Sept. 19, 1967 D. J. ARNEBERG 3,342,958

TWO-PART MECHANICAL INTERLOCK FOR ELECTROMAGNETIC CONTACTORS

Filed Oct. 11, 1965 2 Sheets-Sheet 1

Fig. 1.

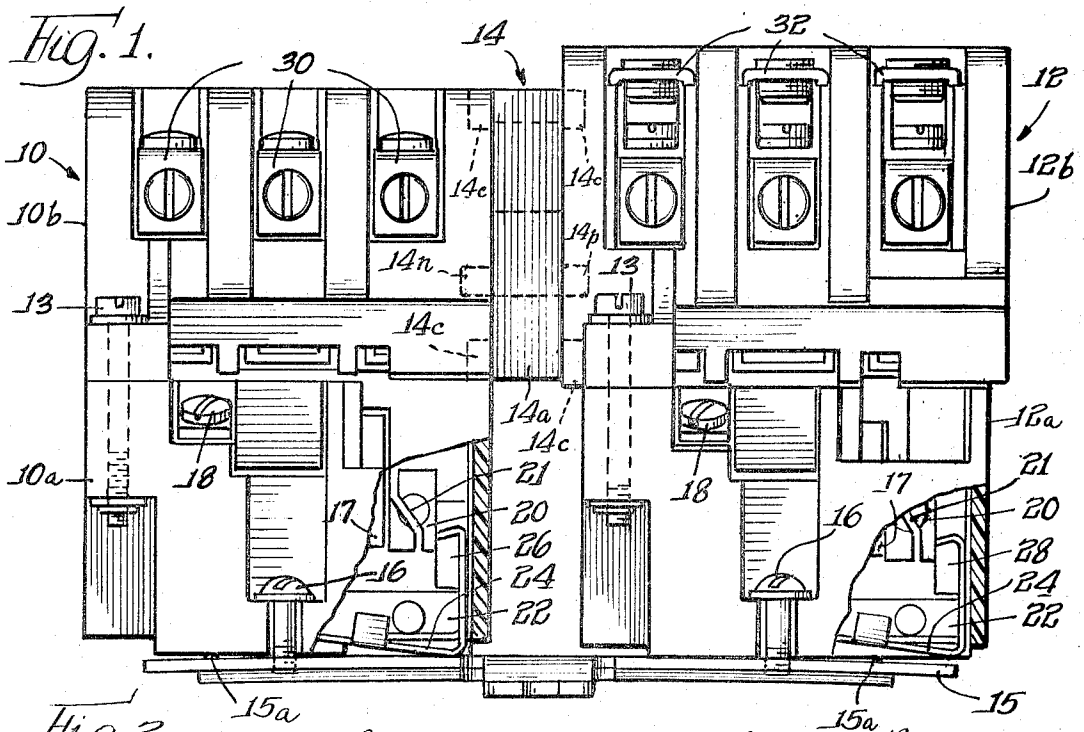


Fig. 2.

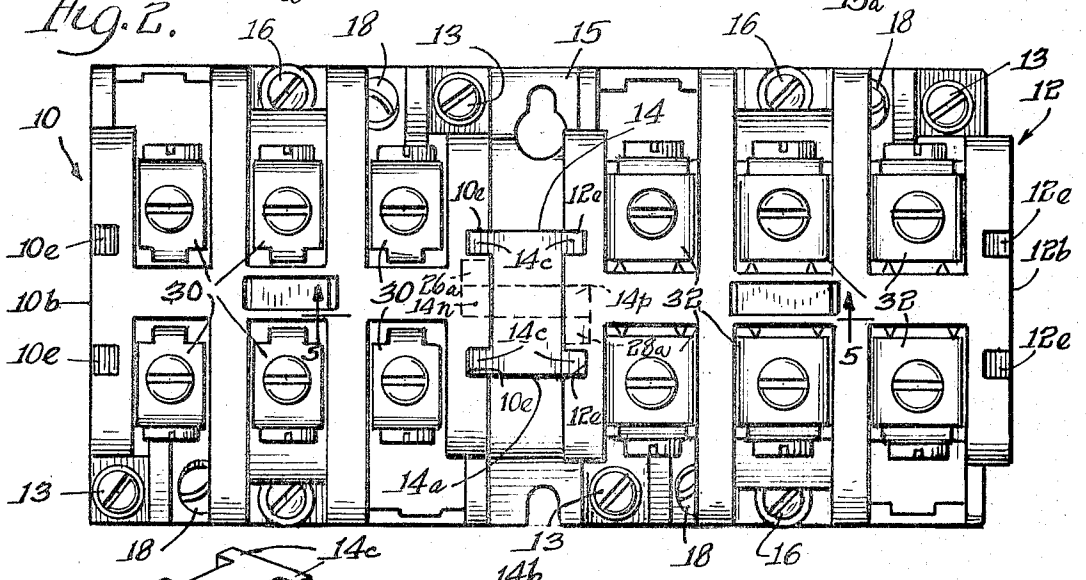
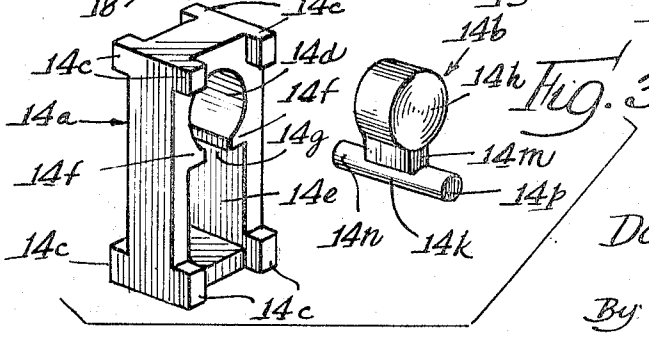


