

Jan. 19, 1960

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2,921,584

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3 Sheets-Sheet 1

FIG. 1

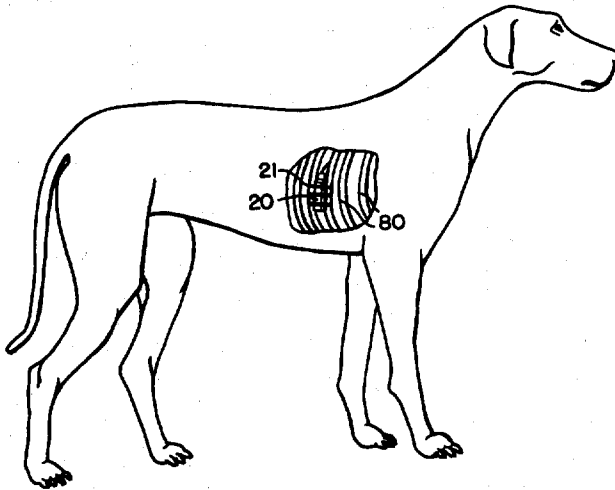


FIG. 2

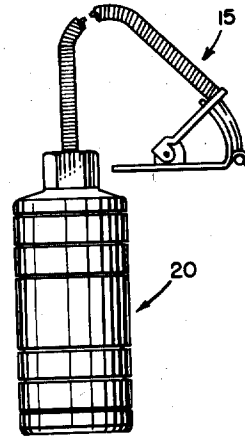


FIG. 5

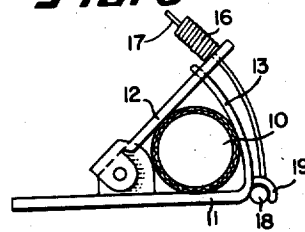


FIG. 3

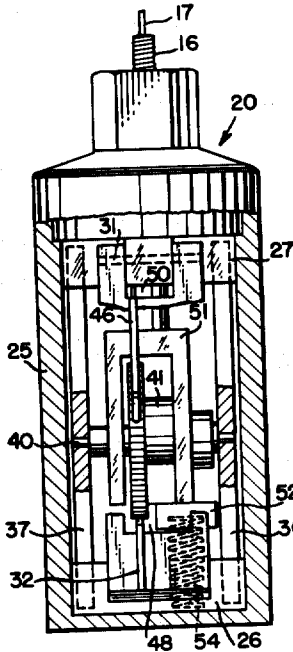


FIG. 4

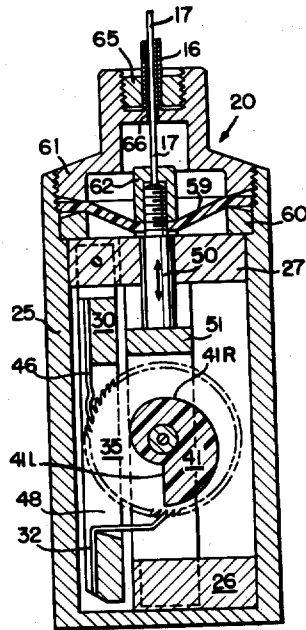
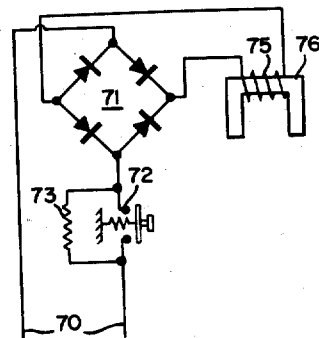


