

[72] Inventor **Wilbur R. Koehn**
 20 Shorewood Drive, Port Washington,
 N.Y. 11050
 [21] Appl. No. **768,743**
 [22] Filed **Oct. 18, 1968**
 [45] Patented **June 15, 1971**

FOREIGN PATENTS

731,988 6/1955 Great Britain..... 251/9
Primary Examiner—William F. O'Dea
Assistant Examiner—Richard Gerard
Attorney—Dawson, Tilton, Fallon & Lungmus

[54] CLAMP FOR RESILIENT TUBING

20 Claims, 11 Drawing Figs.

[52] U.S. Cl..... 251/8,
 24/135, 251/10
 [51] Int. Cl..... F16k 7/06
 [50] Field of Search..... 251/4, 62,
 10; 128/346; 24/125, 125 N, 135; 339/263, 266,
 272 U

[56] **References Cited**
UNITED STATES PATENTS
 820,216 5/1906 Leffingwell et al. 251/10
 950,111 2/1910 Miner..... 251/8
 2,615,668 10/1952 Ernest..... 251/7

ABSTRACT: A screw clamp for flexible and resilient tubing, particularly tubing as used in the administration of parenteral fluids. The clamp includes a pair of rigid jaws mounted for movement towards and away from each other, one of the jaws having a substantially semicylindrical channel and the other jaw having an elongated and arcuate projection of generally semicircular cross section which is smaller in both longitudinal and transverse dimensions than the channel. A knob carried by a threaded post secured to one of the jaws may be rotated to force the jaws together for clamping and collapsing a tube of resilient plastic or other suitable material extending therebetween. In one form of the invention the rigid jaws are hingedly connected by a spring hinge, and a pair of arms extend outwardly from the post-equipped jaw for facilitating one-handed operation of the clamp.

