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1,938,713

BELL RINGING MECHANISM AND CONTROL THEREFOR

Filed Sept. 15, 1927

2 Sheets-Sheet 1

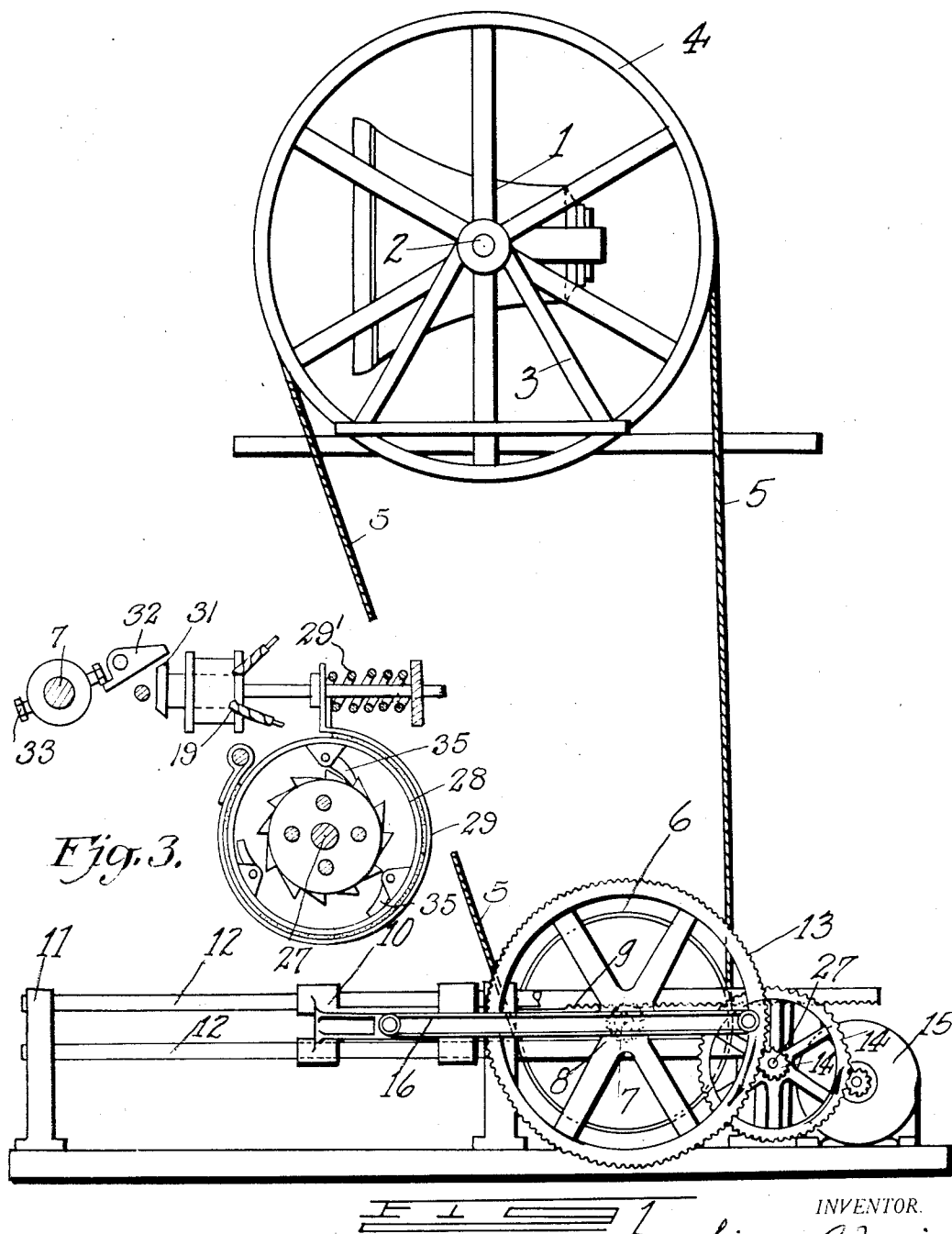


