United States Patent

[11] 3,632,916

[72] Inventor **William J. Schaad**
Winnetka, Ill.

[21] Appl. No. **39,972**
[22] Filed **May 25, 1970**
[45] Patented **Jan. 4, 1972**

[73] Assignee **Indak Manufacturing Corp.**
Northbrook, Ill.

---

[54] **ELECTRICAL SWITCH WITH SELECTIVE BLOCKING ACTION**
1 Claim, 13 Drawing Figs.

[52] **U.S. Cl.** ..... **200/42 R,** 200/44
[51] **Int. Cl.** **H01h 27/06**
[50] **Field of Search** ..... 200/44, 42, 166 SD, 169, 11 R

[56] **References Cited**

UNITED STATES PATENTS

3,300,594	1/1967	Paine et al.	200/166 SD X

FOREIGN PATENTS

1,525,502	4/1968	France	200/166 SD
1,160,140	7/1969	Great Britain	200/44

Primary Examiner—Robert K. Schaefer
Assistant Examiner—Robert A. Vanderhye
Attorney—Burmeister, Palmatier & Hamby

ABSTRACT: The disclosed electrical switch comprises an insulating plastic carriage which is rotatable in a casing, and which supports one or more contactors adapted to engage a series of contact points on an insulating board at the rear of the casing. The carriage is moveable to first, second and third positions. The selective blocking action is brought about by an arrangement comprising a flexible spring arm which is formed integrally with the carriage and thus is preferably made of the same plastic material. When the carriage is moved between the first and second positions, the arm is flexed in one lateral direction by a first cam or ramp on the casing. In this way the arm is enabled to pass a stop which would otherwise block movement of the arm beyond the second position. When the carriage is moved between the second and third positions, the arm moves off the end of the first cam. Upon the return movement of the carriage between the third and second positions, the arm is flexed in a different lateral direction by a second cam or ramp which enables the arm to avoid the first cam. When the carriage reaches the second position, the arm is released so that it moves behind the stop. Thus, the carriage cannot be moved again to the third position until the carriage has been returned to the first position. The spring arm, formed integrally with the carriage, provides the selective blocking action without any need for extra moving parts.

A recess is provided in said second cam behind said stop to receive said spring arm and to effect relaxation of the stress in said arm to prevent it from taking a set.

