United States Patent [19]

Pringle

[11] **3,911,529**

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[54] **DOOR HINGE ASSEMBLY**

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[52] **U.S. Cl.** **16/142;** 16/145

[51] **Int. Cl.²** **E05D 11/08**

[58] **Field of Search** 16/142, 145, 146, 49, 85, 16/139, 140, 82, 180

[56] **References Cited**

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1,019,068	3/1912	McKinnon	16/142
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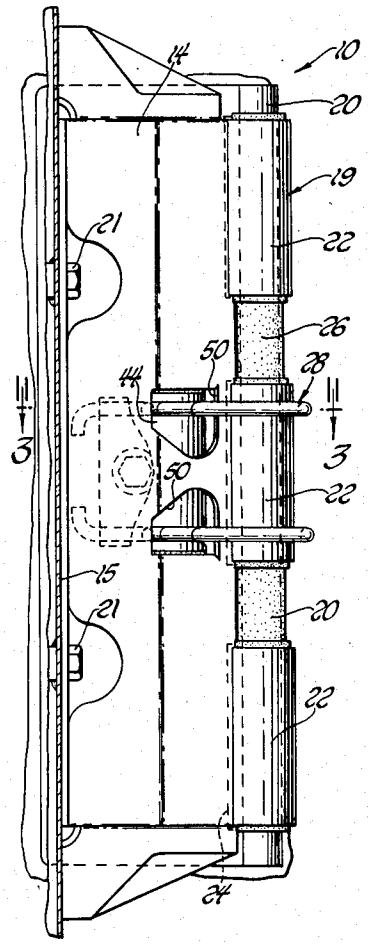
Primary Examiner—Geo. V. Larkin

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[57] **ABSTRACT**

A programmed hinge assembly including a first hinge plate, a second hinge plate, a hinge joint pivotally connecting the hinge plates, a spring arm between the hinge plates for defining at least one stop position; the spring arm including an anchored portion fixed to the first hinge plate, a control portion including at least one detent in controlling engagement with the second hinge plate, and a connecting portion, the connecting portion partially surrounding the outside of the hinge joint such that the spring arm substantially encompasses the hinge joint.

