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ADJUSTABLE CLAMP FOR MOUNTING ELEMENTS ON ROTATABLE SHAFTS

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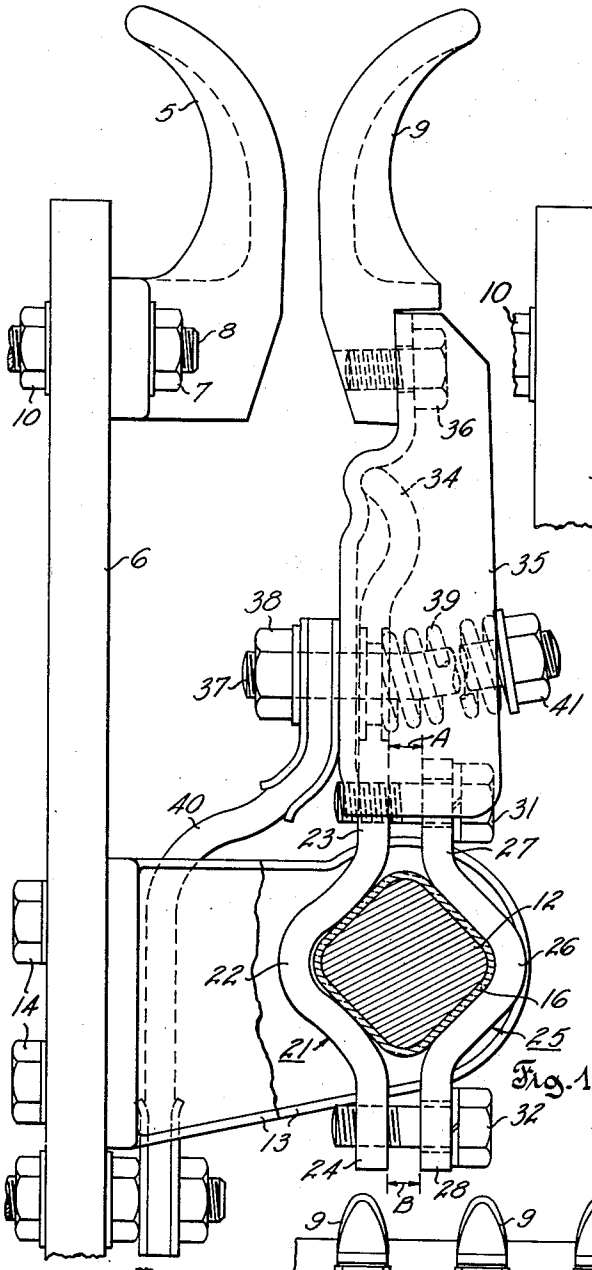


