Nov. 30, 1965 H. T. SIMMONS 3,221,117

ADJUSTABLE CAM TIME SEQUENCE CONTROL

Filed Sept. 9, 1963

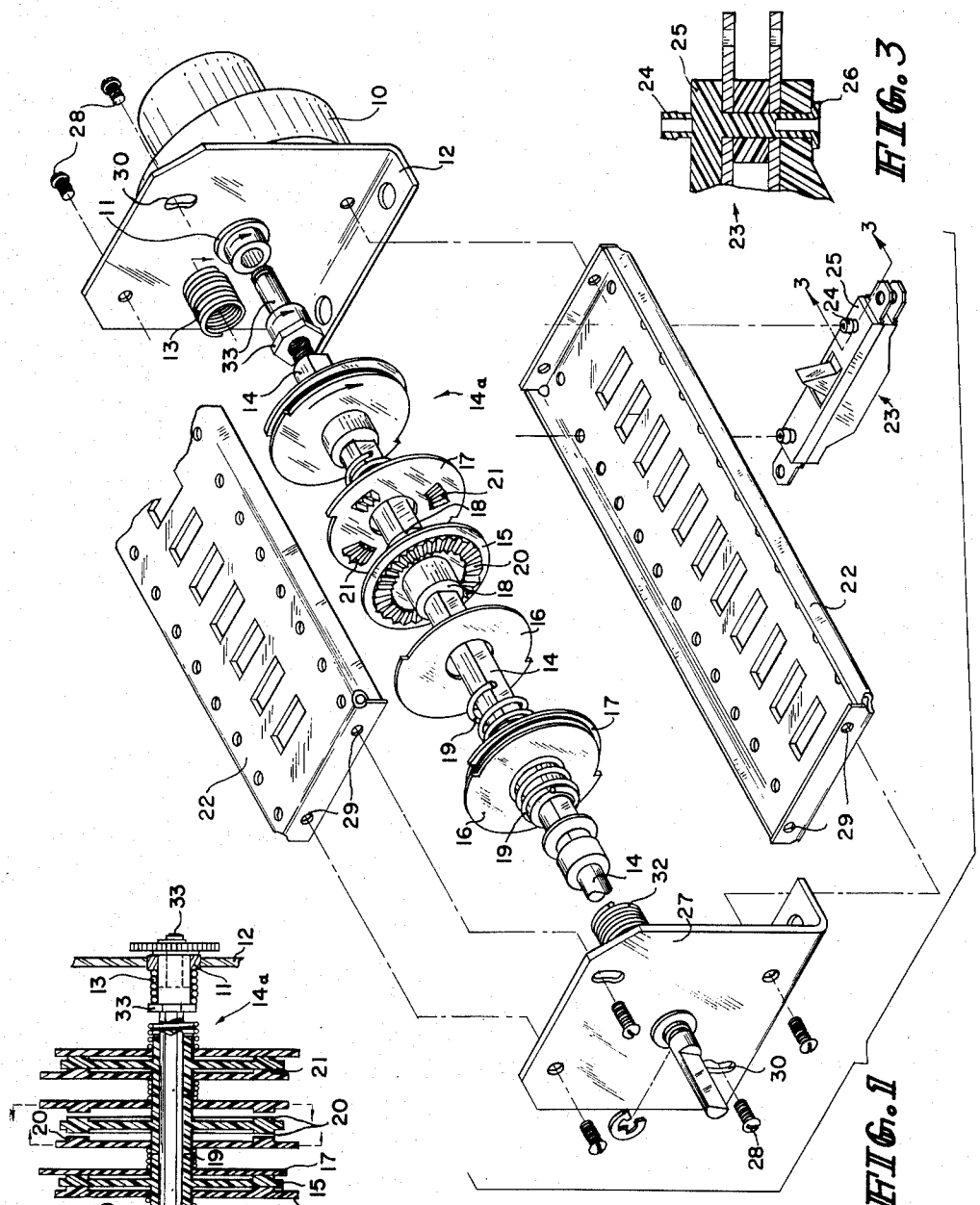

FIG. 1

FIG. 2

FIG. 3

INVENTOR.
HAROLD T. SIMMONS
BY
ATTORNEY

United States Patent Office

3,221,117

Patented Nov. 30, 1965

3,221,117

ADJUSTABLE CAM TIME SEQUENCE CONTROL

Harold T. Simmons, Indianapolis, Ind., assignor to P. R. Mallory & Co., Inc., Indianapolis, Ind., a corporation of Delaware