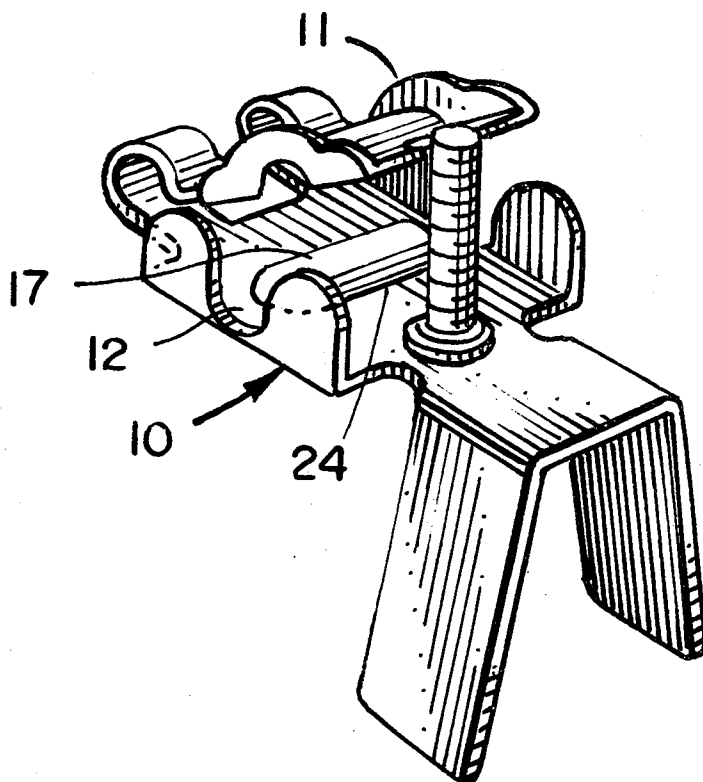


FIG. 1

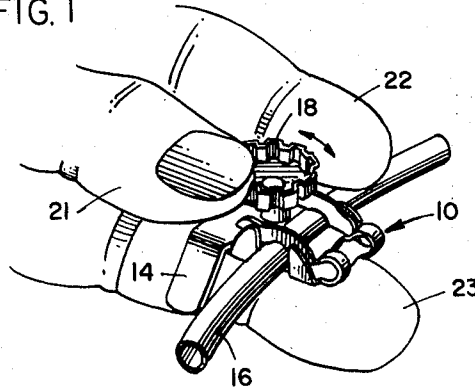


FIG. 2

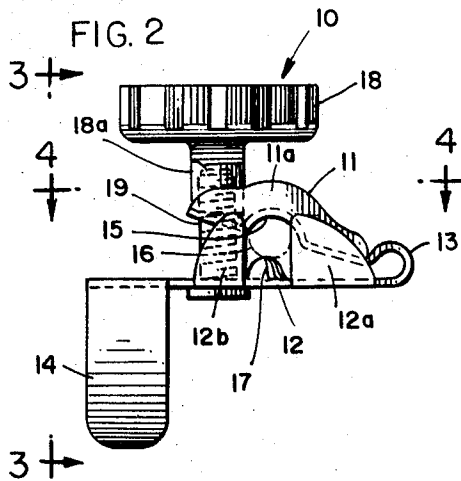


FIG. 3

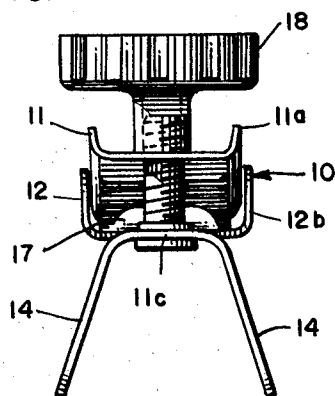


FIG. 4

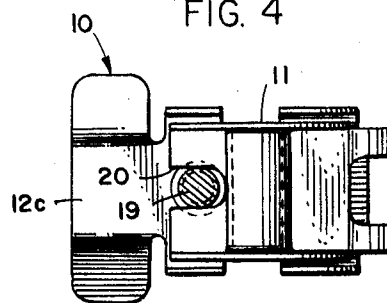


FIG. 5

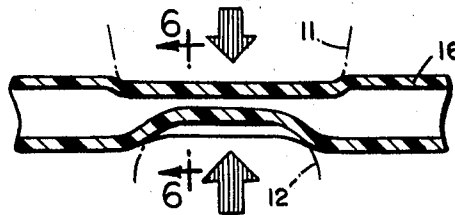
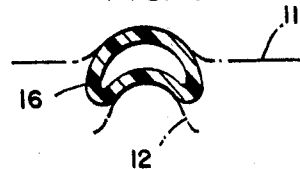


FIG. 6



INVENTOR:

WILBUR R. KOEHN

BY

Dawson, Piltay, Falloy & Lungenus
ATTYYS

FIG. 7

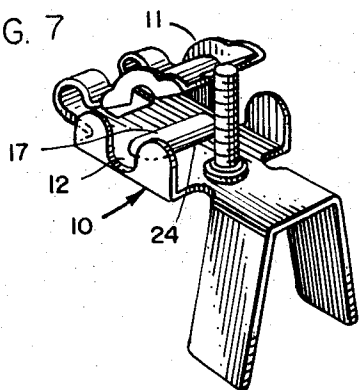


FIG. 8

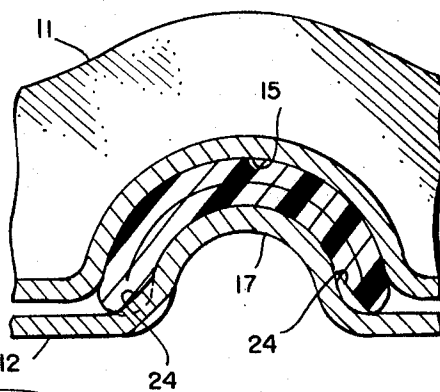


FIG. 9

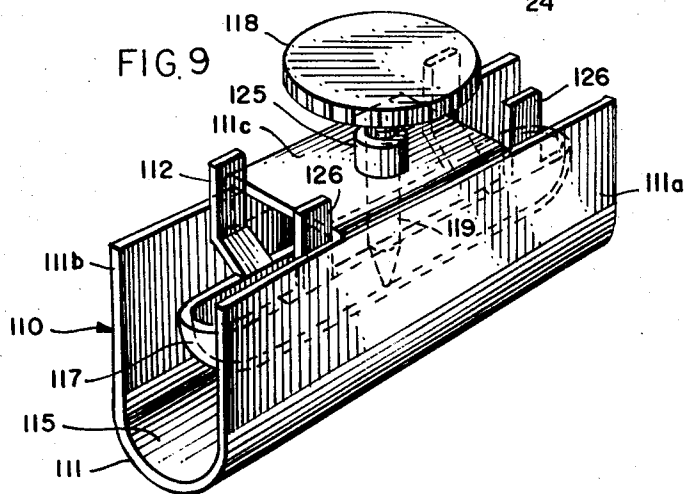


FIG. 10

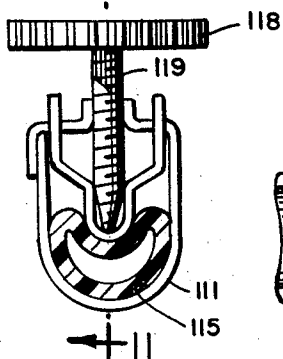
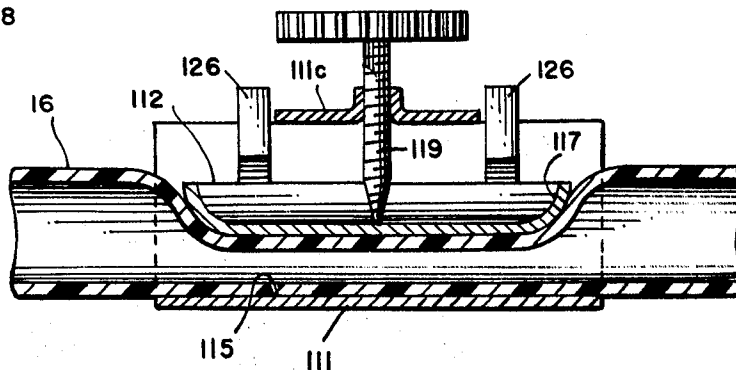


FIG. 11



INVENTOR:

WILBUR R. KOEHN

BY

Dawson, Piltay, Falloy & Lungenius
ATT'YS

CLAMP FOR RESILIENT TUBING

BACKGROUND

While various types of clamps have been used in parenteral fluid administration sets for the purpose of controlling the flow of fluids administered to patients through the tubing of such sets, prior clamps have in general lacked the degree of accuracy and reliability required for precise regulation of flow over extended periods of time. Frequent checking of flow rates and readjustment of such clamps are commonly required if even reasonably uniform rates of administration are to be obtained with present equipment, especially in those instances where relatively low rates of administration (under 200 mil. per hour) are desired.

The unreliability of conventional clamping devices in maintaining uniform flow rates of parenteral fluids has become increasingly apparent from the use of flowmeters of the type disclosed in U.S. Pat. Re. 26,124, issued Dec. 13, 1966, and in my copending application, Ser. No. 731,033, filed May 22, 1968. Such flowmeters, when properly used, give a relatively accurate measurement of the administration rates of parenteral fluids and, when used in conjunction with any of a variety of tubing clamps commonly provided for regulating the administration of parenteral fluids, clearly reveal the general unreliability of such clamps in maintaining selected rates of flow.

