position, said traveler member being arranged to push said pulling member from said reversal position thereof into said rest position thereof.

9. A mechanism according to claim 8, wherein said weight sensing means includes a platform pivotally supported for vertical movement between upper first and lower second positions, a platform spring for biasing said platform to normally assume said upper first position and a plunger mechanism provided one in association with each of said weights and disposed in vertical alignment therewith said said chain pulling member with which said weight is associated, said plunger mechanism having an upper end arranged for engagement by said weight upon movement thereof into said unwound position for effecting pivotal movement of said platform against said bias into said second position thereof under the influence of gravity acting on said weight, said plunger mechanism having a lower end arranged for engagement with said pulling member to effect operation of said latch means incident to movement of said platform into said second position thereof, said platform spring biasing said platform for return to said first position thereof as said weight is lifted for return to its wound position by said pulling member pulling down on said free end of said chain associated with said weight, said first and second switch means are alternatively opened and closed by control means including a switch control member supported for vertical reciprocating movement and normally biased to assume an upper position wherein said first and second switch means are opened and closed, respectively, for operating said drive means when energized to effect movement of said traveler member from said reversal position towards said rest position, said platform engaging with said control means during movement thereof into said lower second position to move said switch control member into a lower position wherein said first and second switch means are in closed and open conditions, respectively, for operating said drive means when energized to effect movement of said traveler member from said rest position towards said reversal position, and said means responsive to the presence of said traveler member in said reverse position includes a cam carried by said traveler member and a pivotally supported latch arm biased to latch said switch control member in said lower position thereof, and said cam is arranged to engage said latch arm upon movement of said traveler member into said reversal position to effect unlatching of said switch control member for return to said upper position thereof.

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