Filed Sept. 9, 1963, Ser. No. 307,635
7 Claims. (Cl. 200—38)

This invention relates generally to cam operated timing devices useful in carrying out predetermined functions and/or operations in accordance with a selective program and more particularly to a device capable of being adjusted to a variation of time sequences.

While most similar switch actuating devices are designed for use in automatic washing machines, dishwashers, clothes dryers, etc., the present invention lends itself to many other applications where an electrically timed sequence is required, for example, in vending machines of the liquid dispensing type.

Other types of adjustable switches require a certain amount of guesswork in setting the cams in desired relationship to each other and these usually require some sort of tool to facilitate setting.

It is an object of the present invention therefore, to provide a device having a means for very close incremental cam settings such as 1° variations.

It is another object of this invention to provide a device wherein the cams can be set in varying relationship to each other without the use of tools. It is another object of this invention to provide a versatile switch actuating means whereby the cams can be set quickly and accurately.

It is still another object of this invention to provide a switch actuating means having a plurality of toothed cam sets whereby the center cam which is rigidly fixed to the rotatable shaft, can be used to carry out a repetitive cycle while the outside or moveable cams can be adjusted to provide variable cycles.

In practice, adjustment of the cams is made by axially disengaging the teeth of the end cams from the mating teeth on the faces of the center driving cam and rotating the adjustable cams to the required setting. The cam teeth are biased back into engagement by springs located on each side of a cam set. It is contemplated that the switch actuating means will be driven by an electric motor. Accordingly, the invention resides in the features of construction and arrangement of parts. However, since various embodiments of the invention are conceivable without departing from the spirit thereof it is intended that the description and drawings be considered as illustrative only and not limiting in scope.

In the drawings:

FIG. 1 shows an exploded perspective view of one embodiment of my invention including a typical electric motor driving mechanism as well as the outline of a single snap-action switch, the actuation of which is representative of a use for my invention.

FIG. 2 is a cam and shaft assembly showing a plurality of cam sets biased in their operating positions by a plurality of springs and one cam set separated axially on the shaft in position for making a cycle adjustment.

FIG. 3 is a cross-section view of a typical snap switch showing the rivetless construction comprising two integral eyelet-like bosses. While I have emphasized the novelty and description of the adjustable cams, it will be understood that a complete assembly may contain a combination of conventional cams as presently known and adjustable cams as per the instant invention.

Generally speaking, the construction of the present time sequence control comprising individually adjustable cam sets, fixed sequence cams and unitary switches fulfills a need not heretofore met by existing or prior art. The

individual switching stations of the present invention are so constructed that adjustments are now possible by hand manipulation, eliminating the need for various tools as well as parts such as set screws, nuts, washers, etc. These features in the present control are further enhanced by obviating the need for an interval stepping mechanism thereby reducing the cost considerably by the use of a constant speed driving mechanism. Also by staggering the positions of the individual switches it is possible to accommodate more switching stations by utilizing both sides of the control assembly. While the embodiment shown in the drawings also represents a single gang version of my invention, it will be apparent to those skilled in the art that by extending the housing components and utilizing a means of connection such as gears or belts, a multiple gang embodiment can be constructed according to the principles of the invention.