Fig. 3.



Inventor
Don J. Arneberg
By: Paul J. Rose
Atty.

Sept. 19, 1967 D. J. ARNEBERG 3,342,958

TWO-PART MECHANICAL INTERLOCK FOR ELECTROMAGNETIC CONTACTORS

Filed Oct. 11, 1965 2 Sheets-Sheet 2

Fig. 4.

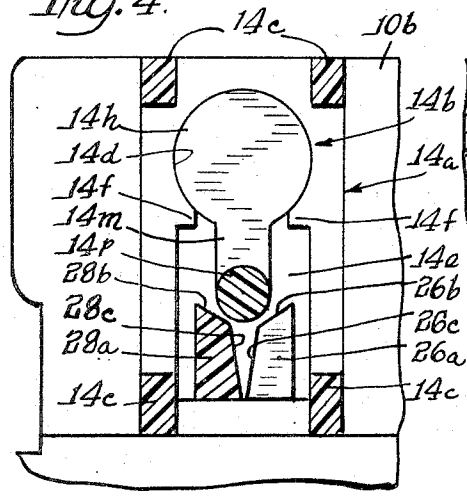


Fig. 5.

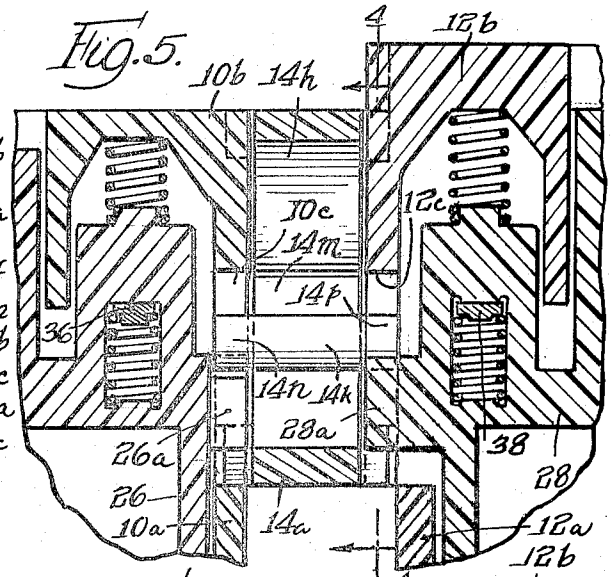


Fig. 6.

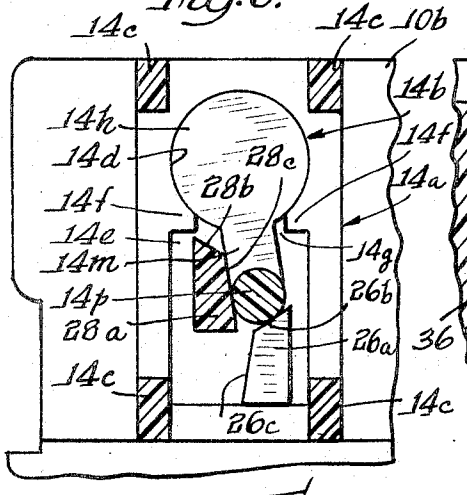


Fig. 7.