FIG. 6



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FIG. 7

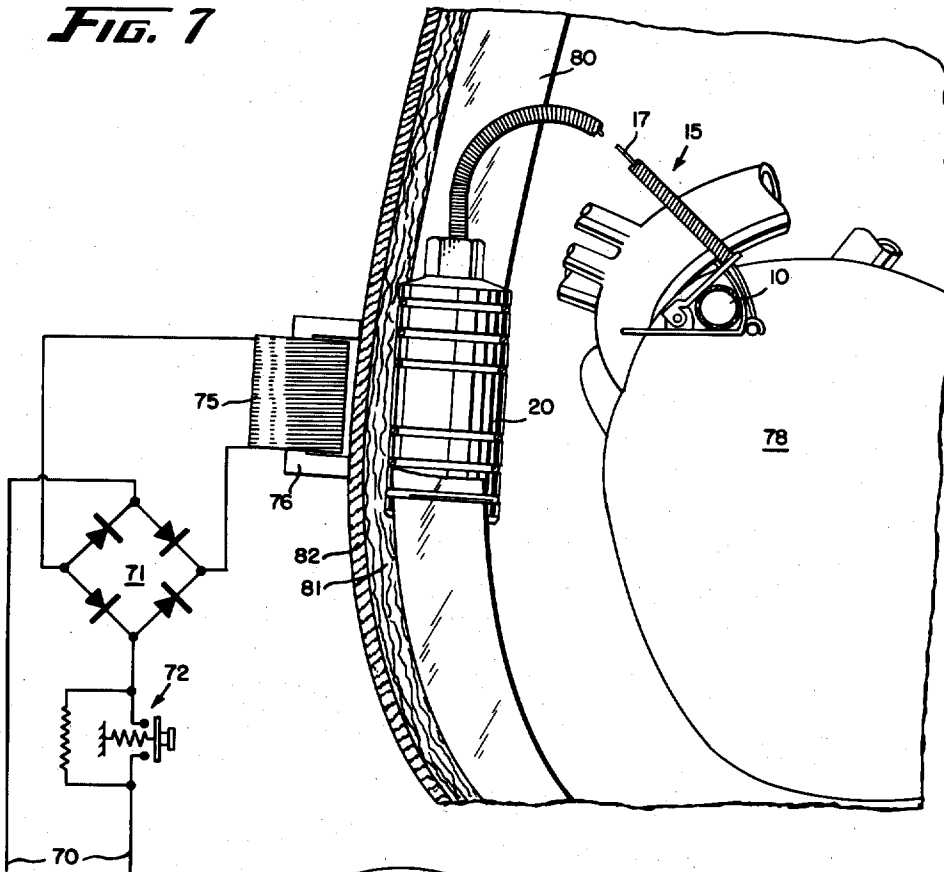
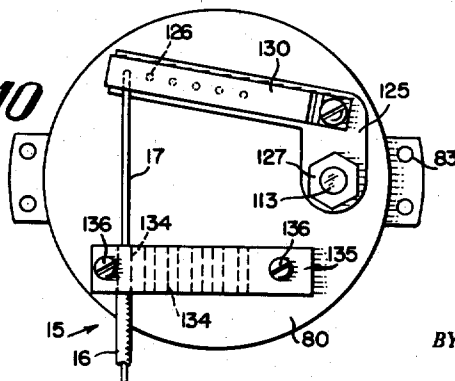


FIG. 10



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FIG. 8

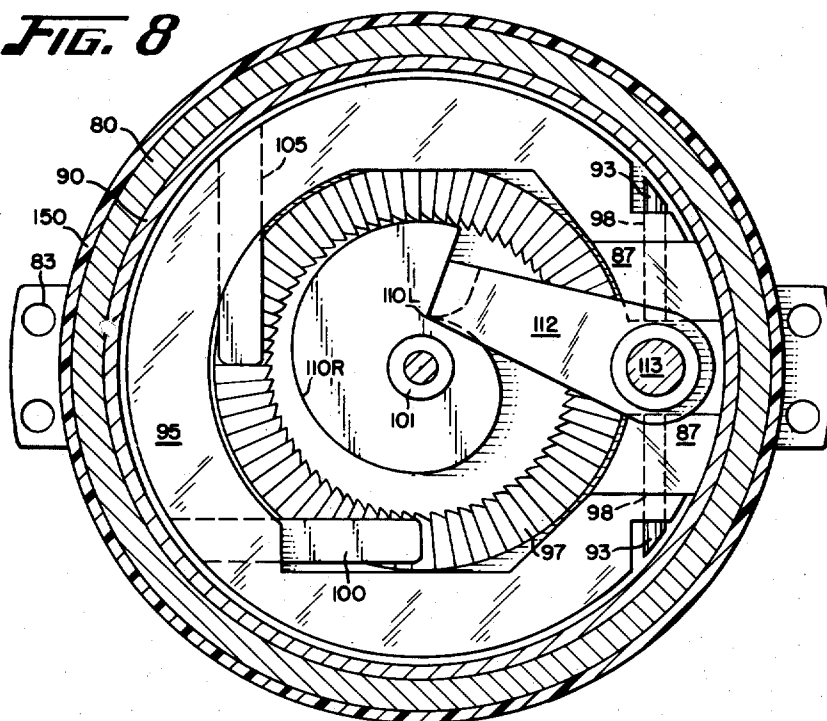
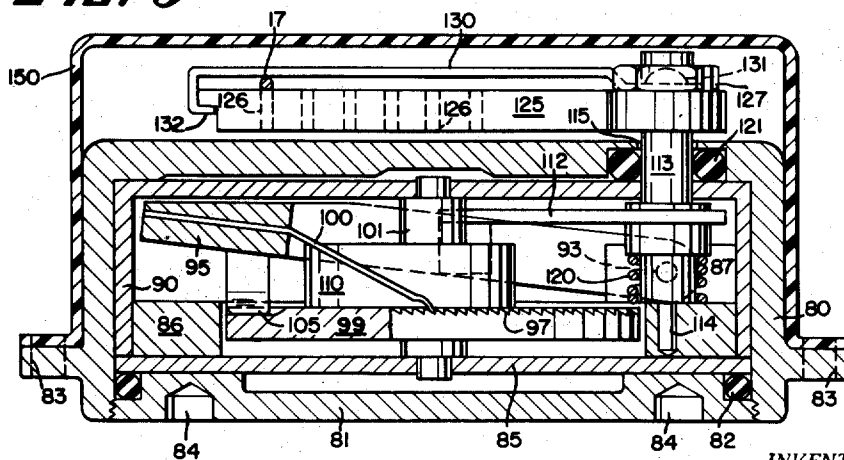