The timing device includes suitable driving means; for example, a clock motor **10** which is not shown in detail since the construction thereof is irrelevant. The clock motor **10** is fastened to an end plate **12** through which the shaft coupling sleeve **11** protrudes to cooperate with cam shaft assembly **14***a* and floating shaft extension **33** which are connected through a spring clutch **13** to cam shaft assembly **14***a*. The cam shaft **14** carries a plurality of cam sets, each consisting of a driving cam **15** fixed in position both radially and axially to cam shaft **14**, a pair of driven cams **16** and **17** aligned axially on hub **18** of driving cam **15** and held in rotating engagement therewith by springs **19**. The driving cam **15** contains a full circle of gear-like teeth **20** on both faces which cooperate with corresponding gear-like teeth **21** on driven cams **16** and **17**. Switch mounting plates **22** consist of channel-like strips each having a plurality of perforated switch mounting apertures. Individual switches **23** are mounted at each station by means of eyelet-like bosses **24** formed integral to the switch housing section **25**. The bosses are inserted through the perforated channel strip and may be heat staked on the opposite side. The switch itself is held together by similar eyelet-like bosses **26** on switch housing section **25** and may be heat staked as shown in FIG. 3. The unit is considered complete with the assembly of a plate **27** which is similar to plate **12** both of which are mounted to switch mounting channels **22** by screws **28** assembled into threaded apertures **29**. Both plates **12** and **27** contain two or more elongated arcuate slots **30** to facilitate radial adjustment of switch mounting channels **22**. Reverse manipulation of the shaft **14** is prevented by the use of clutch springs **13** and **32**. From the foregoing description of the present invention in conjunction with the accompanying drawings, it will be evident that the invention provides an improved time sequence control featuring ruggedness, simplicity and low cost without sacrificing quality and efficient operation.

I claim:

1. In combination, a timing mechanism for sequentially actuating a plurality of switching devices comprising: a motor, said motor activating a shaft through a pair of spring clutches, said clutches permitting rotation of said shaft in one direction only, said shaft having placed thereon a plurality of adjustable cam sets having predetermined functional contours, said cam sets including a driven cam fixedly connected to said shaft and a plurality of cams having a floating characteristic on said shaft, each of said cams in said cam sets having gear-like teeth on the faces thereof, spring means urging engagement of said gear-like teeth of each of said cams of said cam sets, said gear-like teeth being adapted to provide fine incremental setting of said functional contours at predetermined angles as said cams having a floating characteristic on said shaft are manually displaced with respect to said fixed cam of said cam sets, and a plurality of snap action

switches individually riding on said functional contours of said cams whereby on rotation of said cams by said motor, said contours of said cams actuate adjacent snap action switches, said snap action switches mounted on a frame for said combination by means integral to said snap action switches.

2. In combination, a timing mechanism for sequentially actuating a plurality of switching devices comprising: a motor, said motor activating a shaft through a pair of spring clutches, said clutches permitting rotation of said shaft in one direction only, said shaft having placed thereon a plurality of adjustable cam sets having predetermined functional contours, said cam sets including a driven cam fixedly connected to said shaft and a plurality of cams having a floating characteristic on said shaft, said drive cam centrally located within said cam set, each of said cams in said cam sets having gear-like teeth on the faces thereof, spring means urging engagement of said gear-like teeth of each of said cams of said cam sets, said gear-like teeth being adapted to provide fine incremental setting of said functional contours at predetermined angles as said cams having a floating characteristic on said shaft are manually displaced with respect to said fixed cam of said cam sets, and a plurality of snap action switches individually riding on said functional contours of said cams whereby on rotation of said cams by said motor, said contours of said cams actuate adjacent snap action switches, said snap action switches mounted on a frame for said combination by means integral to said snap action switches.

3. In combination, a timing mechanism for sequentially actuating a plurality of switching devices comprising: a motor, said motor activating a shaft through a pair of spring clutches, said clutches permitting rotation of said shaft in one direction only, said shaft having placed thereon a plurality of adjustable cam sets having predetermined functional contours, said cam sets including a driven cam fixedly connected to said shaft and two cams having a floating characteristic on said shaft, said fixed cam positioned between said two cams having a floating characteristic, each of said cams in said cam sets having gear-like teeth on the faces thereof, spring means urging engagement of said gear-like teeth of each of said cams of said cam sets, said gear-like teeth being adapted to provide fine incremental setting of said functional contours at predetermined angles as said cams having a floating characteristic on said shaft are manually displaced with respect to said fixed cam of said cam sets, and a plurality of snap action switches individually riding on said functional contours of said cams whereby on rotation of said cams by said motor, said contours of said cams actuate adjacent snap action switches, said snap action switches mounted on a frame for said combination by means integral to said snap action switches.