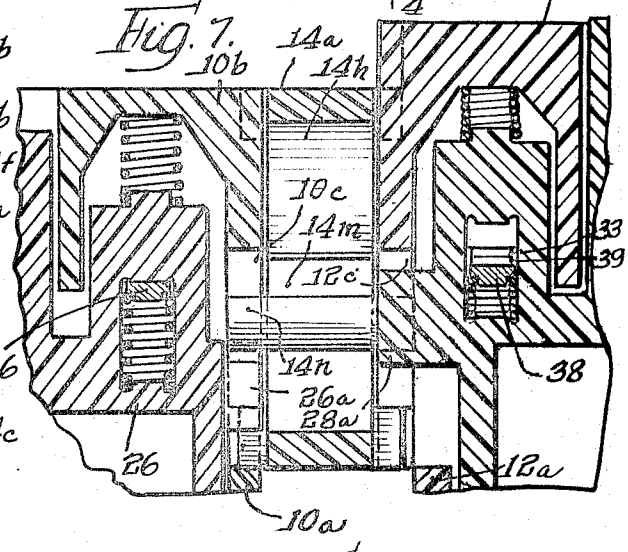


Fig. 8.

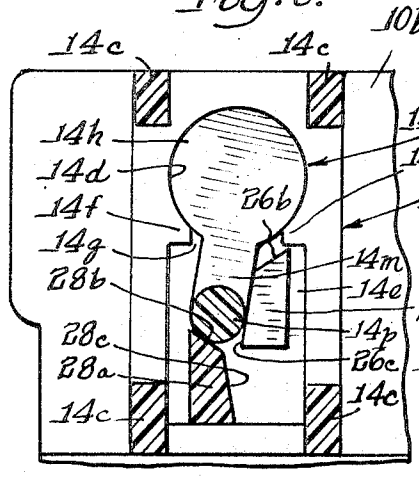
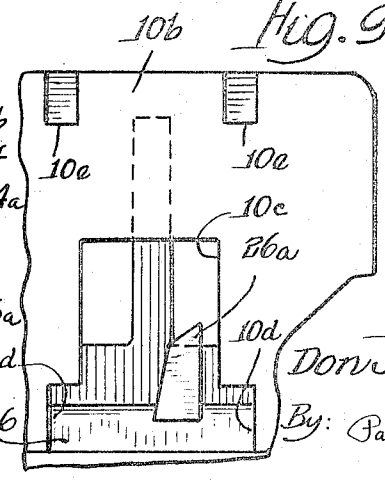


Fig. 9.



Inventor
Don J. Arneberg
By: Paul J. Rose
Atty.

United States Patent Office 3,342,958 Patented Sept. 19, 1967

3,342,958

TWO-PART MECHANICAL INTERLOCK FOR ELECTROMAGNETIC CONTACTORS

Don J. Arneberg, Milwaukee, Wis., assignor to Square D Company, Park Ridge, Ill., a corporation of Michigan

Filed Oct. 11, 1965, Ser. No. 494,615
16 Claims. (Cl. 200—50)

This invention relates to electromagnetic contactors and to a mechanical interlock between two such contactors, the interlock insuring that the contacts of either one of the contactors open before the contacts of the other can be closed.

An object of the invention is to provide an improved mechanical interlock between two electromagnetic contactors.

Another object is to provide a machanical interlock for two electromagnetic contactors, the interlock having only two parts, one of which is pivotally mounted in the other, and the interlock being suitable for use between two contactors of the same or different physical sizes and electrical ratings.

In the drawings, FIG. 1 is a front elevational view, partially in section, of two electromagnetic contactors the casings and movable contact carriers of which are constructed to cooperate with a mechanical interlock constructed in accordance with the invention and mounted therebetween;

FIG. 2 is a top plan view of the contactors and mechanical interlock of FIG. 1;

FIG. 3 is a perspective view of the two parts of the mechanical interlock of FIGS. 1 and 2;

FIG. 4 is a fragmentary sectional view taken substantially along the line 4—4 of FIG. 5 and showing the relative positions of the parts when neither of the contactors is energized, certain portions of one of the contactors being omitted for clarity;

FIG. 5 is a fragmentary sectional view taken substantially along the line 5—5 of FIG. 2;

FIG. 6 is a view similar to FIG. 4, but showing the relative positions of the parts when the right-hand contactor of FIGS. 1 and 2 is energized first;

FIG. 7 is a view similar to FIG. 5, but showing the contact carrier assembly of the right-hand contactor in energized position;

FIG. 8 is a view similar to FIG. 4, but showing the relative positions of the parts when the left-hand contactor of FIGS. 1 and 2 is energized first; and

FIG. 9 is a fragmentary side elevational view of the left-hand contactor of FIGS. 1 and 2.