11 Claims, 7 Drawing Figures



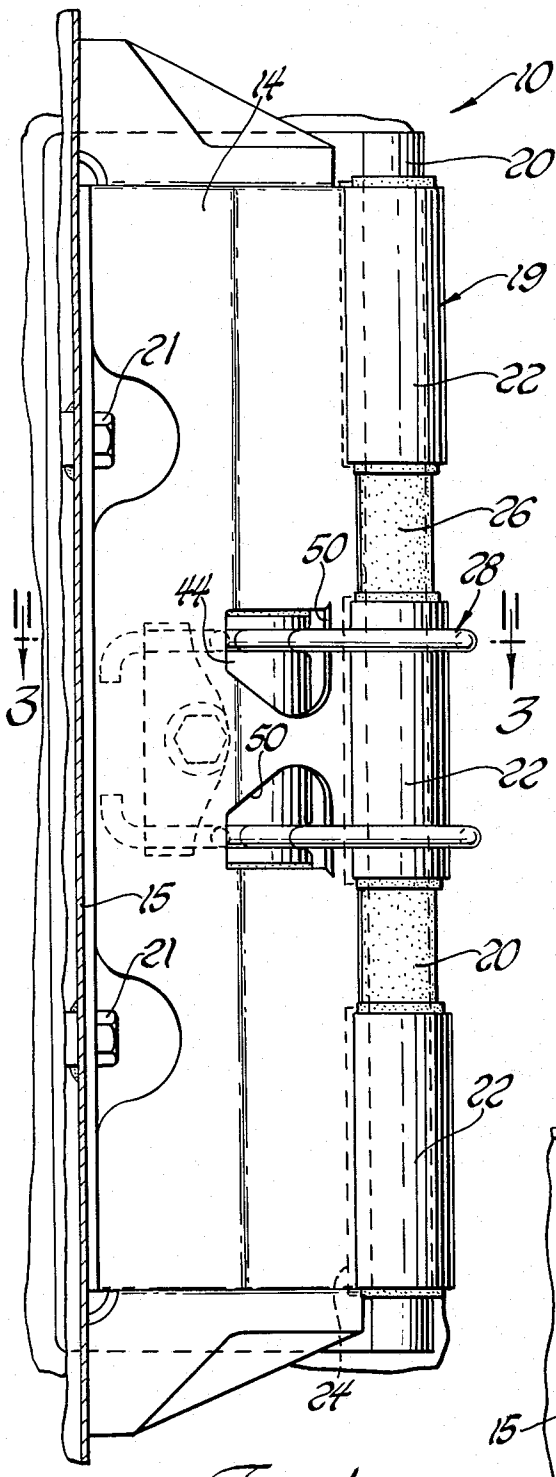


Fig. 1

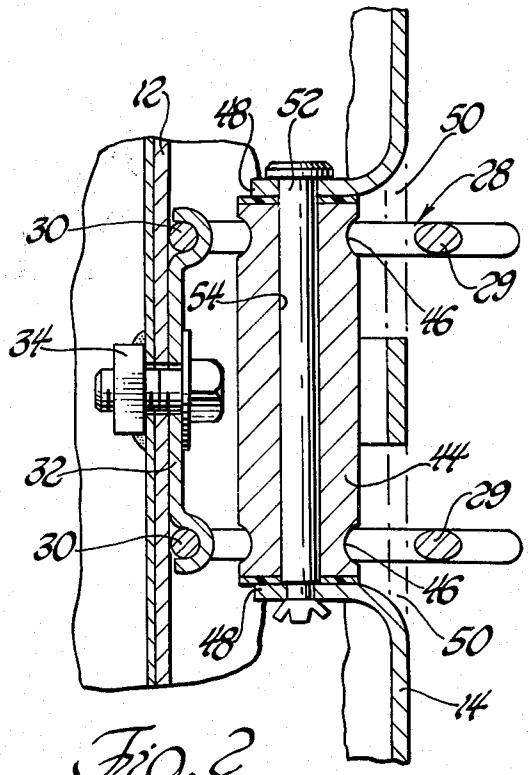


Fig. 2

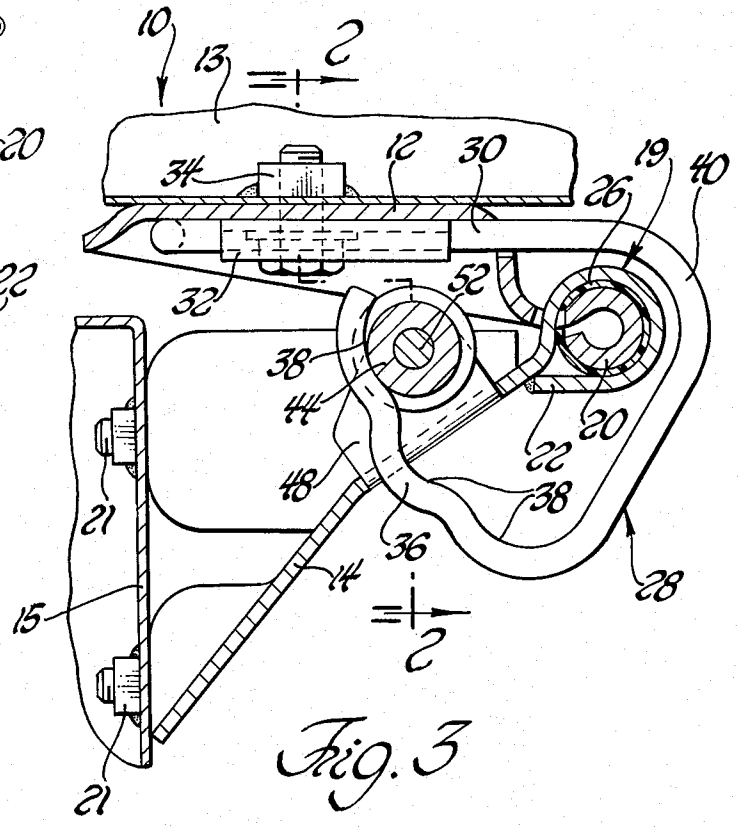


Fig. 3

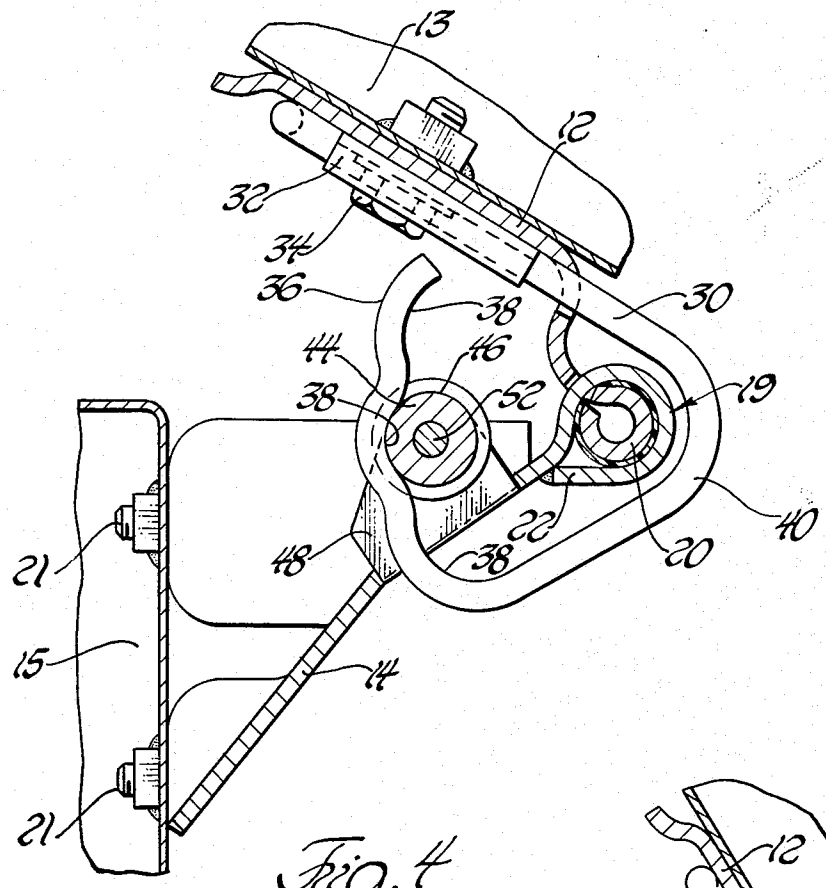

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Fig. 4

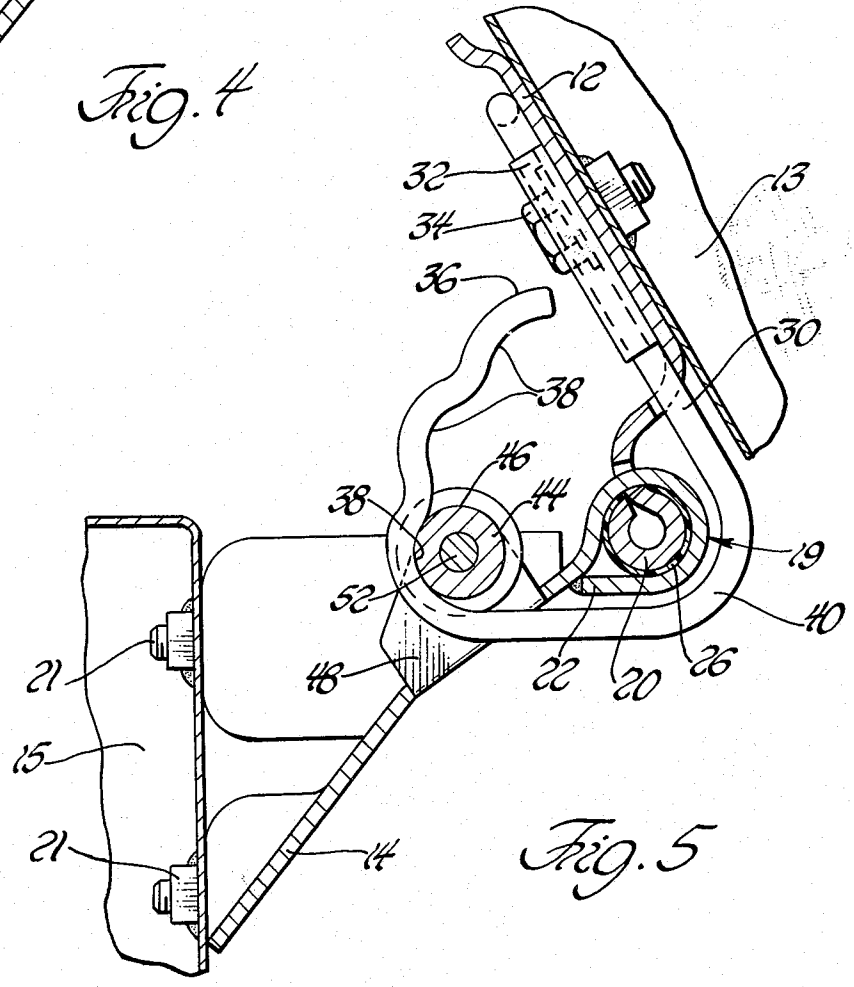