FIG. 9



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15 Claims. (Cl. 128—346)

My invention relates to apparatus for occluding or constricting vessels or similar passageways within the confines of a body, such as an animal or human being, from a point outside of the body and with no mechanical work transmitting connection between the portion of the apparatus which performs the controlling function and that which performs the restricting or occluding function.

Occlusion of vessels of the body for purposes of medical research or remedial medicine by insertion of a clamp through surgery within a body has not been satisfactory because of a lack of adjustability of the clamp without reentry into the body and because of the state of shock of the specimen or patient resulting from the surgery and the constricting operation which prevents the specimen or patient from attaining a condition of health conducive to the carrying on of the research or examination. Any attempt to provide a fixed mechanical connection between the clamping mechanism and the operating mechanism outside of the body has proved unsatisfactory, particularly in the cases of animal specimens because of the discomfort which such connection causes the specimen and generally results in the uncontrolled removal of the connecting apparatus by the animal and a disruption of the research and examination. The presence of such mechanical or electrical connection also operates to retard or prevent the return of the body to a condition of health necessary to adequately carry out such examination research.

In the present invention, the occluding apparatus or clamping mechanism and a motor device for operating same may be inserted into the body of the specimen through surgery and the body allowed to return to a condition of health conducive to proper examination and thereafter a remotely positioned energizing device or source may be brought in contact with or in proximity with the body and the motive device within the body to energize the same and operate the clamping or constricting device. In this manner the specimen is allowed to recover health and does not have any mechanical connections between the body and an outside point which would be the source of irritation or retard the return of health.

It is therefore an object of this invention to provide the improved vessel occluding apparatus which is operative from a point outside the body.

It is also an object of this invention to provide an apparatus for occluding a vessel within a body which includes a motor means to be positioned within the body of the specimen and connected to a clamping means at the vessel within the body and a power supplying device for energizing the motor means to be positioned outside of the body.

It is further an object of this invention to provide an improved method of occluding a vessel within a body.

A further object of this invention is to provide an improved magnetic actuator for operating a vessel occluding apparatus.

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These and other objects of this invention will become apparent from the attached description together with the drawings wherein:

Figure 1 is a view of a specimen or an animal with a portion of our improved vessel occluding apparatus disclosed as attached thereto,

Figure 2 is a plan view of the actuator and clamping mechanism of the improved apparatus,

Figures 3 and 4 are section views of the improved actuator for a vessel occluding apparatus,

Figure 5 is a side elevation view of the clamping apparatus with the vessel,

Figure 6 is an electrical circuit for the energizing electromagnet of the improved vessel occluding apparatus,

Figure 7 is a schematic view of our improved apparatus shown as applied to a body in section, and

Figure 8 is a side elevation view in section of an improved actuator design for the occluding apparatus,

Figure 9 is a plan view of the actuator in section, and,

Figure 10 is a plan view of the actuator with the cover removed.