FIGS. 1 and 2 show a pair of contactors **10** and **12** constructed in accordance with the invention and more fully disclosed in application, Ser. No. 556,414, filed on June 9, 1966. The contactors **10** and **12** may be mounted in any suitable manner in spaced side-by-side correspondingly positioned relationship preferably so as to clamp therebetween a mechanical interlock **14** constructed in accordance with the invention. As shown, the contactors **10** and **12** are secured to a mounting plate **15** by a plurality of screws **16**, the mounting plate being provided with a plurality of dimples **15***a* spaced respectively outwardly of the screws **16** so that as the screws **16** are tightened, the mounting plate **15** is resiliently deformed in a manner such that the top portions of the contactors **10** and **12** are urged toward each other to clamp the interlock **14** therebetween. The interlock **14** is best shown in FIG. 3 and includes a frame member **14***a* and a locking member **14***b* pivotally mounted therein, both members preferably being molded of suitable insulating material.

The contactor **10** includes a casing molded of electrically insulating material and having a base portion **10***a* and a cover portion **10***b* held together as by a pair of

screws **13**. Similarly, the contactor **12** includes a casing having a base portion **12***a* and a cover portion **12***b* held together as by another pair of screws **13**. The base portion **10***a* may be identical to the base portion **12***a*, but the cover portion **12***b* is larger than the cover portion **10***b*, since it is part of the contactor **12**, which is made to accommodate larger load currents than the contactor **10** is made to handle. It will be understood that, if desired, a single size of the interlock **14** of my invention may be used between one of the larger contactors **12** and one of the smaller contactors **10**, as shown, although more commonly it would be used between two of the larger contactors **12** or between two of the smaller contactors **10**.

Each of the base portions **10***a* and **12***a* houses an encapsulated electrical coil **17** having a pair of terminals **18**. Each of the base portions **10***a* and **12***a* also houses an E-shaped laminated magnetic core member **20** each of the outer legs of which is provided with a shading coil **21**, and a magnetic armature member **22** adapted to be attracted into engagement with the respective core **20** upon energization of the respective coil **17**. Each armature **22** is secured by a clip **24** to a pair of opposed depending legs of its respective movable contact carrier, a contact carrier **26** being mounted in the casing of the contactor **10** for reciprocal movement relatively thereto and a contact carrier **28** being mounted in the casing of the contactor **12** for reciprocal movement relatively thereto. As shown in FIG. 1, the lower portions of the contact carriers **26** and **28** may be identical, but the upper portion of the contact carrier **28** is larger than the upper portion of the contact carrier **26** because of the larger current rating of the contactor **12**.

The contactors **10** and **12** are illustrated as having three poles, although it is to be understood that the principle of this invention is equally applicable to contactors of any number of poles. The cover portion **10***b* is provided with three pairs of terminals **30**, one pair for each pole. Each terminal **30** is electrically connected to a stationary contact (not shown). The cover portion **12***b* is provided with three pairs of terminals **32**, one pair for each pole. Each terminal **32** is electrically connected to a stationary contact **33** (FIG. 7), the terminals **32** and contacts **33** being larger respectively than the terminals **30** and their associated stationary contacts, for greater current carrying capacity.

The contact carrier **26** of the contactor **10** carries three movable contact bridges **36**, one of which is shown in FIGS. 5 and 7. Each bridge **36** is provided adjacent opposite ends respectively with a pair of movable contacts (not shown), for engagement respectively with the pair of stationary contacts associated with the terminals **30** of the respective pole upon energization of the coil **17** of the contactor **10**. The contact carrier **28** of the contactor **12** carries three movable contact bridges **38**, one of which is shown in FIGS. 5 and 7. Each bridge **38** is provided adjacent opposite ends respectively with a pair of movable contacts **39**, one of which is shown in FIG. 7, for engagement respectively with the pair of stationary contacts **33** of the respective pole upon energization of the coil **17** of the contactor **12**, the contacts **39** being larger than the contacts of the bridges **36**.

The contact carrier **26** is provided on opposite sides respectively with a pair of camming and locking lugs **26***a*, one of which is shown in FIGS. 4–9. The cover portion **10***b* is provided on opposite sides respectively with a pair of aligned apertures **10***c*, one of which is shown in FIGS. 5, 7, and 9. The lugs **26***a* on opposite sides of the contact carrier **26** are reciprocally movable respectively in the apertures **10***c* and are offset in opposite directions, for a purpose hereinafter set forth, so as to be disposed substantially on opposite sides of a reference plane parallel to the direction of reciprocal move-

ment of the contact carrier **26** and bisecting the apertures **10***c*. Similarly, the contact carrier **28** is provided on opposite sides respectively with a pair of camming and locking lugs **28***a*, one of which is shown in FIGS. 4–8. The cover portion **12***b* is provided on opposite sides respectively with a pair of aligned apertures **12***c*, one of which is shown in FIGS. 5 and 7. The lugs **28***a* on opposite sides of the contact carrier **28** are reciprocally movable respectively in the apertures **12***c* and are offset in opposite directions, for a purpose hereinafter set forth, so as to be disposed substantially on opposite sides of a reference plane parallel to the direction of reciprocal movement of the contact carrier **28** and bisecting the apertures **12***c*, and in positions corresponding to the positions of the lugs **26***a* on the contact carrier **26**.