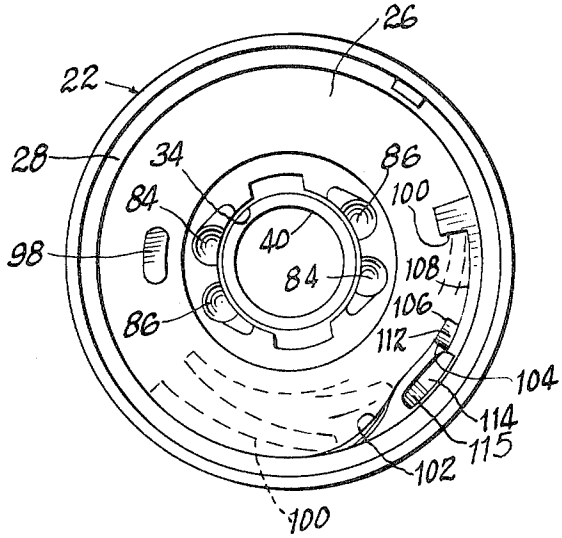


FIG. 1

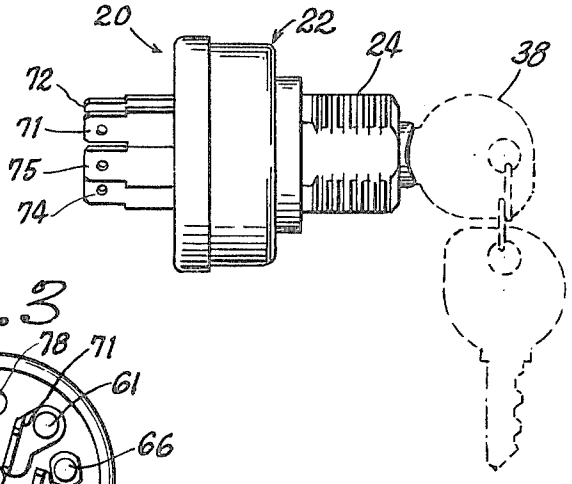


FIG. 3

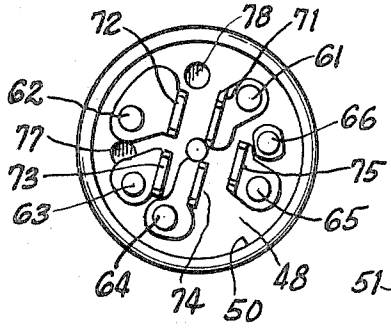


FIG. 2

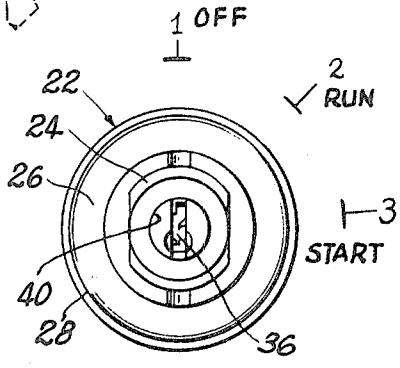


FIG. 4

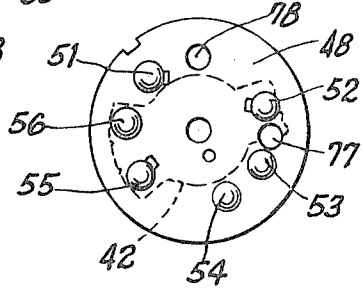


FIG. 5

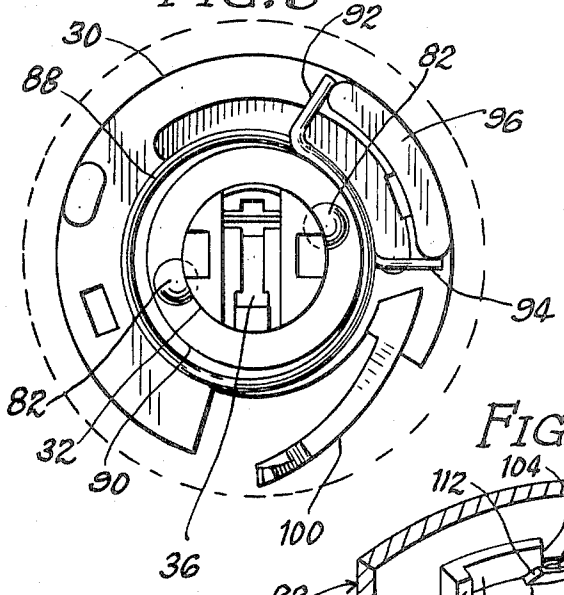


FIG. 6

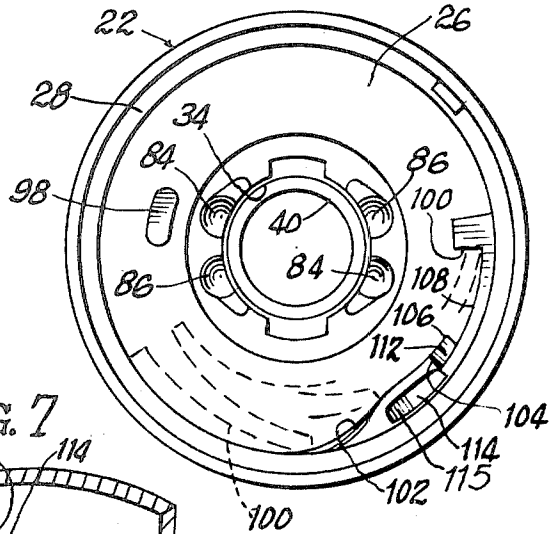
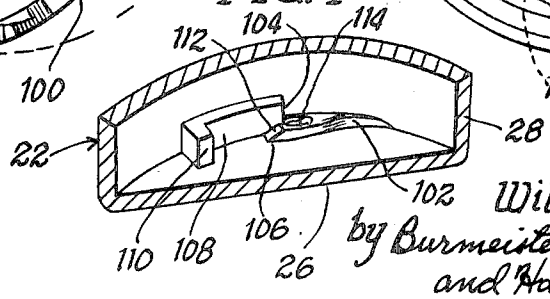