My invention in a vessel occluding apparatus is best shown schematically in Figure 7 of the drawings and as applied to an animal or specimen in Figure 1 of the drawings. Basically the apparatus includes an occluding mechanism or clamping means designed to be positioned around a vessel such as is indicated at 10, in Figures 5 and 7, the clamping means being composed of a pair of relatively movable parts 11, and 12, one of which is pivotally mounted on the other at one extremity and adapted to be moved toward the other to perform a clamping operation on the vessel. The member 11 has an arcuate guide 13 which fits through an aperture in the member 12 to guide the pivotal movement of the members. Motion is transmitted to the clamping mechanism by means of a cable means shown generally in 15 which is comprised of a long flexible casing member 16 and a centrally disposed wire or core 17 which is adapted to move within the casing and relative thereto. One extremity of the casing is attached to the member 12 of the clamping mechanism through suitable means not shown and one extremity of the wire 17 or central member of the cable is connected by means of a ball joint 18 to a flange 19 on the member 11 of the clamping mechanism securing the same thereto. Cable mechanism 15 is designed to be flexible such that it may be inserted into the body of the specimen in proximity with whatever vessel is to be occluded or constricted and such that it may flex around the various organs without disturbing the same. This cable mechanism is attached at its other extremity to a motor indicated generally at 20 in Figures 1 and 2, the motor being adapted to be mounted on the body of the specimen, such as on the rib structure as shown in Figure 1 and secured thereto through suitable binding clamps indicated in 21. As will be seen in Figures 3 and 4, the motor mechanism is primarily a magnetic structure housed in a nonmagnetic casing 25 and consists of a pair of transversely extending members 26, 27 positioned within the casing with member 27 pivotally mounting an armature 30 in a notched surface thereof (see Figures 3 and 4) through suitable pivots indicated at 31. Members 26, 27 and armature 30 are made of a magnetic material and members 26, 27 constitute the core structure of the motor. The armature 30 carries a flexible tooth or ratchet finger 32 at its unpivoted extremity which is adapted to engage a ratchet wheel indicated at 35, as the armature moves toward the second member 26, while the magnetic core structure is under the influence of a magnetic field, to be later described, and the spring finger will engage the tooth periphery of the ratchet wheel to rotate the same. Wheel 35 as will best be seen in Figure 3 is pivotally mounted in a pair of side plates 36, 37 which extend between the

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members 26, 27. A pivot structure 40 mounts the ratchet wheel 35 in suitable bearings (not shown) in the side plates 36, 37 and also carries a cam indicated at 41 which has a rising surface 41R and a sharp dwell surface 41L as indicated in Figure 4. Also attached to the armature 30 is a detent means 46 which is adapted to engage continuously the tooth periphery of the ratchet wheel 35 to prevent counter rotation of the wheel. The detent member 46 is also made flexible and serves, when the armature is deflected toward member 26 to bias the armature in an opposite direction and act as the return spring for the armature. It will be noted in Figures 3 and 4 that the armature has a central opening to provide for clearance of the ratchet wheel, the opening being shown at 48 to thereby provide an arrangement of parts which is small and compact. Slidably mounted in member 27 is a shaft 50 carrying a bracket member 51, which carries at its extremity a cam follower 52 adapted to engage the surfaces 41L and 41R of the cam 41. A spring 54 mounted in an opening in the plate 26 engages the follower 52 in an opening therein to urge the cam follower 52 against the surface of the cam. The shaft 50 extends through the member 27 and is connected to a sealing diaphragm 59 which is held in one end of the casing 25 of motor 20 by means of a retainer 60 and a clamping head 61, the diaphragm being connected to the pin or shaft 50 by means of a nut 62. The nut 62 in addition connects the wire 17 of the cable mechanism to the shaft securing the same thereto such that the wire 17 moves with the shaft upon movement of the cam follower along the cam surfaces 41L and 41R. Thus the diaphragm 59 seals the inner part of the magnetic motor within the casing 25 and allows for connection of the wire or central core of the cable or force transmitting apparatus to the shaft 50 of the motor. Also included in the extremity of the clamping head or sealing cap 61 is a second tapped aperture with a clamping nut therein indicated at 65 within which is positioned the outer portion or flexible casing 16 of the cable 15 to be secured thereto through the clamping of the nut 65 to the remaining portion of the endcap 61. The cap 61 also includes a passageway indicated in 66 through which the wire 17 extends. Thus it will be seen upon movement of the shaft 50 with the movement of the cam follower 52 on the surface of the cam that the diaphragm and shaft 50 will move the wire 17 relative to the flexible outer casing 16 of the cable or force transmission apparatus to provide for relative movement of the clamp parts 11 and 12 to actuate the same, constricting or occluding the vessels associated therewith.