The frame member **14***a* (FIG. 3) is generally rectangular and is provided with eight projections **14***c* extending outwardly respectively from opposite sides thereof and respectively adjacent the four corners of each of the opposite sides thereof. When the interlock **14** is installed between the two contactors **10** and **12**, the projections **14***c* are received in suitable recesses provided respectively in the cover portions **10***b* and **12***b* to thereby support the frame member **14***a*, two of the lower projections **14***c* of FIG. 3 being received respectively in a pair of contoured portions **10***d* (FIG. 9) of a respective one of the apertures **10***c*, and the other two lower projections **14***c* being received respectively in a corresponding pair of contoured portions of a respective one of the apertures **12***c*. Each of the opposite sides of the cover portion **10***b* having the apertures **10***c* respectively therein is also provided with a pair of grooves **10***e* (FIGS. 2 and 9). The cover portion **12***b* is provided with similar pairs of grooves **12***e* (FIG. 2). Two of the upper projections **14***c* of FIG. 3 are received respectively in the respective pair of grooves **10***e*, and the other two upper projections **14***c* are received respectively in the respective pair of grooves **12***e*. An aperture comprising a circular portion **14***d* joined to a generally rectangular portion **14***e* extends completely through the frame member **14***a*, a pair of inwardly extending projections **14***f* being provided between the aperture portions **14***d* and **14***e* and defining a relatively narrow neck portion **14***g* connecting the aperture portions **14***d* and **14***e*.

The pivotable locking member **14***b* includes a first cylindrical portion **14***h* pivotally receivable in the aperture portion **14***d* of the frame member **14***a*, the portion of the frame member **14***a*, defining the aperture portion **14***d* thus forming a bearing for the cylindrical portion **14***h*. The member **14***b* also includes what is shown as a second cylindrical portion **14***k* joined to the first cylindrical portion **14***h* by a connecting portion **14***m*, it being understood that the portion **14***k* need not necessarily be cylindrical. The length of the cylindrical portion **14***h* and the corresponding dimension of the connecting portion **14***m* are preferably substantially equal to but less than the thickness of the frame member **14***a* exclusive of the projections **14***c*, while the length of the cylindrical portion **14***k* is preferably such that a pair of opposite end portions **14***n* and **14***p* thereof project respectively beyond the projections **14***c* on opposite sides of the frame member **14***a* when the member **14***b* is centered in the frame member **14***a* axially of the cylindrical portions **14***h* and **14***k*. Preferably the opposite end faces of the cylindrical portion **14***h* are made slightly outwardly conical, as indicated by the shading in FIG. 3, to provide only point contact respectively with the contactors **10** and **12** and thereby insure that any frictional engagement respectively with the contactors **10** and **12** is kept at a minimum. The pair of oppositely extending projections **14***n* and **14***p* are spaced from and extend parallel to the axis of pivotal movement of the locking member **14***b*. The diameter of the cylindrical portion **14***k* is considerably smaller than that of the cylindrical portion **14***h*, and the thickness of

the connecting portion **14***m* perpendicular to a plane containing the axes of the two cylindrical portions **14***h* and **14***k* is small enough to permit a limited degree of pivotal movement of the member **14***b*, the projections **14***f* limiting movement in opposite directions by engagement respectively with opposite sides of the connecting portion **14***m*. The amount of pivotal movement of the member **14***b* is such that when it is in one extreme position, the cylindrical portion **14***k* is mainly within one-half of the aperture portion **14***e*, and when it is in the other extreme position, the cylindrical portion **14***k* is mainly within the other half of the aperture portion **14***e*, as can be seen in FIGS. 6 and 8.