FIG. 7



INVENTOR
William J. Schaad
by Burmeister, Palmatier
and Hamby Attys

FIG. 8

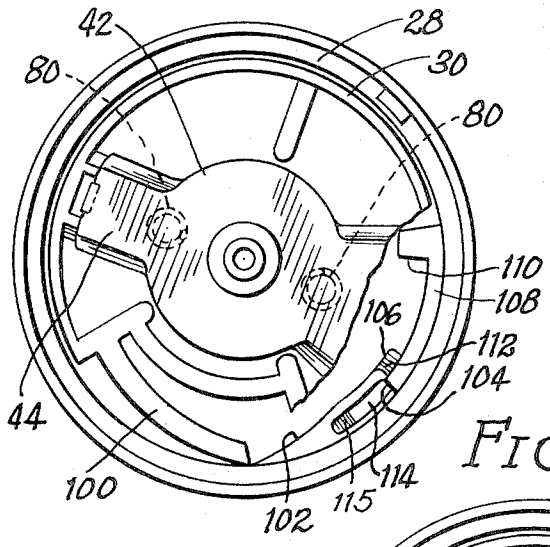


FIG. 9

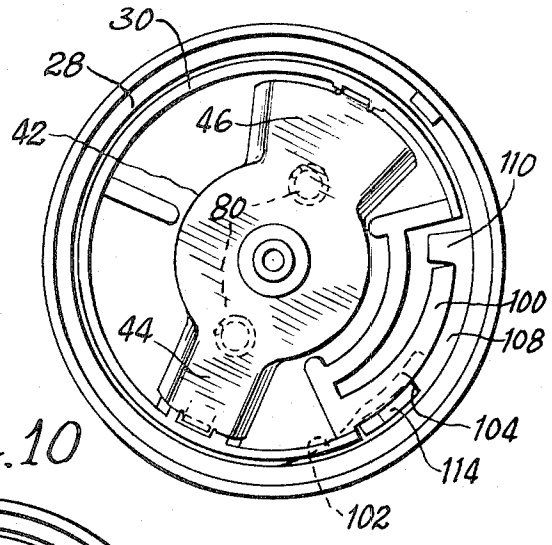


FIG. 10

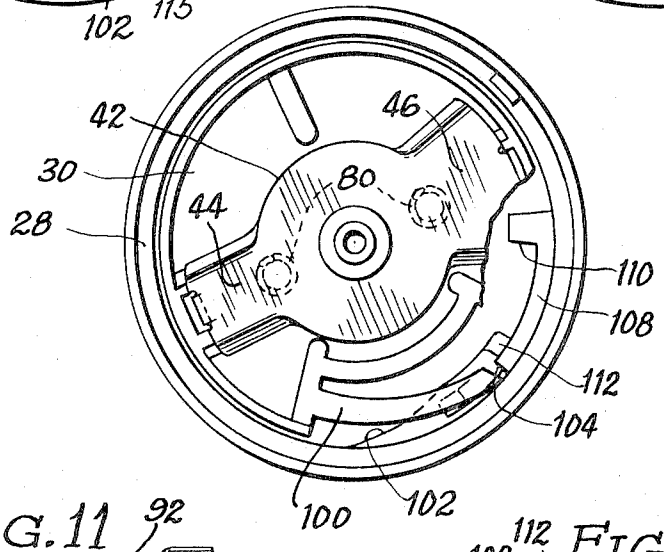


FIG. 11

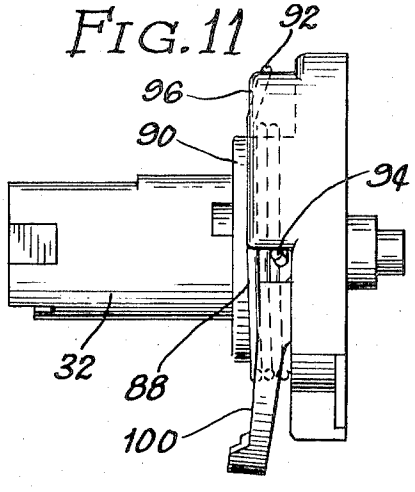
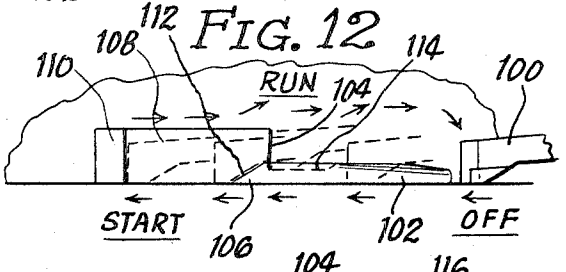


FIG. 12



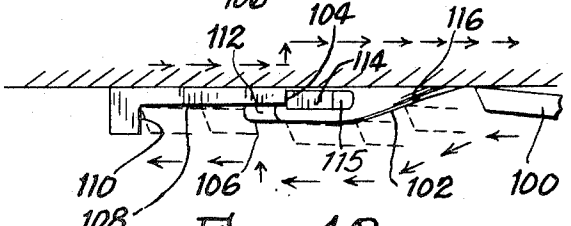


FIG. 13

ELECTRICAL SWITCH WITH SELECTIVE BLOCKING ACTION

This invention relates to electrical switches and is particularly applicable to automotive switches, intended primarily for use on automobiles and other vehicles. However, the invention will find many applications to other types of switches.

