Nov. 10, 1942. J. B. MARIS 2,301,556

TIME SWITCH AND VALVE CONTROL

Original Filed Sept. 13, 1939

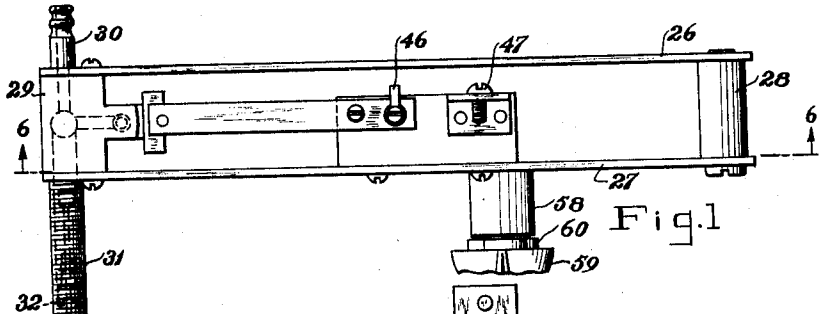


Fig. 1

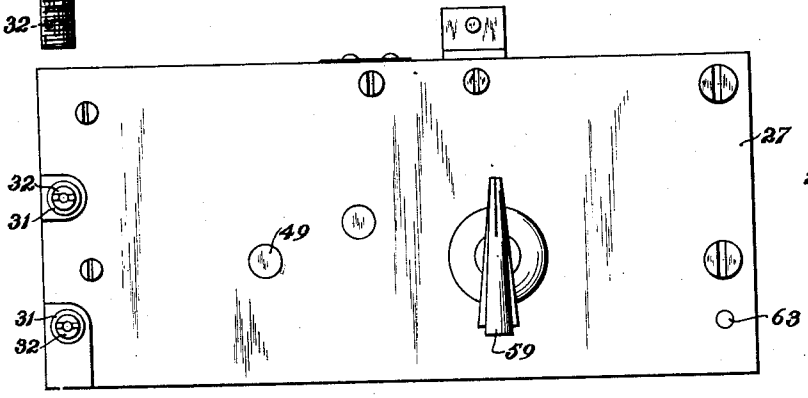


Fig. 2

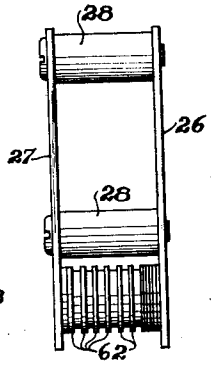


Fig. 3

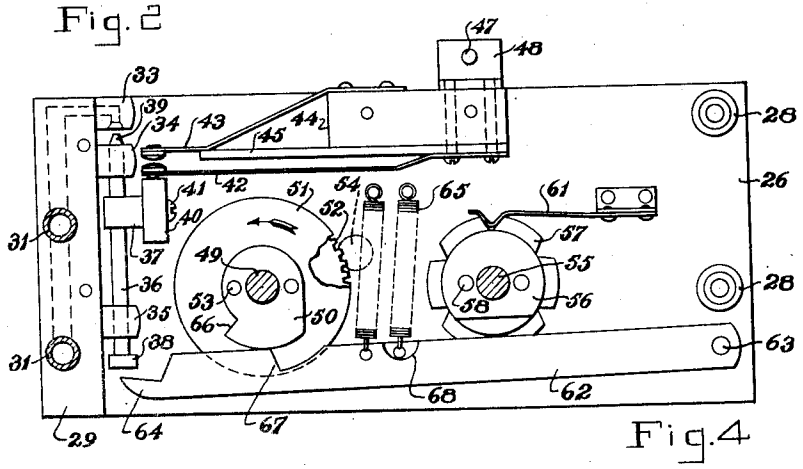


Fig. 4

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TIME SWITCH AND VALVE CONTROL

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Original application September 13, 1939, Serial No. 294,771. Divided and this application June 12, 1940, Serial No. 340,219

4 Claims. (Cl. 74—53)

This is a division of my copending application Serial No. 294,771, filed September 13, 1939. My invention relates to improvements in adjustable cyclic timing means of the type where a synchronous motor driven selective timing means are used to operate electric circuits and pressure valves.