In FIGS. 4, 6, and 8, the cover portion **12***b* is omitted for clarity, the only portion of the contactor **12** shown being a section through the camming and locking lug **28***a* associated with the interlock **14**. The aforementioned offset disposition of the lugs **26***a* and **28***a* causes the lug **26***a* and the lug **28***a* associated with the interlock **14** to be disposed substantially on opposite sides of a vertical (in FIGS. 4, 6 and 8) reference plane bisecting the frame member **14***a* and the apertures **10***c* and **12***c*. Each lug **26***a* of the contactor **10** is provided with a first relatively short camming surface **26***b* facing the reference plane and inclined relatively thereto at a relatively large acute angle and a second relatively long camming and locking surface **26***c* joining the surface **26***b* and facing the reference plane and inclined relatively thereto at a relatively small acute angle. Similarly, each lug **28***a* of the contactor **12** is provided with a first relatively short comming surface **28***b* facing the reference plane and inclined relatively thereto at a relatively large acute angle and a second relatively long camming and locking surface **28***c* joining the surface **28***b* and facing the reference plane and inclined relatively thereto at a relatively small acute angle.

In FIG. 4, the pivotable locking member **14***b* is shown in a central position and the lugs **26***a* and **28***a* are shown respectively in their lower or retracted positions corresponding to the deenergized condition of the respective coils **17**.

FIG. 6 shows the lug **28***a* in raised or protracted position corresponding to the energized condition of the coil **17** of the contactor **12** and the closed-contacts position of the movable contact carrier **28**. In the moving of the lug **28***a* to the position of FIG. 6, first the camming surface **28***b* engages the projection **14***p* at one end of the cylindrical portion **14***k* of the locking member **14***b* and pivots the member **14***b* counterclockwise in FIG. 6. After the projection **14***p* rides off the end of the camming surface **28***b* as the lug **28***a* continues to move toward fully protracted position, the camming and locking surface **28***c* pivots the locking member **14***b* the rest of the way to its extreme counterclockwise position in FIG. 6. If an attempt is made to close the contacts of the contactor **10** by energizing its coil **17** while the coil **17** of the contactor **12** is energized and the lug **28***a* is in fully protracted position and the contacts of the contactor **12** are closed, the camming surface **26***b* engages the projection **14***n* at the other end of the cylindrical portion **14***k* and prevents the movable contact carrier **26** of the contactor **10** from moving to the closed-contacts position thereof. If the coil **17** of the contactor **12** is then deenergized while the coil **17** of the contactor **10** remains energized, the movable contact carrier **26** of the contactor **10** remains blocked by engagement of the lug **26***a* with the projection **14***n* until the movable contact carrier **28** of the contactor **12** with its lug **28***a* is retracted sufficiently for the projection **14***p* to ride off the camming and locking surface **28***c*, at which time the contacts of the contactor **12** will be open. The angularity of the surface **28***c* prevents binding of the movable contact carrier **28** in a protracted position due to pressure exerted by the projection **14***p* when the coil **17** of the contactor **10** is energized. Thus, it will be seen that the interlock **14** prevents closing of the contacts

of the contactor **10** until the contacts of the contactor **12** are open, but that the movable contact carrier **28** will not bind in a protracted position to completely prevent closing of the contacts of the contactor **10**, as might occur if the surface **28***c* were vertical in FIGS. 4, 6, and 8.

FIG. 8 is a view similar to FIG. 6, but showing how the lug **28***a* is blocked when the movable contact carrier **26** is in closed-contact position and the lug **26***a* thereon is fully protracted. Thus, the interlock **14** prevents the contacts of either contactor from closing while those of the other are closed. It will be noted that the lugs **26***a* and **28***a* engage the cylindrical portion **14***k* on opposite sides of a plane containing the axis of pivotal movement of the locking member **14***b* and the axis of the cylindrical portion **14***k*.

I claim:

1. For use between a pair of spaced side-by-side correspondingly positioned movable contact carriers each mounted for reciprocal movement between first and second predetermined positions and having a camming and locking lug movable integrally therewith and disposed on the side thereof adjacent the other movable contact carrier, said lugs being offset from each other in a direction perpendicular to the paths of reciprocal movement of said movable contact carriers, a mechanical interlock for preventing movement of either one of said movable contact carriers to said first predetermined position thereof while the other of said movable contact carriers is in said first predetermined position thereof, said interlock comprising a frame member mountable between said movable contact carriers, and a locking member mountable in said frame member for limited pivotal movement with respect thereto, said locking member having a pair of axially aligned projections respectively disposed on opposite sides thereof, said projections being spaced from and extending axially in opposite directions parallel to the axis of pivotal movement of said locking member into interlocking relationship respectively with said lugs when said locking member is mounted in said frame member and said frame member is mounted between said movable contact carriers.