FIG. 3

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2 Sheets-Sheet 2

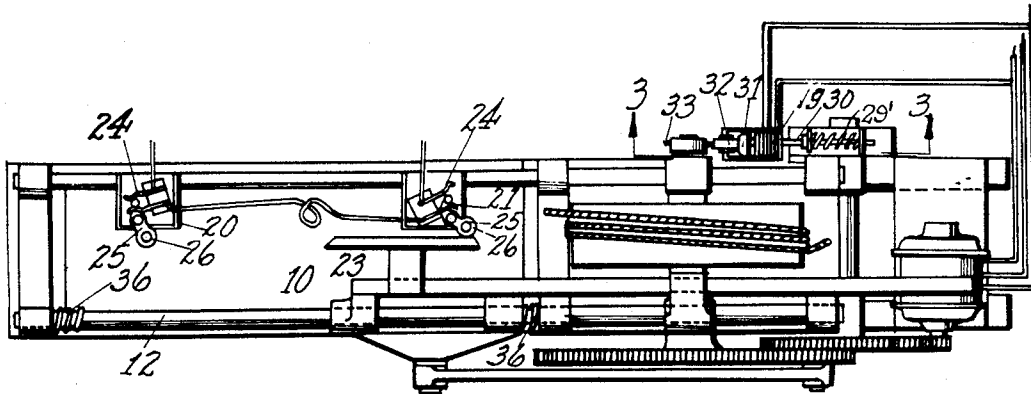


FIG. 2

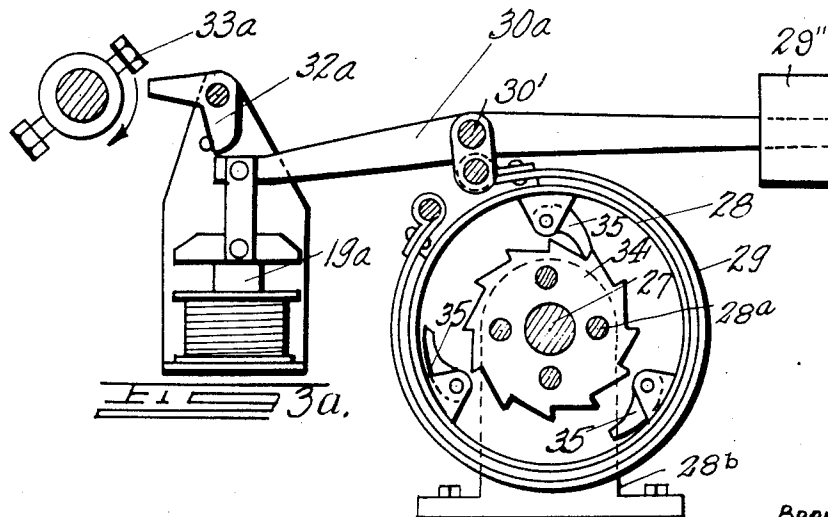


FIG. 3a.