One object of the present invention is to provide a new and improved electrical switch which affords a selective blocking action. Such an action is applicable particularly to switches of the type having at least three positions. An example of such a switch is a combined ignition and starting switch for a vehicle. Such a switch has at least three positions which may be designated OFF, RUN and START. To start the vehicle, the switch is moved from the OFF position to the RUN position, and then to the START position, so as to energize the starter motor. When the engine of the vehicle has been started, the switch is returned to the RUN position. A spring is generally provided in the switch to return it to the RUN position automatically, when the operator releases the switch. In accordance with the selective blocking action, the switch is constructed and arranged so that it cannot be moved again to the START position until it has been returned from the RUN position to the OFF position. This arrangement prevents the accidental energization of the starter motor while the engine is running. The return of the switch to the OFF position stops the engine, so that it is safe to move the switch to the START position.

In the prior art, switches have been produced with such a selective blocking action. However, such switches have required a plurality of extra moving parts, so that the cost of such a switch has been substantially increased. Moreover, the possibility of failure of the switch has been increased.

In accordance with the present invention, a selective blocking action is achieved without providing any extra moving parts. The selective blocking action is achieved by changing the configuration of existing parts. Thus, the selective blocking action can be provided at extremely low cost. Moreover, the serviceability of the switch is maintained at a high level so that the switch provides long life and dependable performance.

In accordance with the present invention, switch preferably comprises an insulating carriage which is rotatable in a casing and is arranged to support one or more contactors. Contact means are mounted on the casing for engagement by the contactor. The carriage is movable to first, second and third positions. The selective blocking action is provided by a flexible spring arm which is formed integrally on the carriage. Preferably, the carriage is made of a resilient resinous plastic material, so that the carriage can be molded in one piece at very low cost. When the carriage is moved between the first and third positions, the spring arm is flexed in one lateral direction by a first cam or ramp on the casing. In this way, the arm is enabled to move past a stop which would otherwise block movement of the carriage between the second and third positions. Before the carriage reaches the third position, the spring arm moves off the end of the first cam. When the carriage is returned between the third and second positions, the spring arm is flexed in a different lateral direction by a second cam, so that the arm will avoid the first cam. When the carriage reaches the second position, the arm springs behind the stop. In this way, movement of the carriage to the third position is blocked until the carriage is returned to the first position.

Further objects, advantages and features of the present invention will appear from the following description, taken with the accompanying drawings, in which:

FIG. 1 is s side illustrative of an electrical switch, to be described as an illustrative embodiment of the present invention.

FIG. 2 and FIG. 3 are front and rear elevations of the switch.

FIG. 4 is a front elevation of the contact board, detached from the switch.

FIG. 5 is an enlarged front elevation of the carriage assembly for the switch.

FIG. 6 is an enlarged rear elevation of the casing, with the contact board and the carriage assembly removed.

FIG. 7 is a fragmentary perspective view showing the cams or ramps on the casing.

FIG. 8 is an enlarged rear view of the switch with the contact board removed and with certain parts broken away, the switch being shown in its first or OFF position.

FIG. 9 is a view similar to FIG. 8, but showing the switch in its third or START position.

FIG. 10 is a view similar to FIG. 8, but showing the switch in its RUN position, after being returned from its START position.

FIG. 11 is an enlarged side elevation of the carriage assembly.

FIG. 12 is a stretched out diagrammatic side view of the cams on the casing.

FIG. 13 is a stretched out diagrammatic rear elevation of the cams.

It will be seen that the drawings illustrate an electrical switch **20**, of the automotive type. The illustrated switch **20** was designed particularly for use as a combination ignition and starting switch for a snowmobile. However, the switch may be employed for automobiles, tractors and other vehicles. Moreover, the invention is applicable to switches of many different types.