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Fig. 5

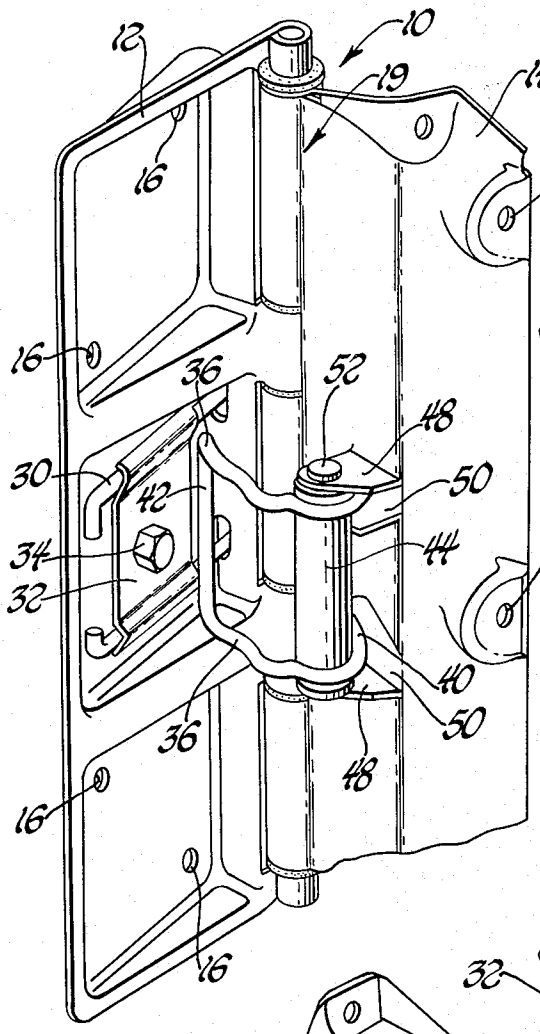

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Fig. 6

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Fig. 7

DOOR HINGE ASSEMBLY

This invention relates to a programmed hinge assembly adapted to connect a closure member to a closure frame whereby the closure member experiences a restraining force in one or more positions; typically, the closed position, the full-open position, and the half-open position. The programmed hinge assembly of the instant invention is particularly suited for use in vehicles, such as automobiles and trucks, a requirement of which is that the doors have multiple stop positions.