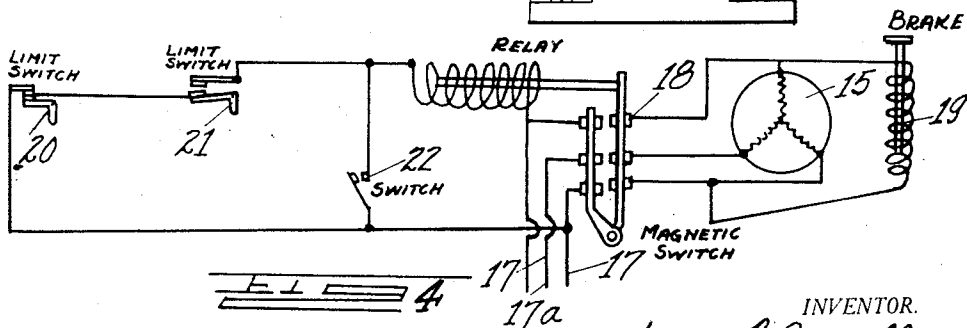


FIG. 4

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BELL RINGING MECHANISM AND CONTROL THEREFOR

Sidney B. Merrill, Cincinnati, Ohio

Application September 15, 1927

Serial No. 219,786

13 Claims. (Cl. 177—288)

My invention relates to bell ringing mechanism and controls therefor, and specifically to a novel braking arrangement which stops the swinging of the bell in such manner that vibratory and jerky strains are avoided.

In my co-pending application Serial No. 124,921, filed July 26, 1926, I have disclosed a preferred arrangement for controlling the operation of a bell. The system contemplates the stoppage of the bell ringing mechanism at the limits of the swing or stroke of the bell so that jerky operation is avoided. At the time of stopping the bell ringing mechanism a brake which is in circuit with the electrical control system is released for operation. While the system which I have suggested is entirely practical for a light bell, I have found that for heavy bell installations there is a tendency to be a decided jerk and jar just prior to the stoppage of the bell.

The invention disclosed herein has as its specific object a novel arrangement of wiring and a mechanical combination of parts in a bell ringing system which is in some respects quite similar to the system disclosed in my aforementioned co-pending application, but which is directed toward easing up or preventing the jerk and strain caused by the abrupt stoppage of the bell motor at a time when the entire mechanism is moving under its full momentum.

One of my objects is to break the circuit to the bell motor at a time when the bell is nearing the limit of its stroke, which allows it to exhaust its momentum and arrive approximately at the end of the movement before the brake is applied to inhibit further operation of the bell. The positions of a swinging bell at its limits of movement are called the instant rest points of the bell, and in the specification and claims which follow I wish this expression to be interpreted accordingly.

The above and other objects to which attention will be directed during the ensuing disclosures I accomplish by that certain arrangement and combination of parts of which I have shown a preferred modification.

In the drawings:—

Figure 1 is a side elevation of the bell support and the ringing mechanism.

Figure 2 is a plan view of the bell ringing mechanism.

Fig. 3 is a sectional front elevation, the section being on the plane of the line 3—3 of Fig. 1;

Figure 3a is a diagrammatic sectional view as would be indicated along the lines 3—3 in Figure 2, showing a modified type of brake control.

Figure 4 is a wiring diagram showing the electrical control for the mechanism.

I have shown the bell 1 mounted on a rotatable shaft 2 journaled in framework members 3. The shaft 2 has a bell wheel 4 mounted thereon by which the movement of the bell is controlled. A cable 5 passes over the bell wheel which is driven alternately in one direction and then the other by a driving pulley 6. The pulley 6 is journaled on the shaft 7. Pinion 8 mounted on a hub of the pulley 6 meshes with a rack 9. The rack 9 is mounted on cross head 10 which is moved from one end to the other of a support 11 and bars or rods 12 slidably support the cross head 10. A large gear 13 which is driven by a gear train 14 from the motor 15 has a crank 16 connected therewith which is pivotally mounted on cross head 10. The mechanical construction hereinbefore described is well shown in the Blood Patent 1,606,464 of Nov. 9, 1926. The only feature to which particular attention is called is that the crank is so adjusted with relation to the bell that when the crank is at one limit of its stroke in substantially a dead center position the bell is also at one limit of its stroke at an instant rest point.

Referring now to the wiring diagram in Figure 4 a three wire A. C. circuit is shown having feed lines 17 and 17a. The lines pass through a magnetic switch relay indicated diagrammatically at 18. The output lines from the magnetic switch are connected to the electric motor 15. A brake member, the control for which is illustrated diagrammatically at 19, is also directly supplied with current from the magnetic switch. Mounted in some conveniently accessible position are the limit switches 20, 21, which are shown as being directly supplied with current from one of the feed lines 17. As the power required for operating a motor is normally much greater than would be required for operating the solenoid in the magnetic switch a smaller gauge or independent wire circuit may be conveniently used for the limit switch circuit.