It will be noted in Figures 3 and 4 that the motive device includes no energizing source and it will be seen in Figure 6 that the energizing source is an externally positioned electromagnet which is designed to be brought into proximity with the motive means which under normal procedure is buried under the skin of the animal or specimen. A pulsed magnetic field is utilized to energize the core structure formed by the members 26, 27 to attract the armature toward the member 26 and actuate the ratchet wheel 35. The circuitry shown in Figure 6 includes an alternating current source indicated at 70 which source is connected through a full wave rectifier 71 and a momentary contact type of switch 72, with an arc suppressing resistor 73 across its contacts, the output of the full wave rectifier being fed to a coil 75 on a core structure 76 comprising the electromagnet. Thus, as the momentary switch 72 is deflected, a direct current flows in coil 75 to provide a field from the electromagnet structure for energizing the motor means.

The arrangement of the apparatus within the specimen is best shown in Figure 7 in which the occluding device or clamp 15 is shown associated with an artery of a heart indicated at 78 and the cable or power transmission means connected thereto being led out through the chest cavity between the rib structure indicated at 80 to the motive means 20 which is secured to the rib structure or

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to any suitable part on the body such that it may apply a thrust through the cable to operate the clamp. The motive means is buried beneath the fatty and skin tissues indicated at 81 and 82 respectively, such that after insertion of the apparatus the wound may be allowed to heal and the specimen returned to normal state or condition of health before the tests begin. Then when the examination or research is desired to be carried on, the electromagnet structure is brought into proximity with the motor with the members 26, 27 being so positioned that the armature 30 is remote from the electro-magnet surface such that the pulsed field will cause the armature to be attracted to the member 26 and operate the ratchet wheel thereby operating the associated cam and cam follower to move the shaft 50 and the wire 17 attached thereto relative to the casing 16 of the cable to operate the clamping mechanism. It will be appreciated that a periodic deflection of the switch 72 will cause the electromagnet to be periodically energized and the motor to be operated in successive steps. With a series of pulses of power applied through successive operations of the switch, the clamping mechanism may be advanced by virtue of the cam surface toward a completely closed position and by still further operation of the switching device to a position beyond the rise portion on the cam such that the clamping device will again open as the follower reaches the low portion of the cam thereby opening the vessel.

A second embodiment of the actuator for our improved occluding apparatus is shown in Figures 8, 9 and 10. This actuator design is generally circular in configuration and is quite flat to provide for ease in mounting the actuator underneath the surface of the skin and fatty tissues of the specimen or animal with the least distortion or raising of the skin and fatty tissues. This actuator design operates on the same principle and is generally the same in configuration with a slight rearrangement of parts to provide for the reduced thickness dimension. As will be seen in Figure 9, the actuator has a two-part casing of non-magnetic material, 80, 81 respectively which is held together in a threaded connection, the part 81 being the base of the apparatus and mounting an O-ring type seal indicated at 82 for sealing the actuator and including a pair of flanges 83 with apertures therethrough for mounting purposes. Tool receiving recesses 84 are positioned in base 81 for assembly purposes. Within the cylindrical casing is mounted a nonmagnetic flat spacer member or plate indicated at 85 which is generally circular in configuration and mounts on top the same a circular or annular core piece 86 of magnetic material having a pair of projections 87 thereon which as will be later noted, are provided for mounting of the armature. Positioning the core 86 within the casing is a cup shaped support member 90 which fits around the annular core member 86 and describes a generally cylindrical aperture within the casing. The support 90 and the plate 85 as will be later noted provide the side supports for the rotating cam and ratchet of the device. Cooperating with the core member and pivoted thereon through pivots indicated at 93 in Figure 8 is an armature 95 which is generally C-shaped in configuration and terminating in a pair of flanges 98 which have apertures therein through which the pivot pins 93 extend to mount the armature on the flanges 87 of the core. Thus it will be seen that the armature is pivoted on the portion of the core and moves relative to the opposite side of the core under the influence of a magnetic field which is directed toward the bottom of the structure as shown in Figure 9. Mounted on the armature 95 is the pawl 100 which is inserted into a slot in the armature and is designed to engage a serrated or toothed upper surface 97 of a pivoted ratchet wheel 99 mounted on a shaft 101 and which is in turn journaled in the support 90 and base 85. Pawl 100 engages the tooth surface 97 to rotate the ratchet wheel 99 about its pivots in the manner similar to the embodiment described in Figures 3

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and 4. Also mounted on the armature on the under surface thereof is a flexible detent member 105 which bears against the tooth surface 97 to prevent counter-rotating movement of the ratchet wheel 99 and like the before mentioned embodiment acts as a spring return for the armature.