2. A mechanical interlock as claimed in claim **1**, wherein said frame member is provided with an aperture extending completely therethrough from one side to another side thereof, said aperture including a cylindrical first portion connected to a second portion, and said locking member includes a cylindrical portion and a connecting portion joining said cylindrical portion thereof to said projections on said locking member, the portion of said frame member defining the first cylindrical portion of said aperture forming a bearing for the cylindrical portion of said locking member, and the connecting portion of said locking member being disposed in said second portion of said aperture.

3. A mechanical interlock as claimed in claim **2**, wherein opposite end faces of said cylindrical portion of said locking member are slightly outwardly conical.

4. A mechanical interlock as claimed in claim **1**, wherein said frame member is provided with an aperture extending completely therethrough from one side to another side thereof, said aperture including a cylindrical first portion and a second portion connected by a neck portion, said frame member including a pair of inwardly extending projections defining said neck portion of said aperture, and said locking member includes a cylindrical portion and a connecting portion joining said cylindrical portion thereof to said projections on said locking member, the portion of said frame member defining the cylindrical portion of said aperture forming a bearing for the cylindrical portion of said locking member, and the inwardly extending projections of said frame member forming a pair of stops limiting pivotal movement of said locking member in opposite directions by engagement respectively with said connecting portion of said locking member.

5. A mechanical interlock as claimed in claim **1**, wherein said frame member is provided on opposite sides respectively with a plurality of outwardly extending projections for use in mounting said frame member between said movable contact carriers.

6. An assembly comprising a pair of spaced side-by-side correspondingly positioned movable contact carriers each mounted for reciprocal movement between first and second predetermined positions and having a camming and locking lug movable integrally therewith and disposed on the side thereof adjacent the other movable contact carrier, said lugs being offset from each other in a direction perpendicular to the paths of reciprocal movement of said movable contact carriers, and a mechanical interlock for preventing movement of either one of said movable contact carriers to said first predetermined position thereof while the other of said movable contact carriers is in said first predetermined position thereof, said interlock including a frame member mounted between said movable contact carriers and a locking member mounted in said frame member for limited pivotal movement with respect thereto said locking member having a pair of axially aligned projections respectively disposed on opposite sides thereof, and said projections being spaced from and extending axially in opposite directions parallel to the axis of pivotal movement of said locking member into interlocking relationship respectively with said lugs.

7. The assembly claimed in claim **6**, wherein said frame member is provided with an aperture extending completely therethrough from one side to another side thereof, said aperture including a cylindrical first portion connected to a second portion, and said locking member includes a cylindrical portion and a connecting portion joining said cylindrical portion thereof to said projections on said locking member, the portion of said frame member defining the first cylindrical portion of said aperture forming a bearing for the cylindrical portion of said locking member, and the connecting portion of said locking member being disposed in said second portion of said aperture.

8. An assembly comprising a pair of spaced side-by-side correspondingly positioned movable contact carriers each mounted for reciprocal movement between first and second predetermined positions and having a camming and locking lug movable integrally therewith and disposed on the side thereof adjacent the other movable contact carrier, said lugs being disposed substantially on opposite sides of a first reference plane intersecting said movable contact carriers and extending parallel to the paths of reciprocal movement thereof, each lug having a first camming surface facing said first reference plane and inclined relatively thereto at a relatively large acute angle and a second camming and locking surface joining the first camming surface and facing said first reference plane and inclined relatively thereto at a relatively small acute angle, and a mechanical interlock for preventing movement of either one of said movable contact carriers to said first predetermined position thereof while the other of said movable contact carriers is in said first predetermined position thereof, said interlock including a frame member mounted between said movable contact carriers, and a locking member mounted in said frame member for limited pivotal movement with respect thereto about an axis in said first reference plane, said locking member having a pair of axially aligned projections respectively disposed on opposite sides thereof, said projections being spaced from and extending axially in opposite directions parallel to the axis of pivotal movement of said locking member into interlocking relationship respectively with said lugs for engagement respectively thereby on opposite sides of a second reference plane containing said axis of pivotal movement and the axis of alignment of said projections, whereby when either one of said movable contact carriers is in said first predetermined position thereof and an attempt is made to move the other of said movable con-

tact carriers to said first predetermined position thereof, the second camming and locking surface of the lug on said one movable contact carrier engages the respective projection on the locking member on one side of said second reference plane to maintain the locking member substantially in one of its extreme positions, and the other projection on the locking member engages the first camming surface of the lug on said other movable contact carrier on the other side of said second reference plane to prevent movement of said other movable contact carrier to said first predetermined position thereof.

9. The assembly claimed in claim **8**, wherein said movable contact carries respectively form parts of a pair of separate electromagnetic contactors.