Fig. 1

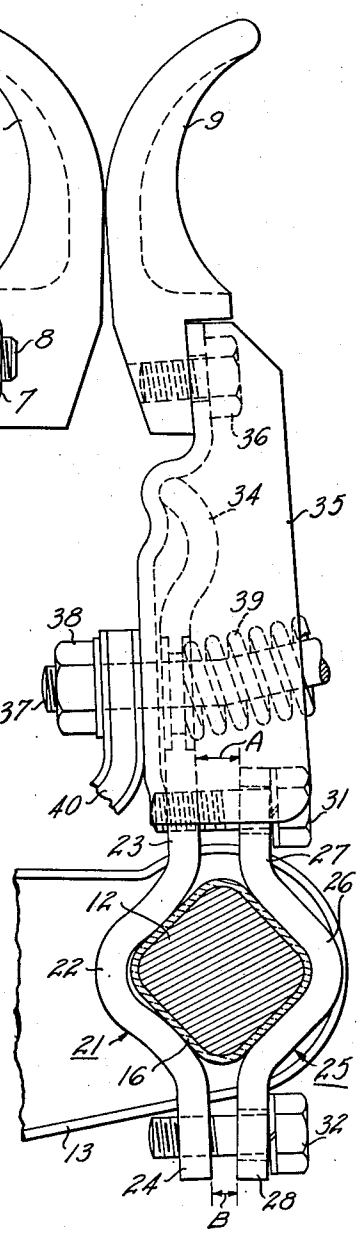


Fig. 2

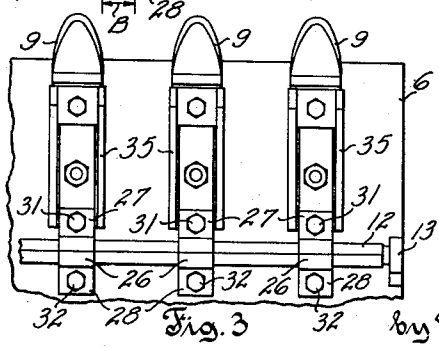


Fig. 3

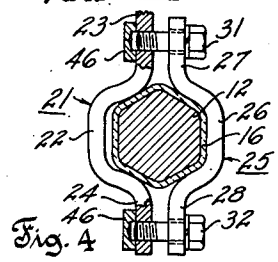


Fig. 4

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ADJUSTABLE CLAMP FOR MOUNTING ELEMENTS ON ROTATABLE SHAFTS

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This invention relates in general to clamping members and in particular to members for adjustably clamping an element to a rotating shaft.

In electromagnetic contactors having a movable contact actuated by a rotatable shaft, the shaft is usually provided with a substantially polygonal cross section, and a clamping member comprising a pair of complementary clamping elements each engaging the shaft along the entire length of at least two sides of the shaft is secured to the contact to transmit the motion of the shaft to the contact. Such a clamping member has the disadvantage that the clamp cannot be rotated about the axis of the shaft to adjust the position of the clamp and contact relative to the shaft, since the clamping member engages the shaft along substantially the full length of at least four sides of the shaft and is therefore rigidly fixed relative thereto. This is especially disadvantageous where a plurality of contacts are mounted on one shaft and where, owing to mechanical difference in the different contacts, it is necessary to adjust the contacts to produce alignment thereof radially of the shaft to insure simultaneous engagement with the fixed contact elements.

This disadvantage can be overcome by utilizing a clamping member which rigidly secures the movable element to the rotating shaft and which permits adjustment of the position of the element about the axis of the shaft.

It is therefore an object of this invention to provide an improved clamping device for adjustably securing a movable element to a rotating shaft.

It is an additional object of the present invention to provide means for clamping a movable element to a substantially polygonal rotatable shaft which permits adjustment of the position of the element about the axis of the shaft.

Objects and advantages other than those set forth above will be apparent from the following description when read in connection with the accompanying drawing, in which:

Fig. 1 is a partial end view of an electromagnetic contactor shown in partially open position utilizing the preferred embodiment of this invention;

Fig. 2 is a partial end view similar to Fig. 1 of the contactor adjusted to contact making position;

Fig. 3 is a side view of a portion of the electromagnetic contactor shown in Figs. 1 and 2; and

Fig. 4 illustrates an alternate embodiment of the clamping device of this invention.

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Referring to Fig. 1, one embodiment of the invention is illustrated in connection with an electromagnetic contactor having a plurality of fixed contacts 5 secured to a suitable insulating base 6 by nuts 7 and studs 8. Each stud 8 may also be provided with a nut 10 to provide a terminal for connection to a circuit to be controlled by the contactor. A movable contact 9 is engageable with each contact 5 through movement imparted thereto by a shaft 12. Shaft 12 is journalled in brackets 13 secured to base 6 by bolts 14 and is rotated about its axis by any suitable electromagnetic actuating means (not shown). Shaft 12 has any suitable substantially polygonal cross section, preferably the substantially rectangular cross section shown in Figs. 1 and 2, and is provided with an insulating coating 16.

Secured to shaft 12 is the clamping device of this invention comprising a first member 21 having a jaw portion 22 engaging shaft 12 and shank portions 23, 24 extending from the ends of jaw portion 22 and located on opposite sides of shaft 12. The clamping device further comprises a second member 25 having a jaw portion 26 engaging shaft 12 and shank portions 27, 28 on opposite sides of shaft 12. The jaw portion 26 of member 25 is shaped to engage shaft 12 at more than two points on at least two sides of shaft 12, and preferably engages shaft 12 along the entire surface of jaw portion 26, as shown in Figs. 1 and 2. Jaw portion 22 is shaped to engage shaft 12 at only two points on two sides of shaft 12, and preferably is provided with the arcuate surfaces shown in Figs. 1 and 2, engaging adjacent sides of shaft 12 at two points.