The illustrated switch **20** comprises a casing **22**, having a threaded mounting stub or stem **24**, projecting forwardly therefrom. The illustrated casing **22** is made of metal, but it may be made of plastics or other suitable materials. As shown, the casing **22** is generally cup shaped, with a front wall **26** and a cylindrical sidewall **28**. The mounting stub **24**, projects forwardly from the front wall **26**.

Within the casing **22**, a carriage **30** is rotatably mounted. The carriage **30** is preferably made of a resilient resinous plastic material, but may be made of various other materials, preferably of a type which affords electrical insulation. The illustrated carriage **30** has a forwardly projecting shaft portion **32**, which is rotatably received in a bore **34**, formed in the mounting stub **24** of casing **22**.

The illustrated switch **20** is of the key operated type, but the invention is applicable to other types of switches. A slot **36** is formed in the front of the illustrated shaft **32**, to receive a removable operating key **38**. The key slot **36** is accessible through an opening **40** formed in the front of the mounting stub **24**.

The carriage **30** is adapted to support one or more contactors, for engagement with contact means mounted on the casing **22**. The illustrated contact and contactor arrangement is in accordance with the invention disclosed and claimed in the Schink and Schaad U.S. Pat. No. 3,497,644, issued Feb. 24, 1970, to which reference may be had for a detailed description. It will be understood, however, that the invention is applicable to switches with a wide variety of contact and contactor arrangements.

The illustrated switch **20** utilizes a single contactor **42**, which is mounted on the rear of the carriage **30** and is rotatable therewith. The contactor **42** has two diametrically opposite contact segments **44** and **46**. It will be seen that the contact segment **46** is substantially wider than the segment **44**.

The contactor **42** is engageable with contacts which are mounted on an insulating board **48**, forming the rear wall of the casing **22**. The board **48** may be retained by an inturned flange **50** at the rear end of the sidewall **28**.

In the illustrated arrangement, there are six contact points **51–56** on the front side of the insulating board **48**. The contact points **51–56** are preferably in the form of the sperically rounded heads of rivets **61–66**, extending through corresponding holes in the insulating board **48**.

Terminals **71–75** are mounted on the rivets **61–65**. In this case, the rivet **66** is left unconnected, inasmuch as the contact point **56** is intended to serve as a dummy. Additional dummy

points are provided by insulating bosses or semiperforations 77 and 78 on the insulating board 48.

The contactor 42 is pressed rearwardly against the contact points 51–56 by spring means, preferably in the form of a pair of coil springs 80, extending through corresponding holes in the carriage 30. Various other spring arrangements may be provided.

The carriage 30 is movable to three positions, designated OFF, RUN and START in FIG. 2. Preferably, the carriage 30 is detained in its OFF and RUN positions, and is spring returned from its START position. As shown in FIG. 5, the illustrated carriage 30 is provided with a pair of detent balls 82, which may be biased forwardly by the same spring 80 which bias the contactor 42 rearwardly. INsulators, not shown, are preferably provided between the springs 80 and the detent balls 82 to avoid grounding the contactor 42 to the casing 22. The detent balls 82 are adapted to be received in two pairs of recesses 84 and 86, formed in the casing 22.

VArious arrangements may be employed to provide a spring return of the carriage 30 from the START to the RUN position. As shown in FIG. 5, a coiled torsion spring 88 is mounted around a hub portion 90 on the carriage 30. The spring 88 has end portions in the form of generally radial arms 92 and 94, engaging the opposite ends of an arcuate boss or stop 96 on the carriage 30. WHen the carriage 30 is moved from the RUN to the START position, the arm 92 engages a projection or stop 98 on the casing 22. Thus, the arm 92 is held stationary, while the arm 94 is moved farther away from the arm 92 by the boss 96. Accordingly, the stress in the spring 88 is increased so that the spring tends to return the carriage to the RUN position. To achieve the blocking action, the carriage 30 is provided with a spring arm 100 which is adapted to be flexed laterally. Preferably, the spring arm 100 is formed integrally with the carriage 30. It is preferred to mold the carriage 30 and the spring arm 100 in one piece of a resinous plastic material. In this way, the spring arm 100 can be provided at extremely low cost.

As shown to best advantage in FIG. 5, the spring arm 100 angles outwardly, relative to the rotary axis of the carriage 30, and also peripherally, about the rotary axis. The spring arm 100 is preferably curved as to be arcuate in shape.