Mounted on the upper surface of the ratchet wheel and radially inward from the tooth surface of the wheel is the cam member 110 having the rise portion 110R and the fall portion 110L, which cam member is integral with shaft 101 or suitably secured thereto and rotates with the ratchet wheel. Cooperating with cam 110 is a cam follower indicated at 112 which is mounted on a shaft 113, the shaft extending down into an aperture 114 in the core 86 to be journaled therein and extending through member 90 and an aperture 115 in the housing or casing member 80 to be suitably journaled and supported therein and extending through the casing for purposes to be later defined. A spring 120 is attached at one extremity to the shaft 113 and at the other extremity to the core 86 through suitable means (not shown) and is adapted to supply a biasing force to the follower urging the follower against the cam surfaces of the cam. Thus as the armature is attracted toward the core and the pawl engages the ratchet wheel the cam will be rotated to present a different surface to the follower which is biased against the same and will cause the follower to rotate the shaft 113. As indicated in Figure 8 the shaft is sealed at the casing by means of an O-ring 121.

Positioned on top of the casing 80 and attached to the shaft 113 by a nut 127 is an L-shaped operator arm 125 best seen in Figure 10. A plurality of apertures 126 are formed in the operating arm and are adapted to receive the wire 17 of the cable to connect the cable to the motor. The wire 17 is inserted through one of the apertures 126 depending upon the amount of differential movement required by the clamping mechanism and an adjustable clamp 130 which is pivotally secured by screw 131 to the arm 125 with a catch portion which is bent over the arm as at 132 (see Figure 9) to secure the wire in the aperture 126. The casing portion of the cable or helical spring is secured to the actuator by means of a clamping bar 135, the clamping bar having a number of apertures 134, therethrough, of dimension sufficient to accommodate the casing 16 of the cable and secure the casing 16 to the casing 80 of the actuator. Screws 136 attach the bar 135 to casing 80. A plastic or non-magnetic cover 150 which is also cup shaped in form is fitted over the casing 80 and houses the arm 125, the connection of the cable thereto and the securing bar 135.

A suitable aperture in the cover 150 (not shown) permits the entrance of the cable into the cover and to the connecting apparatus described above.

In operation, this motor is substantially the same as that previously described. Upon energization of the electromagnet which is adapted to be associated therewith, the core structure 86 will be energized to attract the armature 95 and cause the pawl 100 to contact the toothed periphery of the ratchet wheel and rotate the wheel and the cam 110 thereon about its pivots, causing the cam follower to follow the contour surface of the cam and rotating the shaft 113 to operate the arm 125 secured thereto. The wire 17 then moves relative to the casing 16 to operate the clamping mechanism and occlude the vessel. The occlusion will be terminated with the operation of the motor to a point where the fall or low portion of the cam 110L is reached at which point the arm 125 will be advanced to a point where the clamping mechanism will be open.

In this embodiment it will be seen that the differential movement required by the clamp may be adjusted by utilizing the various apertures 134 in the securing bar 135 and the apertures 126 in the operating lever or arm 125. This assembly provides for a small compact device which

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is relatively thin and should not present any excessive protuberance under the surface of the skin.

While the above apparatus is at the present time directed primarily to medical research on specimens such as animals for the study of coronary diseases, it may be well appreciated that this type of apparatus may be equally applicable to other conditions present in any type of a living body where for the purpose of remedial medicine it is desired to clamp a vessel such as an artery or vein to produce a desired result. It will further be recognized that while we have shown a specific type of clamping means, that variations in the form of the motor and the clamping means may be utilized within the scope of the invention. Therefore, I wish to be limited only by the appended claims.

I claim:

1. A vessel occluder comprising, a clamping mechanism including two members pivotally connected at one extremity and adapted to be placed around a vessel to be occluded, a two-part cable mechanism connected respectively to the opposite extremities of said members of the clamping mechanism and adapted by relative movement of the cable mechanism parts to operate said clamping mechanism to clamp and unclamp the vessel associated therewith, motor means including a magnetic structure and a ratchet means operated thereby, means including said ratchet means connected to said cable mechanism and adapted to move the parts of said cable mechanism relative to one another, and an electro-magnetic means for supplying periodic magnetic fields to said motor means to operate the same.