Many of the conventional vehicle door hinge assemblies employ add-on parts to provide the programmed feature. In other words, a spring device of some sort, which is not an integral part of the hinge assembly, must be separately attached to the door frame. The spring device is positioned on the door frame to coact with an element of the hinge assembly to program the movement of the door. The problem, however, is that conventional vehicle door hardware for providing programmed action of the door is not in unit form. Accordingly, an unnecessary number of operations are required on the assembly line to install all of the door hinge elements.

Presently known unitized door hinge assemblies which include means for programming the movement of the door, commonly referred to as hold-open devices, are oftentimes unsuitable for use in a vehicle door due to the limited amount of space available for installing such assemblies. Other of these assemblies are unsuitable merely from design and manufacturing considerations.

Examples of programmed hinge assemblies are disclosed in the U.S. Pat. Nos. **1,019,068** issued Mar. **5, 1912,** and **2,314,416** issued Mar. **23, 1943.**

The instant invention provides an integral or utilized programmed hinge assembly which is compact and, therefore, readily suited for use in vehicle doors. More specifically, the programmed hinge assembly includes first and second hinge plates pivotally connected by a hinge joint and a spring arm between the hinge plates for defining at least one stop position. The spring arm substantially encompasses the hinge joint and includes an anchored portion fixed to the first hinged plate, a control portion including at least one detent in controlling engagement with the second hinge plate, and a connecting portion, the connecting portion partially surrounding the outside of the hinge joint.

Other features and advantages of the present invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings wherein:

FIG. **1** is a front-elevational view of a hinge assembly constructed in accordance with the instant invention;

FIG. **2** is a cross-sectional view taken generally along line **2—2** of FIG. **3**;

FIG. **3** is a transverse cross-sectional view taken generally along line **3—3** of FIG. **1** illustrating the closed position;

FIG. **4** is a view similar to FIG. **3** illustrating the half-open position;

FIG. **5** is a view similar to FIGS. **3** and **4** illustrating the full-open position;

FIG. **6** is a front-elevational view of the hinge assembly in the full-open position, and

FIG. **7** is an exploded perspective view illustrating the various components of the instant invention.

Referring to the drawings, a programmed hinge assembly is generally shown at **10.** The hinge assembly **10** includes a first hinge plate **12** and a second hinge plate **14.** The second hinge plate **14** is pivotally connected to the first hinge plate **12** as hereinafter described.

As noted above, the hinge assembly **10** is particularly adapted for use in vehicle doors. Accordingly, hinge plate **12** is adapted for attachment to the inner edge **13** of a vehicle door, while the second hinge plate **14** is adapted for attachment to the pillar **15** in the vehicle door frame. As is generally the case, two or more hinge assemblies may be mounted between the door and door frame. Only one hinge assembly is shown, however, since it is typical of the others used.

For the purpose of attaching the hinge plates **12** and **14** to the door or door frame, the hinge plates **12** and **14** include suitable openings **16** and **18,** respectively, for receiving fasteners, such as shown at **21.** Other means for securing the hinge plates **12** and **14** to either the door **13** or the pillar **15** may be provided.

A hinge joint, generally indicated at **19,** pivotally connects the two hinge plates **12** and **14.** To form the hinge joint **19,** the inner edge of the hinge plate **12** is rolled to form a cylindrical portion **20** which comprises the pintle of the hinge joint. A number of rectangular openings **24,** in this case three, are provided adjacent the cylindrical portion **20.** The second hinge plate **14** includes a number of spaced-apart tabs **22** which are guided through the rectangular openings **24** adjacent the cylindrical portion **20.** The tabs **22** are subsequently bent or otherwise wrapped around the cylindrical portion **20.** In this manner a pivotal connection is formed between the hinge plates **12** and **14.** The pivotal connection described eliminates the necessity of a separate hinge pin for the hinge assembly.