SUMMARY

The present invention is based in part on the discovery that the unreliability of prior clamping devices results to an appreciable extent from the "flow" of the plastic tubing material over the duration of administration procedures. The material of such tubing, commonly plasticized polyvinyl chloride, is tough, flexible, and resilient; however, while all of these properties are desirable for surgical tubing, they are accompanied by the tendency of such material to flow at least to a slight extent when subjected to pressure. When tubing formed of such material is subjected to the forces exerted by a conventional clamp as used in the administration of parenteral fluids, the flow of material in response to the clamping forces results in dimensional changes which, over the period of fluid administration, may result in a progressive change (usually a decrease) in flow rates. Such changes tend to occur even though the setting of the clamping device remains unaltered; however, since such dimensional adjustments of the tubing tend to relieve the force applied by the clamp, it is apparent that the clamp itself becomes increasingly susceptible to forces which might tend to alter its setting.

One aspect of this invention therefore lies in providing a clamp for resilient plastic tubing which substantially eliminates or greatly reduces the possibilities of cold flow of the tubing material in the area subjected to the clamping forces. A further aspect is to provide a clamp which has rigid and unyielding clamping surfaces and which will retain a selected position of adjustment despite opposing forces of considerable magnitude exerted upon and by the clamped tube. The result is a clamp capable of precisely regulating the flow of fluids such as parenteral solutions through such tubing and of maintaining a uniform selected rate of flow throughout the period of intravenous feeding. The clamp is therefore particularly suitable for use in conjunction with flowmeters of the type referred to in the aforementioned patent and copending application.

The clamp consists of a pair of stiff or rigid jaws which, as in one form of the invention, may be interconnected by a spring hinge. One of the jaws has a transverse channel of generally semicylindrical shape, the channel having a radius approximating the outside radius of the tubing to be received therein and having a length considerably greater than the outside diameter of such tubing. The opposing jaw is provided with an elongated projection or protuberance receivable in the chan-

nel, the protuberance having a length less than the channel, being generally arcuate in a longitudinal direction, and having a generally semicircular cross-sectional configuration. The radius of curvature of the protuberance when viewed in transverse section approximates the tubing's outside radius less two times the thickness of the tubing wall.

One of the jaws is provided with a threaded post which extends towards the other jaw, the post threadedly supporting a knob which may be rotated to open or close the jaws and, in one form of the invention, also blocking release of the tubing from between the jaws as long as the knob remains on the post or stem. In a preferred form of the invention the post-equipped jaw is provided adjacent its free end with a pair of spaced arms which project away from the post and which are adapted to receive therebetween a supporting finger of an operator, thereby facilitating one-handed operation of the device. The spaced arms diverge towards their free ends with the different spacings between them along their length corresponding to a full range of finger sizes for users of the clamp.

DRAWINGS

FIG. 1 is a perspective view showing a clamp of the present invention as it is being adjusted to control the lumen size of flexible plastic tubing;

FIG. 2 is a side elevational view of the clamp;

FIG. 3 is an end elevation viewed from line 3-3 of FIG. 2;

FIG. 4 is a horizontal sectional view taken along line 4-4 of FIG. 2;

FIG. 5 is a longitudinal sectional view illustrating the configuration of tubing as the same is subjected to clamping forces exerted by the clamp;

FIG. 6 is an enlarged sectional view taken along line 6-6 of FIG. 5;

FIG. 7 is a perspective view of a modified clamp with the knob removed therefrom for clarity of illustration;

FIG. 8 is an enlarged fragmentary sectional view illustrating an operative feature of the modified clamp when the same is used to shut off completely the flow of fluid through a resilient tube;

FIG. 9 is a perspective view of an additional embodiment of the invention;

FIG. 10 is a side elevational view of the clamp of FIG. 9, showing such clamp with a partially clamped tube extending therethrough;

FIG. 11 is a longitudinal sectional view taken along line 11-11 of FIG. 10.