Briefly the operation of the limit switch circuit is to break the connection to the magnetic switch which in turn shuts off the current to the motor and brake mechanism.

I propose to control the operation of the limit switch circuit by detent wheels which will chime or ring the bell in accordance with requirements, but as I have shown a preferred type of detent mechanism for controlling either chiming or ringing in my co-pending application, I will make no further reference to the

preferred system here, excepting to say that the switch indicated at 22 controls the current to the magnetic relay when either of the limit switches is open. The switch 22 may be considered a symbol for any type of electrical or mechanical control which I may find desirable. I have also proposed to connect the hour striking mechanism of a clock to the bell ringing mechanism which can be readily accomplished by using a make and break switch for the switch 22 and operatively connecting it with the hour striking mechanism of a clock. As many churches, schools and other public buildings have bells therein for straight ringing or tolling only, the use of the bell for striking the hours gives the effect of a clock without the dial, and increases the use and value of the bell. Referring now to the mechanical construction of the bell ringing mechanism, the slidable cross head 10 has a member 23 or members which engage either the limit switch 20 or the limit switch 21 near its extreme limits of movement. The limit switches 20, 21, have electrical connectors 24 which are mounted on pivoted arms 25 which have portions 25 which extend into the path of movement of the portions 23 carried by the cross head. When the switch 22 is opened the circuit to the magnetic switch is not broken until the cross head 10 moves toward the end of its stroke, as the limit switches are in series each with the other, and in shunt with the circuit through the switch 22.

Mounted on the two rods and the frame of the machine carrying a driving gear is the brake assembly indicated in Figure 3. The gear shaft which may be indicated at 27 has a brake drum 28 mounted thereon. A brake band 29 encloses the brake drum and as the brake must be positive and not dependent on sudden cutting off of the electrical system, I prefer to have the brake set with suitable resilient means, as a spring 29' in Figs. 2 and 3, or a weight as in Fig. 3a, being normally set except when the motor starts and the solenoid is energized thereby releasing the brake. The solenoid is in circuit with the motor supply lines. In Figure 2 I have shown the solenoid 19 with its core mounted on a rod 30 which bears on the free end of the brake band 29. The solenoid core has an extension 31 which slides into engagement with a trip 32. The trip 32 which may be a gravity pawl is engaged twice during each revolution of the shaft 7 of the large gear by lugs 33 which extend from a collar on said shaft.

In Figure 3a I have shown a modified arrangement in which the brake is set by a weight 29'' on the free end of a lever 30a, the middle of which is fulcrumed on a pin 30' and has a depending lug pivoted to the free end of the brake band 29. This lever 30a tends to set the brake, but the solenoid 19a pulls down on the opposite end of the lever and, when the current is on, holds the brake open. This modification also shows a trip 32a which only releases the brake setting mechanism when one of the lugs 33a engages and rocks the trip.

Within the brake drum 28 and fixedly mounted with studs 28a on a bracket 28b supported on the machine frame therein is a ratchet wheel 34. In interspaced position about the inner periphery of the drum are also mounted pivoted pawls 35 which are thrown centrifugally outward when the shaft 27 and drum 28 are rotating. The ratchet wheel does not rotate and the shaft 27 rotates freely within the hole in

the ratchet wheel carrying the drum with it. When the shaft stops rotating there will be one pawl which will drop down into engagement with the teeth of the fixed ratchet. There are normally at least three pawls so that one will always be above the fixed cog wheel sufficiently to drop down by gravity between two teeth and so block a reversing movement of the bell driving mechanism.