To facilitate the pivotal movement between the hinge plates **12** and **14,** an elongated split-sleeve bushing **26** is disposed about the cylindrical portion **20** before the second hinge plate **14** is secured thereto. The bushing **26** is made of nylon or other suitable material to reduce frictional resistance to movement between the two hinge plates.

As noted above, the most important characteristic of the hinge assembly is that it is programmed, that is, includes an integral hold-open device for defining one or more stop positions. The programmed feature is provided by a spring arm generally indicated at **28** which is disposed between the two hinge plates **12** and **14.** The spring arm **28** defines at least one stop position, and preferably a plurality of stop positions, for the door.

As best shown in FIGS. **3** through **5,** the spring arm **28** is generally triangularly shaped and, in the preferred embodiment, includes a pair of identically-shaped branches **29** made of a suitable material, such as, heavy gauge spring steel wire. As shown in the drawings, the branches **29** of the spring arm **28** are generally parallel and spaced-apart. Each of the branches **29** includes an anchored portion **30** which is fixed to the first hinge plate **12** by means of a suitable bracket **32** and fastener **34** arrangement. Each branch of the spring arm **28** further includes a control portion **36** which includes at least one, and preferably three detents **38.** The control portion **36** of the spring arm **28** is in controlling engagement with the second hinge plate **14** so that movement

between the two hinge plates and, consequently, movement between the door and door frame is programmed or controlled.

The spring arm **28** also includes a connecting portion **40** which connects the anchored portion **30** to the control portion **36.** The connecting portion **40** partially surrounds the outside of the hinge joint **19.** As used herein, the outside of the hinge joint **19** means the side of the hinge joint which is generally opposite to the side occupied by the hinge plates **12** and **14** when the door is in the closed position.

Described in another way, the spring arm **28** includes a base portion **30** which is anchored to the first hinge plate **12** and extends generally parallel to the hinge plate **12** toward and beyond the hinge joint **19.** An intermediate portion **40** is connected to the base portion **30** at an angle so that it extends generally away from the first hinge plate **12.** Accordingly, the base portion **30** and the intermediate portion **40** form an included angle therebetween within which is disposed the hinge joint **19.** The control portion **36** is connected to the intermediate portion **40** at an angle thereto so that it extends generally toward the base portion **30.** Hence, the spring arm **28** is somewhat triangularly-shaped and surrounds or encompasses the hinge joint **19.**

The branches **29** of the spring arm **28** may be connected together across the ends of the control portion **36** by a connecting segment **42.** The connecting segment **42** aids in maintaining the spacing between the two branches **29** of the spring arm **28.**

As shown in the drawings, the detents **38** comprise arcuate irregularities spaced along the length of the control portion **36.** To provide smooth controlling engagement between the control portion **36** and the second hinge plate **14,** the second hinge plate includes a roller member **44** which is directly engaged by the branches of the control portion **36.** To insure continued engagement with the control portion **36,** the roller member **44** includes a pair of spaced, circumferential grooves **46** in which the branches of the control portion **36** are seated.

The roller **44** is mounted between two spaced-apart, struck-out tab portions **48.** The tab portions **48** are struck out of the hinge plate by a suitable piercing and bending operation. This construction is used for economy of manufacture as well as for providing apertures **50** in the hinge plate **14** through which the branches of the spring arm **28** extend. The roller member **44** is supported by a pin **52** which extends between the two tab portions **48** through a cylindrical passageway **54** in the roller member **44.** Washers **56** may be provided between the ends of the roller member **44** and the tab portions **48.**