Suitable adjustable fastening means are provided to secure the clamp members to shaft 12, and such fastening means may comprise bolts 31, 32 extending through aligned openings in shank portions 23, 24, 27, 28. Bolts 31, 32 extend loosely through the shank portions of one of members 21, 25, and as shown in Figs. 1 and 2, the bolts may extend loosely through the openings in shank portions 27, 28 of member 25 and adjustably engage threaded portions of the openings in shank portions 23, 24.

Member 21 is provided with an extension forming a finger 34 bearing against a U-shaped conductive plate 35 secured to movable contact 9 by a bolt 36. A stud 37 extends with clearance through an aperture in the extension of member 21 and has a nut 38 secured to one end thereof. A flexible conductive lead 40, representing a connection to the circuit to be controlled by the contactor, may be connected to plate 35 and movable contact 9 by studs aligned with stud 37 and

nuts aligned with nut 38. A spring 39 compressed between a nut 41 and finger 34 pulls against member 35 and causes member 35 and contact 9 to pivot about finger 34 when contact 9 engages contact 5, to provide a wiping engagement and disengagement of contacts 5, 9. Member 21 is thus connected to contact 9 and imparts movement of shaft 12 to contact 9.

To vary the position of movable contact 9 about the axis of shaft 12, the adjustable fastening means are adjusted to rotate member 21 about shaft 12. In Fig. 1, representing one adjustment of the clamping device, the distance A between the inner ends of adjacent shank portions 23, 27 is equal to the distance B between the inner ends of adjacent shank portions 24, 28, and contact 9 assumes the position shown. If it is desired to move contact 9 closer to contact 5 without rotating shaft 12, bolt 32 is advanced in the threaded opening in shank portion 24 and bolt 31 is withdrawn in the threaded opening in shank portion 23. This action causes member 21 and contact 9 to rotate counterclockwise about shaft 12 on the two pivot points provided by the engagement of the jaw portion 22 with the two sides of shaft 12.

As shown in Fig. 2, this movement reduces the distance B between shank portions 24, 28 and increases the distance A between shank portions 23, 27, and causes contact 9 to approach contact 5. During the above described adjustment, the position of member 25 relative to shaft 12 is fixed owing to the engagement of jaw portion 26 with shaft 12 along the entire surface of portion 26. Adjustment of bolts 31, 32 in the direction opposite to that described above will cause member 21 and contact 9 to rotate clockwise about shaft 12, and the amount of movement of contact 9 may be accurately controlled by bolts 31, 32.

The clamping device of this invention is especially useful where a plurality of elements are actuated by a common rotatable shaft, as shown in Fig. 3, where several movable contacts 9 are actuated by the common rotatable shaft 12. In such contactors, it is desirable that all of the movable contacts engage and disengage their respective fixed contacts simultaneously to insure proper division of current between the different contact sets. Since mechanical differences in the component parts of such a contactor make it unlikely that such simultaneous engagement and disengagement would occur without adjustment, some adjustment of the position of contacts 9 relative to shaft 12 is required. This adjustment is provided by utilizing the clamping device of this invention, as described above, so that the plurality of contacts 9 may be aligned radially of shaft 12 to produce the desired result.

Fig. 4 illustrates an alternate embodiment of the invention in which a hexagonal actuating shaft 12 is provided, having an insulating coating 16 thereon. In this embodiment, the clamp member 25 has a jaw portion 26 preferably engaging shaft 12 on three sides thereof along the entire surface of jaw portion 26 to rigidly secure member 25 relative to shaft 12. Jaw portion 22 of member 21 engages two sides of shaft 12 at only two points thereon, so that member 21 is free to rotate about shaft 12. Shank portions 23, 24 are provided with built-up sections or blocks 46 having threaded continuations of the threaded openings in shank portions 23, 24.