DESCRIPTION

Referring to the embodiment illustrated in FIGS. 1-6 of the drawings, the numeral 10 generally designates a clamp having rigid upper and lower jaws 11 and 12 connected by flexible hinge or strap portions 13. The paired jaws are movable towards and away from each other, the force exerted by the spring hinge portions 13 tending to urge the jaws into the open positions illustrated in FIG. 2. The free end portion of the lower jaw projects well beyond the end of the upper jaw and is provided with a pair of downwardly turned and diverging arm portions 14.

In the illustration given, the jaws 11 and 12, connecting hinge portions 13, and depending arm portions 14 are all formed integrally from a hard and rigid sheet material such as steel or any other material having similar properties. The springiness of the hinge portions 13 arises in part because of their width; in contrast, jaws 11 and 12 are relatively rigid or stiff because of their greater width and because of upstanding side portions which produce a stiffening or reinforcing effect. As shown most clearly in FIGS. 2 and 3, the upper jaw is provided with upstanding sidewall portions 11a whereas the lower jaw has upstanding sidewall portions 12a and 12b. The paired sidewall portions of the lower jaw are spaced apart a distance greater than the maximum width of the upper jaw so that movement of the upper jaw between open and closed positions occurs between such paired sidewall portions.

One of the jaws (upper jaw 11 in the illustrated embodiment) is provided with a downwardly facing transverse channel 15 of generally semicylindrical configuration. It will be observed that the cross-sectional configuration of the channel corresponds closely to the contour of a flexible plastic tube to be received therein, such tube being indicated by broken lines 16 in FIG. 2. Specifically, the radius of curvature of the channel approximates the outside radius of tube 16. The length of the elongated channel is substantially greater than such radius of curvature. In the illustration given, the channel length is approximately five times the radius of the channel (and of the tube 16); while larger ratios may be provided, a ratio of less than 3:1 is generally unsuitable for reasons which will become apparent as the specification proceeds.

Sidewall portions 12a and 12b on each side of the lower jaw are spaced apart of distance slightly greater than the outside diameter of tube 16 and, since such wall portions project upwardly a distance greater than the spacing between the fully open jaws (FIG. 2) such wall portions serve as retaining means to restrain lateral movement of a tubing section passing between the jaws.

Lower jaw 12 is provided with an upstanding and transversely elongated projection or protuberance 17 which is disposed beneath channel 15 of the upper jaw. Viewed in longitudinal elevation, the upper outline of the protuberance is generally arcuate in configuration with the ends of the protuberance curving downwardly and merging smoothly with the top surface of the lower jaw. The length of the protuberance (measured transversely of jaw 12) is substantially less than the width of the lower jaw and, in particular, is substantially less than the length of semicylindrical channel 15. In transverse or cross-sectional contour, the rounded protuberance is generally semicircular in shape with its radius of curvature approximating a dimension equal to the external radius of the tubing less two times the tubing's wall thickness. Like channel 15, protuberance 17 should have a length equal to at least three times the outside radius of tubing 16; however, as indicated above, the length of the protuberance should be less than the length of the channel.

The spacing between the jaws is controlled by a knob 18 threadably carried by an upstanding threaded post or stem 19 which has its lower end rigidly fixed to lower jaw 12. The free end portion of the upper jaw 11 is provided with a recess 20 to receive the post (FIG. 4), the width of the recess being less than the outside diameter of shank portion 18a of the knob. Thus, as the knob is screwed downwardly, jaws 11 and 12 are urged together, and when the knob is screwed upwardly the jaws are urged apart by spring hinge portions 13 to the extent permitted by the shank portion 18a of the knob.

Arm portions 14 extend downwardly and outwardly from the sides of an extension 12c of the lower jaw which continues beyond the free end of upper jaw 11. The width of extension 12c, and hence the minimum spacing between arms 14, should fall within the range of 0.2 to 0.4 of an inch, whereas the distance between the free end of the arms should be at least 0.7 of an inch. In the embodiment illustrated, each arm slopes outwardly from the vertical at an angle of approximately 20°. Such angle has been found effective in producing a clinging effect when fitted upon adult fingers of a wide range of sizes; however, it is believed that angles within the range of 10 to 30° may generally be used depending in part on the selected spacing between the arms at their upper and lower limits.