An important object of my invention is to provide a simple, light weight, compact, silent assembly of apparatus which may be used for various types of medical and surgical applications such as draining of wounds, artificial respiration and other pressure and vacuum applications. My invention also represents an improved apparatus for applying intermittent compression of the main arteries as described by Leo Buerger, M. D., in "The Circulatory Disturbances of the Extremities," W. B. Sounders Company, 1924.

A further object of my invention is to provide an efficient, low cost, silent, synchronous motor driven combination time switch and valve permitting variation of the "on" and "off" cycle over a large range.

Other objects and advantages of the invention will be apparent during the course of the following description.

In the accompanying drawing, forming part of this specification, and in which like numerals are employed to designate like parts throughout the same,

Figure 1 is a top view of the timing switch,

Figure 2 is a side view of the same,

Figure 3 represents an end view, and,

Figure 4 represents a section along line 6—6 in Fig. 1.

Figures 1, 2, 3 and 4 show details of the time switch. This switch consists of two plates **26** and **27** held in spaced relation by posts **28** and the valve block **29**, and fastened to same with screws or other suitable means. The valve block **29** has two inlet connections **30** on one side, suitable for permanent connection by rubber hose, and two outlet connections **31** on the other side. In the preferred arrangement illustrated the two outlet connections **31** are threaded tubes containing valves, similar to the Schroder valves used in automobile tubes. These valves are arranged so that when a connection is made to the threaded ends of **31** the valve inside of same is thereby automatically opened and again closed when the outside connection is removed. The valves are designated with numeral **32**, see Fig. 1 and Fig. 2.

On the inside face of valve block **29** there are three projecting studs **33**, **34** and **35** which are rigidly fastened to block **29**. A valve stem **36** with a block **37** is slidable in holes in blocks **34** and **35**. One end of valve stem **36** carries a cross arm **38** while the other end **39** is tapered to form a needle valve with block **33**. The needle valve in block **33** is connected to inlets **30** and outlets **31** and acts as a pressure release valve.

An insulating block **40** is fastened to block **37** by screw **41**. Adjacent to block **40** is mounted a switch comprising the switch springs **42** and **43** both of which are fixed to an insulating support **44** which is mounted on the inside of plate **27**. An insulating member **45** holds spring **43** back when spring **42** is removed. The switch, as shown, is a single pole single throw one with one connection made to lug **46** and the other connection is made to screw **47** in bracket **48** which is connected to spring **42** through two screws penetrating the insulating block **44**.

A shaft **49** journalled in plates **26** and **27** carries a revolving cam structure comprising a plurality of disc cams **50** with spacing washers **51** and a driving gear **52** all fastened together into one structure by rivets **53**. The cam structure is rotated by a small synchronous motor mounted on the outside of plate **26** with a driving pinion (not shown in drawing) extending through hole **54** into engagement with gear **52**.

A second rotatable cam structure is mounted on shaft **55** which is journalled in plates **26** and **27**. This cam structure consists of a plurality of disc cams **56** fastened together with notched wheel **57** by rivets **58**. The cam discs **56** are essentially circular washers with a portion cut off. The cut edges of the washers are disposed in a definite angular relation to one another to correspond with the notches in wheel **57**. Shaft **55** extends through bushing **58***a* to knob **59** whereby the cam structure may be manually turned. The bushing **58***a* has a nut **60** whereby the assembled mechanism may be mounted, see Fig. 1. A spring **61** is fixed on plate **26** and is in engagement with the notches of wheel **57** which thereby acts as an index for the setting of the cam structure. The cams **56** are angularly displaced in such a manner that only one at a time has its cut-off in the operating position at one time.

A plurality of spring loaded cam levers **62** are pivoted at one end on shaft **63** which is journalled in plates **26** and **27**. There is one lever **62** for each cam **50** and **56** and thus there are as many as there are notches in wheel **57**. In the embodiment of my invention shown in the drawing there are six, but any desired number may be used. The levers **62** are cut at one end

to form fingers **64** and each lever has a spring **65** by which it is pulled up tight against cams **50** and **56**. Adjacent to cams **50** the levers **62** have a cut out portion **67** which makes it possible for the levers to be pulled up as soon as the nose **66** of cams **50** enters the notch of the corresponding lever. Due to the thinness of levers **62** the springs **65** are staggered and a notch **68** in adjacent levers provides clearance.