4. In combination, a timing mechanism for sequentially actuating a plurality of switching devices comprising: a motor, said motor activating a shaft, said shaft having placed thereon a plurality of adjustable cam sets having predetermined functional contours, said cam sets including a driven cam fixedly connected to said shaft and a plurality of cams having a floating characteristic on said shaft, each of said cams in said cam sets having gear-like teeth on the faces thereof, spring means urging engagement of said gear-like teeth of each of said cams of said cam sets, said gear-like teeth being adapted to provide incremental setting of said functional contours at predetermined angles as said cams having a floating characteristic on said shaft are displaced with respect to said fixed cam of said cam sets, and a plurality of switches individually riding on said functional contours of said cams, contours of said cams for actuating said switches.

5. In combination, a timing mechanism for sequentially actuating a plurality of switching devices comprising: a motor, said motor activating a shaft through a pair of spring clutches, said clutches permitting rotation of said shaft in one direction only, said shaft having placed thereon a plurality of adjustable cam sets having predetermined functional contours, said cam sets including a driven cam fixedly connected to said shaft and a plurality of cams having a floating characteristic on said shaft, each of said cams in said cam sets having means for interconnecting said cams of said cam set with other cams of said cam set, on the faces thereof, spring means urging engagement of said means for interconnecting said cams of said cam sets, said means for interconnecting said cams adapted to provide fine incremental setting of said functional contours at predetermined angles as said cams having a floating characteristic on said shaft are manually displaced with respect to said fixed cam or said cam sets, and a plurality of snap action switches individually riding on said functional contours of said cams whereby on rotation of said cams by said motor, said contours of said cams actuate adjacent snap action switches, said snap action switches mounted on a frame for said combination by means integral to said snap action switches.

6. In combination, a timing mechanism for sequentially actuating a plurality of switching devices comprising: a motor, said motor activating a shaft, said shaft having placed thereon a plurality of adjustable cam sets having predetermined functional contours, said cam sets including a driven cam fixedly connected to said shaft and a plurality of cams having a floating characteristic on said shaft, each of said cams in said cam sets having means for interconnecting said cams of said cam set with other cams of said cam set on the faces thereof, means urging engagement of said means for interconnecting said cams of said cam sets, said means for interconnecting said cams adapted to provide incremental setting of said functional contours at predetermined angles as said cams having a floating characteristic on said shaft are displaced with respect to said fixed cam of said cam sets, and a plurality of switches individually riding on said functional contours of said cams, said contours of said cams for actuating said switches.

7. In combination, a timing mechanism for sequentially actuating a plurality of switching devices comprising: a motor, said motor activating a shaft, said shaft having placed thereon a plurality of adjustable cam sets having predetermined functional contours, said cam sets including a driven cam fixedly connected to said shaft and two cams having a floating characteristic on said shaft, said fixed cam positioned between said two cams having a floating characteristic, each of said cams in said cam sets having means for interconnecting said cams of said cam set with other cams of said cam set, spring means urging engagement of said means for interconnecting said cams of said cam sets, said means for interconnecting said cams adapted to provide incremental setting of said functional contours at predetermined angles as said cams having a floating characteristic on said shaft are displaced with respect to said fixed cam of said cam sets, and a plurality of switches individually riding on said functional contours of said cams, said contours of said cams for actuating said switches.

References Cited by the Examiner

UNITED STATES PATENTS

2,852,957	9/1958	Breitenstein	74—568
2,863,969	12/1958	Edmunds	200—168
2,875,306	2/1959	Allen	200—168
2,963,628	12/1960	Ostland	200—38
3,033,949	5/1962	Hehl	200—38
3,038,040	6/1962	Stolle et al.	200—38
3,126,759	3/1964	Cook	200—38

BERNARD A. GILHEANY, *Primary Examiner.*

ROBERT K. SCHAEFER, *Examiner.*

HIRAM B. GILSON, *Assistant Examiner.*