In use, the clamping device is supported as indicated in FIG. 1 for one-handed adjustment by a user. The knob 18 is gripped between the thumb 21 and index finger 22 and the clamp as a whole rests upon another finger 23 of the same hand, such other finger normally being the middle finger. The outwardly spreading arms 14 straddle finger 23, prevent the jaws of the clamp from rotating in a horizontal plane as the knob is turned and, in general, perform an important function in maintaining the clamp in place as the knob is adjusted. Because of the divergence of arms 14, such arms tend to fit snugly against finger 23 regardless of the size of the operator's hand. Thus, if the operator has a relatively small hand and slender fingers,

then finger 23 will be gripped at the narrower zone between arms 14, whereas if the user has a relatively broad hand and thick fingers the gripping action of the arms will occur nearer their free ends.

FIG. 1 illustrates the clamp with arms 14 disposed inwardly along finger 23; however, the clamp may if desired be reversed so that arms 14 straddle the end of the finger with tubing 16 crossing the finger at a point between arms 14 and the base of the finger. In either case, arms 14 serve to hold the clamp in place during one-handed adjustment of knob 18, thereby leaving the operator's other hand free for other operations.

FIGS. 5 and 6 illustrate somewhat schematically the effect on tubing 16 as the jaws are closed to constrict the tubing and thereby reduce the flow therethrough. It will be observed that the upper jaw 11 serves as a platen to maintain the upper portion of the tube substantially undistorted throughout the width of the upper jaw. Avoidance of distortion of the tube's upper wall portion results from the semicylindrical configuration of channel 15 and from the fact that the radius of curvature of that channel closely approximates the outside radius of curvature of the tube (FIGS. 2 and 6). It is also significant that the length of protuberance 17 of the lower jaw is less than the length of the channel 15.

Constriction of the tube 16 is achieved by reversing the contour of its lower portion along a substantial length of the tube, as shown clearly in FIGS. 5 and 6. The tube therefore becomes crescent-shaped in cross-sectional configuration along a longitudinal stretch of substantial length. Since the protuberance is elongated and is rounded at its ends, the changes in contour of the tubing's lower portion are gradual, as shown in FIG. 5. This gradual infolding of the tubing's lower portion, the substantial axial length of such infolding, and the effective use of the grooved jaw as a platen for supporting in generally undistorted condition that portion of the tubing wall opposite from the infolded portion, all contribute to produce a clamping action in which cold flow of the resilient material of the tubing is avoided or substantially eliminated when clamping forces are applied. Even over extended periods of eight hours or more of parenteral fluid administration wherein the rate of flow is controlled by a clamp embodying the present invention, it has been found that uniform selected flow rates are maintained without requiring readjustment of the clamp.

A major factor in achieving uniform flow rates over extended periods without requiring clamp readjustment is the relatively low unit pressure exerted on the tubing by the clamp because of the substantial surface area of the tubing subjected to clamping force. While knob adjustments to vary flow rates may be made easily and with little effort by a user, the torque or twisting force which must be applied to the knob to achieve complete cessation of all fluid flow is somewhat greater. In the modified construction of FIGS. 7 and 8, the clamp 10 is identical to the one already described except that a small gussetlike transverse rib 24 is formed in lower jaw 12 on opposite sides of protuberance 17 and intermediate the length of that protuberance. Each rib extends along a generally transverse plane and has a smooth downwardly and outwardly sloping edge which bears forcibly against the underside of tubing 16 only when the jaws are closed sufficiently to shut off, or almost completely shut off, the flow of fluid through the tube. Under such conditions, the ribs bear against areas of limited axial length on opposite sides of the infolded tube to insure that the tube's lumen will be completely closed near the collapsed tube's lateral limits (FIG. 8).