The operation of my invention is as follows: The desired cycle is set by turning knob **59** until a given cam **56** is in a position where its cut-off portion is in line with a given lever **62**. All the other levers are then held back by the uncut peripheries of the other cams **56** and only the selected lever is free to operate. The selected lever is riding upon cam **50** and when the nose **66** of this cam enters notch **67** the lever will be pulled up by spring **65** and finger **64** will press against cross bar **38** pushing same and valve stem **36** upward thus closing the valve. At the same time switch blades **42** and **43** make contact and may be used to start a pump motor having a pump furnishing the pressure governed by the valve **39** and the pressure is "on." The cams **50** revolve as described supra and the length of time "on" depends upon the shape of cams **50**. Once during each revolution the lever **62** is lifted away from **38** by the cam **50**. The valve stem **36** then drops by the spring action of switch spring **42**, the valve opens, the pressure is released and the switch spring **42** moves away from spring **43** thereby opening the switch and stopping the pump motor. The cams **50** are of different shape giving varying periods of "on" and "off" and any one of these cams may be selected for use by turning knob **59** to the proper position on a dial. It is thus possible to obtain various pressure curves illustrated in Fig. 2 of my original application as identified above. In the curve shown at the top of said figure the pressure is "on" one minute and "off" five minutes. The following curves show the "on" period increased to respectively 1.5, 2, 3 and 4 minutes while the "off" period is correspondingly reduced to 4.5, 4, 3 and 2 minutes, respectively.

It is to be understood that the form of my invention herewith shown and described is to be taken as a preferred example of the same, and that various changes in the shape, size, and arrangement of parts may be resorted to without departing from the spirit of my invention or the scope of the subjoined claims.

Having thus described my invention I claim:

1. A timing mechanism of the character described comprising a frame; a synchronous motor-driven cam structure rotatably mounted in said frame, said cam structure having a plurality of flat disc cams fixed on a central, rotatable shaft journalled in said frame; a plurality of levers pivoted at one end in said frame and being supported against said cam structure by individual springs; a manually rotatable cam structure mounted in said frame parallel to said motor-driven cam structure and located between same and the pivoted end of said levers, and control means operable in turn by said levers.

2. A timing mechanism of the character described comprising a frame; a synchronous motor-driven cam structure rotatably mounted in said frame, said cam structure having a plurality of flat disc cams fixed on a central, rotatable shaft journalled in said frame; a plurality of levers pivoted at one end in said frame and being supported against said cam structure by individual springs; a manually rotatable cam structure mounted in said frame with its central shaft parallel to the shaft of said motor-driven cam structure and having a similar number of flat disc cams, said manually rotatable cam structure being located in operable engagement with said levers between the pivoted ends of same and said motor-driven cam structure, and control means operable by said levers.

3. A timing mechanism of the character described comprising a frame; a synchronous motor-driven cam structure rotatably mounted in said frame, said cam structure having a plurality of flat disc cams fixed on a central, rotatable shaft journalled in said frame, each one of said disc cams having a given portion of its circumference removed; a plurality of levers pivoted at one end in said frame and being supported against said cam structure by individual springs; a manually rotatable cam structure mounted in said frame with its central shaft parallel to the shaft of said motor-driven cam structure and having a similar number of flat disc cams, said manually operable cam structure being located in operable engagement with said levers at a point between the pivoted ends of same and said motor-driven cam structure, and control means operable in turn by said levers.

4. A timing mechanism of the character described comprising a frame; a synchronous motor-driven cam structure rotatably mounted in said frame, said cam structure having a plurality of flat disc cams fixed on a central, rotatable shaft journalled in said frame; a plurality of levers pivoted at one end on a transverse shaft in said frame and being supported against said cam structure by individual coil springs, each one of said levers having a notch engageable in a corresponding notch in said flat disc cams; a manually rotatable cam structure mounted in said frame with its central shaft parallel to the shaft of said motor-driven cam structure and having a similar number of flat disc cams each of which comprise a circular washer having a segment removed, said manually operable cam structure being located in operable engagement with said levers at a point between the pivoted ends of same and said motor-driven cam structure, and control means operable in turn by any one of said levers.

JAMES B. MARIS.