The operation of the mechanism is as follows: For purposes of illustration, let it be assumed that the operator closes and then immediately opens the switch 22. The circuit to the magnetic switch is established and the bell motor starts to rotate. The bell, which is normally either in the position shown in Figure 1, or in the opposite position, when shut down, starts to move. As the member 23 on cross head 10 comes in contact with the other member 26 on the limit switch 24, the circuit is broken. The momentum of the bell and motor, however, keeps them in movement until such time as the brake is applied. Although the electrical circuit to the solenoid which is keeping the brake from engagement is broken at the same time that the motor current is shut off the trip 32 or 32a holds the link 30 or 30a in position until a lug 33 or 33a engages the trip and releases the link 30 at which time the brake is set either by the spring or the weight. The springs 36 mounted on the ends of the cross head guides serve to ease the reversing motion. This effect has ordinarily been produced by inserting a spring in the bell wheel cable.

The limit switches are so located that the circuit will be open and the motor cut off at such time as to allow the momentum of the bell to be practically expended before the brake is set by release of the trip 32. The bell will stop in the position as shown in Figure 1, with very little or no jerk or jar, depending on the accuracy in placing the limit switches.

In bell installations which are usually ponderous structures located up in church towers the hazard of mechanism which is liable to be collapsed by sudden jars is very great, as a bell weighing several tons dropping from a church tower might cause a bad accident. If the power is suddenly cut off during the operation of the mechanism and the bell does not go to the limit of one of its strokes for normal braking it will swing until its momentum has been overcome when the pawl brake will prevent a reverse swing in a direction counter to its normal movement. Should the current be cut off during normal operation and the weight of the bell cause reversing movement of the mechanism, much serious damage might be done.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent, is:—

1. In combination with an oscillatable bell and an electrically operated bell ringing reciprocating mechanism, a control system therefor, comprising means for cutting off the current supplied to said electrically operated mechanism, and means for mechanically retarding the operation of the mechanism at a timed interval after the cutting off of current whereby the momentum of the bell is dissipated and the bell stopped as it approaches an instant rest point.

2. Bell ringing mechanism comprising in combination with a bell oscillatable between points of instant rest above the lowest position of the bell, means for oscillating the bell, means for

actuating the oscillating means, means for inhibition of the actuating means, means for retarding the movement of the bell upon approach to said instant rest points, and means for actuating said retarding means, a predetermined interval after the inhibition of said means for actuating said oscillating means.

3. Bell ringing mechanism comprising in combination with a bell oscillatable between points of instant rest above the lowest position of the bell, means for oscillating the bell, means for actuating the oscillating means, means for controlling the actuating means, means for retarding the movement of the bell, and means for actuating said retarding means, only after said bell has reached a predetermined limit of its oscillatory stroke beyond its lowest point.

4. In combination with an oscillatable bell, electrically operated mechanism for oscillating said bell, means for controlling the electrical energization and de-energization of said mechanism, means normally inoperative for retarding and stopping the movement of the bell at its instant rest point, and means actuated a predetermined time interval after de-energization of said mechanism by said first named means for operating said retarding and stopping means.

5. In combination with an oscillatable bell and power-operated mechanism oscillating said bell between points of instant rest above the lowest position of the bell, and devices acting successively upon approach of the bell to its instant rest points, the first-acting device inhibiting the power operation of said mechanism and the next-acting device retarding the movement of the bell and the mechanism for their stoppage when the bell reaches its instant rest points.

6. In combination with an oscillatable bell and power-operated mechanism oscillating said bell between points of instant rest above the lowest position of the bell, and devices acting successively upon approach of the bell to its instant rest points, the first-acting device inhibiting the power operation of said mechanism and the next-acting device retarding the movement of the bell and the mechanism for their stoppage when the bell reaches its instant rest points, and means acting upon said stoppage to insure prevention of reversal of said mechanism under the weight of the bell.