2. A vessel occluder comprising, a clamping mechanism including a pair of members adapted to be placed around the vessel to be occluded and mechanically associated to move relative to one another and clamp the vessel, a two part force transmission means connected respectively to the parts of said clamping mechanism and adapted by relative movement of the transmission means to operate said clamping mechanism to clamp and unclamp the vessel associated therewith, motor means including a magnetic structure and a member movable relative thereto to the influence of magnetic fields, said motor means being connected to the force transmission means and adapted to move the parts of said force transmission means relative to one another to operate said clamping mechanism, and an electromagnetic means mechanically independent of said motor means and positioned remotely therefrom for supplying periodic magnetic fields to said motor means to operate the same.

3. Apparatus for occluding a vessel within a body comprising, a clamping mechanism adapted to be placed within a body and around a vessel to be occluded, flexible connection means connected to said clamping mechanism and adapted to transmit a working force to the clamping mechanism to operate the same, motor means connected to the flexible connecting means and adapted to supply said working force to said connecting means, a magnetic structure included in said motor means, and means providing a source of magnetic field adapted to be positioned adjacent said magnetic structure and external of a body for energizing said motor means.

4. Apparatus for occluding a vessel within a body comprising, a clamping mechanism adapted to be placed within the body and around the vessel to be occluded, flexible connection means connected to said clamping mechanism and adapted to transmit working force to the clamping mechanism to operate the same, motor means including a magnetic structure connected to the flexible connecting means and adapted to supply the working force in said motor means, and electromagnet means mechanically independent of said magnetic structure for energizing said motor means.

5. Apparatus for controlling the occlusion of a vessel within a body from a point outside of the body comprising, clamping means adapted to be associated with the

vessel and adapted to be operated from a force transmitted thereto, flexible connection means adapted to extend through the rib structure of a body into the chest cavity and connected to the clamping means for transmitting the working force to the clamping means, motor means adapted to be mounted on a rib structure under the surface of the skin of a body and connected to the flexible connection means to supply the working force thereto, and external magnetic means adapted to be periodically energized to apply a magnetic field to said motor means and energize the same to operate said clamping means.

6. Apparatus for controlling the occlusion of a vessel within a body from a point outside of the body comprising, clamping means adapted to be associated with the vessel and adapted to be operated from a force transmitted thereto, flexible connection means adapted to extend inwardly into a body into proximity with said clamping means and connected to said clamping means for transmitting a force thereto, a flat motor means adapted to be mounted on the outer surface of a body and underneath the skin thereof and connected to said flexible connection means to supply the force thereto, and magnetic means adapted to be positioned outside the skin of a body in proximity with said motor means to produce a magnetic field to energize said motor means and operate the clamping means.

7. Apparatus for controlling the occlusion of a vessel within a body from a point outside of a body comprising, clamping means adapted to be associated with a vessel and adapted to be operated from a force transmitted thereto, flexible connection means adapted to extend through the rib structure of a body into the chest cavity and connected to the clamping means for transmitting the working force to the clamping means, motor means adapted to be mounted on the outer surface of a body and underneath the skin thereof and including a magnetic core structure and an armature pivoted thereon adapted to be attracted to said core structure, ratchet means engaged by said armature and pivotally mounted to rotate with attraction of said armature, cam means including a follower means connected in part to said ratchet wheel and in part to said flexible connection means to apply the working force to said flexible connection means upon operation of said armature, and magnetic means adapted to be located outside of a body adjacent said motor means to periodically apply magnetic field to said motor means to energize the same and operate the clamping means.

8. Apparatus for controlling the occlusion of a vessel within a body from a point outside of a body comprising, clamping means adapted to be associated with a vessel and adapted to be operated from a force transmitted thereto, flexible connection means adapted to extend through the rib structure of a body into the chest cavity and connected to the clamping means for transmitting the working force thereto, motor means including a magnetic core structure and an armature pivoted thereon and adapted to be attracted to said core structure, ratchet means engaged by said armature and pivotally mounted to rotate with attraction of said armature, cam means including a follower means connected in part to said ratchet wheel and in part to said flexible connection means to apply the working force to said flexible connection means upon operation of the armature, and an electromagnet associated with said motor means and adapted to be periodically energized to apply a magnetic field to said motor means to energize the same and operate said clamping means.