Bolts 31, 32 extend loosely through shank portions 27, 28, respectively, and adjustably engage the openings in shank portions 23, 24, respectively. It will be noted that bolts 31, 32 do not extend entirely through shank portions 23, 24, as in the other embodiment, owing to blocks 46. The embodiment of Fig. 4 operates substantially as described above in connection with the other embodiment, to produce rotation of member 21 about shaft 12 upon adjustment of bolts 31, 32.

Although but two embodiments of the invention have been illustrated and described, it will be apparent to those skilled in the art that various changes and modifications may be made therein without departing from the spirit of the invention or from the scope of the appended claims. In particular, although the clamping device of this invention has been illustrated in connection with an electromagnetic contactor, it will be apparent that the device may be utilized in many other applications.

It is claimed and desired to secure by Letters Patent:

1. In a device having an element to be moved and a shaft for moving said element, said shaft having a plurality of flat sides and having a substantially polygonal cross section, a clamp for adjustably securing said element to said shaft in adjustable angular relation thereto, said clamp comprising a first member connected to said element and a second member, said first member having a first jaw portion spaced from the edges of said shaft and having two arcuate portions engaging said shaft at only two variable points on two of said sides and first and second shank portions extending from the ends of said jaw portion, said second member having a second jaw portion shaped to engage said shaft at more than two points around the periphery of said shaft and third and fourth shank portions extending from the ends of said second jaw portion, and adjustable means for varying said two points of engagement of said first jaw portion with said shaft to rotate said first member and said element with respect to said shaft, said adjustable means comprising first adjustable fastening means secured to said first and third shank portions and second adjustable fastening means secured to said second and fourth shank portions.

2. In combination, an element to be moved, a rotatable shaft having a plurality of flat sides and having a substantially polygonal cross section for moving said element, and a clamp for adjustably securing said element to said shaft in adjustable angular relation thereto comprising a first member connected to said element and a second member, said first member having a first jaw portion spaced from the edges of said shaft and having two arcuate portions shaped to engage said shaft at only two variable points on two of said sides and first and second shank portions extending from the ends of said jaw portion, said second member having a second jaw portion shaped to engage said shaft along substantially the entire surface of said second jaw portion and third and fourth shank portions extending from the ends of said second jaw portion, and adjustable means for varying said two points of engagement of said first jaw portion with said shaft to rotate said first member and said element with respect to said shaft, said adjustable means comprising parts of the shank portions of one of said members provided with a pair of openings and a pair of bolts extending loosely through said openings and adjustably engaged with the shank portions of the other of said members.

3. In combination, an element to be moved, a rotatable shaft having a substantially hexagonal cross section for moving said element, and a clamp for adjustably securing said element to said shaft in adjustable angular relation thereto comprising a first member connected to said element and a second member, said first member having a first jaw portion spaced from the edges of said shaft and having two arcuate portions shaped to engage said shaft at only two variable points on two sides of said shaft and first and second shank portions extending from the ends of said jaw portion, said second member having a second jaw portion shaped to engage said shaft at more than two points on at least two of said sides of said shaft and third and fourth shank portions extending from the ends of said second jaw portion, and adjustable means for varying said two points of engagement of said first jaw portion with said shaft to rotate said first member and said element with respect to said shaft, said adjustable means comprising parts of the shank portions of one of said members provided with a pair of openings and a pair of bolts extending loosely through said openings and adjustably engaged with the shank portions of the other of said members.

4. In combination, an element to be moved, a rotatable shaft having a plurality of flat sides and being of substantially rectangular cross section for moving said element, and a clamp for adjustably securing said element to said shaft in adjustable angular relation thereto comprising a first member connected to said element and a second member, said first member having a first jaw portion spaced from the edges of said shaft and

having two arcuate portions shaped to engage said shaft at only two variable points on two sides of said shaft and first and second shank portions extending from the ends of said jaw portion, said second member having a second jaw portion shaped to engage said shaft at more than two points on at least two of said sides of said shaft and third and fourth shank portions extending from the ends of said second jaw portions, and adjustable means for varying said two points of engagement of said first jaw portion with said shaft to rotate said first member and said element with respect to said shaft, said adjustable means comprising parts of said third and fourth shank portions provided with a pair of openings and a pair of bolts extending loosely through said openings and adjustably engaged with said first and second shank portions.

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