When the carriage 30 is in its OFF position, as shown in FIG. 8, the spring arm 100 extends into close proximity to the cylindrical wall 28 of the casing 22. The spring arm 100 is also shown in its OFF position in full lines in FIGS. 12 ans 13.

When the carriage 30 is turned from its OFF position toward its RUN position, the spring arm 100 engages a first cam or ramp 102, formed on the casing 22. The ramp 102 is located on the inside of the front wall 26, near the intersection with the cylindrical wall 28. The ramp 102 causes the spring arm 100 to be flexed laterally, generally in a radially inward direction. The effect of the ramp 102 is to deflect the spring arm 100 around a stop 104 which would otherwise be engaged by the arm.

After the carriage 30 passes the RUN position, the spring arm 100 moves off the end or terminus 106 of the cam 102, whereupon the arm 100 springs outwardly against a rib 108. It will be seen that the stop 104 is formed on one end of the rib 108. At the START position, the spring arm 100 engages an abutment 110, extending in a radially inward direction from the rib 108. In this way, further movement of the carriage 30, beyond the START position, is preferred.

When the carriage 30 is returned from the START to the RUN position, the spring arm 100 engages a second cam or ramp 112, which flexes the spring arm in a different lateral direction, illustrated as being generally parallel to the rotary axis of the carriage 30. The cam 112 enables the spring arm 100 to avoid moving around the cam 102. As the carriage is returned to the run position, the spring arm moves behind the stop 104, whereupon the arm 100 springs outwardly into close proximity to the cylindrical wall 28. At the same time, the spring arm 100 drops into a recess 114, formed in the cam 112 behind the stop 104. The recess 114 causes relaxation of the stress in the spring arm 100 and thereby enables the arm to stand in the RUN position over a long period of time, without taking a set. This feature is especially advantageous when the switch is to be used under conditions of extreme cold. The recess 114 also assists in preventing the spring arm 100 from moving around the stop 104, if an attempt is made to move the carriage 30 from the RUN to the START position The stop 104 effectively blocks such movement of the carriage 30.

When the carriage 30 is moved from the RUN to the OFF position, the spring arm 100 moves out of the recess 114 by way of a ramp 115, and then off the end portion or terminus 116 of the cam 112, so that the arm 100 is returned by its own springiness to its OFF position, in close proximity to the end wall 26 and the cylindrical wall 28 of the casing 22. The spring arm 100 is thus positioned in readiness to engage the first cam 102 when the carriage 30 is again advanced from its OFF position to its START position.

The arrangement of the stop 104 and the cams 102 and 112 is such that the spring arm 100 is blocked against movement to the START position, after the spring arm has been returned from the START position to the RUN position. However, the spring arm 100 can again be moved to the START position, after the spring arm has been returned to its OFF position.

It will be evident that the spring arm 100 can be molded in one piece with the carriage 30 at very low cost. Moreover, the cams 102 and 112, as well as the stop 104 and the rib 108 can be formed integrally with the casing 22, by a die casting operation, or in any other desired manner. Thus, the selective blocking action can be achieved without providing any extra moving parts.

The carriage is preferably made of a highly resilient, wear-resistant plastic material, such as delrin or nylon. When made of such a material, the spring arm will give extremely long life and dependable service.

Various other modifications, alternative constructions and equivalents may be employed, as will be evident to those skilled in the art.

I claim:

1. An electrical switch,
comprising a casing,
a carriage rotatably mounted in said casing,
said carriage being made of a resilient electrically insulating resinous plastic material,
contact means mounted on said casing,
at least one contactor mounted on said carriage and selectively engageable with said contact means,
means defining first, second and third positions of said carriage,
a flexible spring arm formed integrally with said carriage and flexible relative thereto,
a stop on said casing for engagement by said spring arm to prevent movement of said carriage from said second to said third position,
a first cam on said casing for flexing said spring arm laterally in a first direction away from said stop upon movement of said carriage from said first position to said second position whereby said spring arm is able to pass said stop upon movement of said carriage to said third position,
said first cam having a terminus to release said spring arm from said first cam between said second and third positions,
a second cam on said casing for flexing said spring arm in a second direction upon return movement of said carriage between said third and second positions to carry said spring arm past said first cam whereby said spring arm is engageable with said stop to prevent a second movement of said carriage between said second and third positions until said carriage has been returned to said first position,
and means forming a recess in said second cam behind said stop to receive said spring arm when it is in said second position and is engageable with said stop,
said recess causing relaxation of the stress in said arm to prevent said arm from taking a set.