7. In combination with an oscillatable bell and power-operated mechanism oscillating said bell between points of instant rest above the lowest position of the bell, means acting upon approach of the bell to its instant rest points to inhibit the power operation of said mechanism, whereby the bell and the mechanism stop when the bell reaches its instant rest points, and means inhibited by the operation of said mechanism but permitted to act upon stoppage of the mechanism, to insure prevention of reversal of the mechanism under the weight of the bell.

8. In combination with an oscillatable bell and power-operated mechanism oscillating said bell between points of instant rest above the lowest position of the bell, means acting upon approach of the bell to its instant rest points to inhibit the power operation of the mechanism, whereby the bell and the mechanism stop when the bell reaches its instant rest points, and means comprising a circular series of fixed ratchet teeth and a pawl rotated around said teeth by said mechanism and thereby held away

from said teeth by centrifugal action but engaging with said teeth upon stoppage of said mechanism to insure prevention of reversal of said mechanism under the weight of the bell.

9. In combination with an oscillatable bell and electrically operated mechanism oscillating said bell between points of instant rest above the lowest position of the bell, limit switches controlling supply of current to said mechanism, and a retarding device, one or the other switch and the retarding device acting successively under control of the mechanism upon approach of the bell to one or the other instant rest point, the switch thereby acting to affect the supply of current for inhibiting the electrical operation of the mechanism, and the retarding device thereby acting to retard movement of the bell and the mechanism for their stoppage when the bell reaches the instant rest point.

10. In combination with an oscillatable bell and power-operated mechanism oscillating said bell between points of instant rest above the lowest position of the bell, and devices acting successively under control of said mechanism upon approach of the bell to its instant rest points, the first-acting device inhibiting the power operation of said mechanism and the next-acting device retarding the movement of the bell and the mechanism for their stoppage when the bell reaches its instant rest points.

11. In combination with an oscillatable bell and mechanism operative to oscillate the bell between points of instant rest above the lowest position of the bell, a brake operative when set to retard movement of the bell and mechanism, means for setting the brake, means to release the brake, retention means to hold the brake released, power means operating the mechanism and the brake releasing means, and devices acting successively under control of the mechanism upon approach of the bell to its instant rest points, the first-acting means inhibiting the power operation of the mechanism and the brake releasing means, and the second-acting means inhibiting the action of the retention means, allowing the brake to set and retard the movement of the bell and the mechanism for their stoppage when the bell reaches its instant rest points.

12. In combination with an oscillatable bell and mechanism operative to oscillate the bell between points of instant rest above the lowest position of the bell and an electric motor driving said mechanism, a brake operative when set to retard movement of the bell and mechanism, means for setting the brake, a magnet releasing the brake when energized, retention means to hold the brake released, limit switches in circuit with the motor and the magnet, and means to inhibit the action of the retention means, one or the other switch and the inhibiting means acting successively under control of the mechanism upon approach of the bell to one or the other instant rest point, the switch breaking the circuit through the motor and the magnet, and the inhibiting means inhibiting the action of the retention means, allowing the brake to set and retard the movement of the bell and the mechanism for their stoppage when the bell reaches the instant rest point.

13. In combination with an oscillatable bell and mechanism comprising a member reciprocatable and operatively connected to the bell to oscillate the bell upon reciprocation, rotary

means operatively connected to said member to reciprocate it, an electric motor to drive said rotary means, a brake operative when set to retard movement of said rotary means and said motor, and thereby retard movement of said member and said bell, means for setting the brake, a magnet releasing the brake when energized, retention means to hold the brake released, limit switches in circuit with said motor and said magnet, means rotating with said rotary means to inhibit the action of the retention means, and means reciprocating with said member to actuate one or the other switch as the member approaches one or the other end of its reciprocation, either switch, when actuated, breaking the circuit through the motor and magnet, and the rotating inhibiting means being timed to act after actuation of the switch and before the end of the reciprocation.

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