9. A vessel occluder comprising, a clamping mechanism including two members pivotally connected at one extremity and adapted to be placed around the vessel, a two-part motion transmitting means connected respectively to opposite extremities of said members of the clamping mechanism and adapted by relative movement to operate said clamping mechanism to clamp and unclamp the vessel associated therewith, a motor means

including a magnetic structure having a pair of members of magnetic material and an armature member pivotally mounted on one of said members and adapted to be actuated to move toward the other member, a ratchet member, a pawl mounted on said armature adapted to engage said ratchet member to move the same upon attraction of the armature toward said other member, a spring detent means mounted on the armature and adapted to continuously engage said ratchet member operating as a detent for the ratchet member and a return spring for the armature, cam means connected to the ratchet member and adapted to be moved with movement of the ratchet member, cam follower means mounted on the casing for the motor means and engaging the cam to be moved in proportion to the contour of the cam, means connecting said cam follower means to one part of said motion transmitting means to impart motion thereto for relative movement of its parts, and an external magnetic energizing source in proximity with said magnetic structure to energize said magnetic structure and attract said armature to operate said clamping mechanism.

10. Apparatus for occluding a vessel within a body comprising, a clamping mechanism adapted to be placed within the body and around the vessel to be occluded, flexible connection means connected to said clamping mechanism and adapted to transmit working force to the clamping mechanism to operate the same, motor means including a magnetic structure having a pair of members of magnetic material and an armature member pivotally mounted on one of said members and adapted to be attracted toward the other said members, a pivoted ratchet wheel, a pawl mounted on said armature adapted to engage said ratchet wheel and rotate the wheel upon attraction of the armature toward said other member, a spring detent means mounted on the armature and adapted to continuously engage said ratchet wheel operating as a detent for said ratchet wheel and a return spring for said armature, cam means connected to the ratchet wheel and adapted to be moved with the rotation of the ratchet wheel, cam follower means mounted on a casing for said motor and engaging the cam to be moved in proportion to the rotation of the ratchet wheel and the surface of said cam, means connecting said cam follower to said flexible connection means to apply the working force thereto for transmission to said clamping mechanism, and an external magnetic energizing source in proximity with said magnetic structure to energize said magnetic structure and operate said armature.

11. A magnetic motor including a magnetic core structure having a pair of members of magnetic material and an armature member pivotally mounted on one of said members and adapted to be attracted toward the other of said members, a pivoted ratchet wheel, a pawl mounted on said armature and adapted to engage said ratchet wheel and rotate the wheel upon attraction of said armature toward said other member, a spring detent means mounted on the armature and adapted to continuously engage said ratchet wheel operating as a detent for said ratchet wheel and a spring bias for said armature away from said other member, cam means connected to the ratchet wheel and having a contour surface which is rotated with rotation of said ratchet wheel, cam follower means mounted on a casing for said motor and engaging the contour surface of said cam to be moved in proportion to the rotation of the surface of said cam, and a remote magnetic energizing source in proximity with said magnetic core structure to energize said magnetic core structure and operate said armature.

12. A vessel occluding apparatus comprising a vessel clamping mechanism, a motion transmitting means connected to the vessel clamping mechanism, a motor means connected to said motion transmitting means and operating in response to a pulsed magnetic field brought into proximity therewith, and a remotely positioned electro-

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magnet in proximity with said motor means to energize the same and operate said vessel clamping mechanism.

13. Apparatus for occluding a vessel within a body comprising, a clamping mechanism adapted to be positioned within the body and associated with the vessel to occlude the same, a motor means adapted to be positioned within the body, means for connecting the motor means to said clamping means to operate the clamping means, and a magnetic field supplying device for energizing said motor adapted to be positioned outside of the body.

14. Apparatus for operating a device on one side of a partition from a point on the other side of the partition comprising, a device and a motor means both positioned on one side of said partition, said motor means including a magnetic core structure and an armature pivoted thereon and adapted to be attracted to said core structure, ratchet means engaged by said armature and pivotally mounted to rotate with the attraction of said armature, cam means including a follower means connected in part to said ratchet means and in part to the device to apply a working force to said device to operate the same upon operation of said armature, an electromagnet means positioned on the other side of said partition and associated with said motor means, and means connected to said electromagnet means for periodically energizing said electromagnet means to apply magnetic field to said motor means to energize the same and operate said device.

15. Apparatus for operating a device on one side of a partition from a point on the other side of the partition comprising, a device and a motor means both positioned

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on one side of said partition, said motor means including a magnetic core structure and an armature pivoted thereon and adapted to be attracted to said core structure, ratchet means engaged by said armature and pivotally mounted to rotate with the attraction of said armature, cam means including a follower means connected in part to said ratchet means and in part to the device to apply a working force to said device to operate the same upon operation of said armature, and magnetic means positioned on the other side of said partition and associated with said motor means being adapted to be periodically controlled to apply a pulsed magnetic field to said motor means to energize the same and operate said device.

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