The operation of the hinge assembly when disposed between a door **13** and a door frame **15** is best shown in FIGS. **3** through **5.** Specifically, when the door **13** is in the closed position, as shown in FIG. **3,** the roller member **44** seats in the outermost detent **38** of the control portion **36** of the spring arm **28.** When the door is swung toward the open position about the hinge joint **19,** the spring arm **28** offers some resistance to such movement. In other words, the door **13** is not freely swingable toward an open position. Exerting a nominal force on the door **13,** however, forces the control portion **36** over the roller member **44** thereby causing the roller member to move out of the outermost detent **38.**

A half-open position, as shown in FIG. **4,** is established when the control portion **36** moves with the respect to the roller member **44** a sufficient distance to bring the second or intermediate detent **38** into engagement with the roller member **44.** Movement of the door **13,** either toward the full-open position or toward the closed position, is met with some resistance due to the spring action of the spring arm **28.** Again, however, the application of a sufficient force enables movement between the control portion **36** and the roller member **44.**

In like manner, a full-open position, as shown in FIG. **5,** is established when the third or innermost detent **38** engages the roller member **44.** Again, the control portion **36** of the spring arm **28** maintains the door **13** in the full-open position until a sufficient force is applied to the door **13** to move it toward the closed position.

It is noted that the roller member **44** provides a smooth, essentially frictionless movement between the control member **36** and the roller member **44** since movement of the control portion **36** relative to the roller member **44** is accompanied by rotational movement of the roller member **44.** Accordingly, the spring arm **28** and roller member **44,** which make up the programmed or hold-open device, operate essentially noiselessly thus avoiding squeaks and other undesirable sounds.

The invention has been described in an illustrative manner, and it is to be understood that the terminology which has been used is intended to be in the nature of words of description rather than of limitation.

Obviously, many modifications and variations of the present invention are possible in light of the above teachings. It is, therefore, to be understood that within the scope of the appended claims, the invention may be practiced otherwise than as specifically described.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A programmed hinge assembly comprising: a first hinge plate, a second hinge plate, a hinge joint pivotally connecting said hinge plates, a spring arm between said hinge plates for defining at least one stop position; said spring arm including an anchored portion fixed to said first hinge plate, a control portion including at least one detent in controlling engagement with said second hinge plate, and a connecting portion, said connecting portion partially surrounding the outside of said hinge joint such that said spring arm substantially encompasses said hinge joint.

2. An assembly as set forth in claim **1** wherein said second hinge plate includes a roller member engaged by said control portion of said spring arm.

3. An assembly as set forth in claim **2** wherein said spring arm extends in a generally triangular path about said hinge joint.

4. An assembly as set forth in claim **3** including a bracket device for securing said anchored portion to said first hinge plate.

5. An assembly as set forth in claim **3** wherein said second hinge plate includes a pair of spaced-apart, struck-out tab portions for rotatably supporting said roller member.

6. An assembly as set forth in claim **5** wherein said second hinge plate includes apertures adjacent said tab portions through which said control portion extends.

7. An assembly as set forth in claim 6 wherein said spring arm includes a pair of parallel spaced-apart, resilient members.

8. An assembly as set forth in claim 7 wherein said roller member includes a pair of circumferential grooves for seating said resilient members.

9. An assembly as set forth in claim 8 wherein said control portion includes three detents comprising three arcuate irregularities.

10. A programmed hinge assembly comprising: a first hinge plate, a second hinge plate, a hinge joint pivotally connecting said hinge plates, a triangularly-shaped spring arm between said hinge plates and substantially surrounding said hinge joint for defining at least one stop position, said spring arm including a base portion anchored to said first hinge plate and extending toward and beyond said hinge joint, an intermediate portion connected to said base portion at an angle and thus forming an included angle within which is disposed said hinge joint, and a control portion connected to said intermediate portion and extending generally toward said base portion including at least one detent in controlling engagement with said second hinge plate.

11. An assembly as set forth in claim 10 wherein said second hinge includes a roller member engaged by said control portion of said spring arm.

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