10. The assembly claimed in claim **8**, wherein said frame member is provided with an aperture extending completely therethrough from one side to another side thereof, said aperture including a cylindrical first portion and a second portion connected by a neck portion, said frame member including a pair of inwardly extending projections defining said neck portion of said aperture, and said locking member includes a cylindrical portion and a connecting portion joining said cylindrical portion thereof to said projections on said locking member, the portion of said frame member defining the cylindrical portion of said aperture forming a bearing for the cylindrical portion of said locking member, and the inwardly extending projections of said frame member forming a pair of stops limiting pivotal movement of said locking member in opposite directions by engagement respectively with said connecting portion of said locking member.

11. An assembly comprising a pair of spaced side-by-side correspondingly positioned electromagnetic contactors each having a casing, an aperture in the side of the casing adjacent the other casing and aligned with the aperture in the other casing, a movable contact carrier mounted in the casing for reciprocal movement between open-contact and closed-contact positions, and a camming and locking lug on the movable contact carrier and disposed in the aperture for reciprocal movement therein, the lug being disposed on the opposite side of a first reference plane from the camming and locking lug on the other movable contact carrier, said first reference plane being parallel to the direction of reciprocal movement of the movable contact carriers and bisecting the aligned apertures, the lug having a first camming surface facing said first reference plane and inclined relatively thereto at a relatively large acute angle and a second camming and locking surface joining the first camming surface and facing said first reference plane and inclined relatively thereto at a relatively small acute angle, and a mechanical interlock for preventing movement of the movable contact carrier of either of said contactors to closed-contact position while the movable contact carrier of the other of said contactors is in closed-contact position, said interlock including a frame member mounted between said contactors, and a locking member mounted in said frame member for limited pivotal movement with respect thereto about an axis in said first reference plane, said locking member having a pair of axially aligned projections respectively disposed on opposite sides thereof, said projections being spaced from and extending axially in opposite directions parallel to the axis of pivotal movement of said locking member into interlocking relationship respectively with said lugs for engagement respectively thereby on opposite sides of a second reference plane containing said axis of pivotal movement and the axis of alignment of said projections, whereby when the movable contact carrier of either one of said contactors is in closed-contact position and an attempt is made to move the movable contact carrier of the other of said contactors to closed-contact position, the second camming and locking surface of the lug on the movable contact carrier of said one contactor engages the respective projection on the locking member on one side of said second reference plane to maintain the locking member substantially in one of its extreme positions, and the other projection on the locking member engages the first camming surface of the lug on the movable contact carrier of said other contactor on the other side of said second reference plane to prevent movement of the movable contact carrier of said other contactor to closed-contact position.

12. The assembly claimed in claim **11**, wherein said frame member is provided on opposite sides respectively with a plurality of outwardly extending projections and the casings of said contactors are provided respectively with a plurality of suitable recesses in which the projections on said frame member are respectively received.

13. The assembly claimed in claim **11**, wherein said frame member is generally rectangular and each of a pair of opposite sides thereof is provided with four projections respectively adjacent the four corners, wherein each of the casings of said contactors is provided with a pair of grooves in which two of said projections on each of the opposite sides of said frame member are respectively received, and wherein the other two projections on each of the opposite sides of said frame member are respectively received in contoured portions of said apertures in said casings of said contactors.

14. The assembly claimed in claim **11**, wherein said locking member includes a cylindrical portion the opposite end faces of which are slightly outwardly conical to insure only point contact of said opposite end faces respectively with the casings of said contactors.

15. The assembly claimed in claim **11**, including a resiliently deformable mounting plate and fastening means securing the casings of said contactors to said mounting plate, the configuration of said casings and mounting plate and the disposition of said fastening means being such as to resiliently deform said mounting plate and effect clamping of said frame member by said casings of said contactors.

16. An assembly comprising a pair of spaced side-by-side correspondingly positioned electromagnetic contactors each having a casing and a movable contact carrier reciprocably mounted therein, each of the casings of said contactors including an upper portion and a lower portion, mechanical interlock means disposed between and supported by the upper portion of the casings of said contactors and operatively connected to the movable contact carriers of said contactors, a resiliently deformable mounting plate, and fastening means securing the lower portions of said casings to said mounting plate, the configuration of said lower portions and mounting plate and the disposition of said fastening means being such as to resiliently deform said mounting plate and effect urging of said upper portions toward said interlock means.

References Cited

UNITED STATES PATENTS

3,240,889 3/1966 Lawrence et al. ------- 200—50

ROBERT K. SCHAEFER, *Primary Examiner.*

J. R. SCOTT, *Assistant Examiner.*