It is to be emphasized that ribs 24 are intended solely for the purpose of insuring complete closure of the tube and do not become operative until the tube is substantially fully collapsed. During normal use of the clamp in regulating the flow of fluid through the resilient tubing, the jaws 11 and 12 are spaced far enough apart so that the lateral limits of the tube (i.e., the edges defined by infolding of the tubing wall) are spaced generally above and are not brought into forceful engagement with the ribs.

FIGS. 9—11 illustrate a further embodiment of the invention which differs from the form shown in FIGS. 1—6 primarily in the way that its jaws are operatively connected. Instead of having jaws joined by an integral hinge portion, clamp 110 of FIGS. 9—11 has its jaws 111 and 112 formed as separate elements mounted for sliding movement towards and away from each other. Jaw 111, like jaw 11, defines an elongated channel 115 of semicylindrical configuration which has a radius of curvature approximating the outside radius of tube 16 and a length substantially greater than such radius of curvature. In the illustration given, the channel length is approximately seven times the radius of the channel and, while even larger ratios may be provided, a ratio of less than 3:1 is generally unsuitable for the reasons already given.

Jaw 111 is generally U-shaped in cross section, having upstanding sidewall portions 111a and 111b bridged at their upper ends by transverse wall portion 111c. As shown most clearly in FIG. 9, transverse portion 111c is shorter in its axial dimension than the channel and is disposed intermediate the length of the channel-shaped jaw. An internally threaded collar 125 is formed centrally in the transverse wall portion 111c and receives a vertically extending threaded shaft or stem 119 equipped at its upper end with a knurled knob 118.

The upper jaw 112 comprises an elongated protuberant section 117 and a plurality of integrally formed upstanding arms 126 which project upwardly from the channel-shaped lower jaw at opposite ends of transverse portion 111c and which restrain the jaws against relative horizontal movement without preventing vertical movement of the upper jaw within the vertical limits defined by channel 115 and transverse wall portion 111c.

The elongated protuberant portion 117 of the upper jaw has a lower surface which is generally semicircular in transverse section with a radius of curvature approximately equal to the outside radius of tube 16 minus two times the wall thickness of that tube. At its ends, the protuberant portion is rounded and curves upwardly away from channel 115. The length of the protuberant portion is substantially less than the length of channel 115 (FIG. 11).

It will be noted from FIG. 11 that the upstanding guide arms 126 of the upper jaw are spaced a slight distance from the ends of transverse bridging portion 111c to permit longitudinal tipping or tilting of the upper jaw to a slight extent within the channel defined by the lower jaw. Such movement is not prevented by the threaded shaft 119 which simply bears against the upper surface of the protuberant section 117 at its longitudinal midpoint. Consequently, when knob 118 is rotated to force jaw 112 downwardly into engagement with a resilient tube 16 supported within channel 115, jaw 112 is free to tip slightly to insure the application of uniform clamping force upon the tube along the length of the upper jaw. Because of the self-seating action of the movable jaw, and because the closing action (as controlled by shaft 119 and knob 118) is in a radial plane with respect to tube 16 and channel 115, the application of clamping force upon tube 16 is precisely and uniformly controlled.

Release of the clamping force is achieved simply by unthreading the knob-equipped shaft 119, the resiliency of the tubing, along with the pressure of the fluid therein, acting to lift the movable jaw to the extent permitted by shaft 119.

The clamp of FIGS. 9—11, like the embodiments of FIGS. 1—8, not only eliminates or minimizes cold flow of the tube material but also provides clamping surfaces which are unyielding and which will retain their selected positions of adjustment for extended periods of fluid administration. The rigid jaws of clamp 110 are formed of steel or of any other material having similar properties of rigidity and strength.

While not shown in FIGS. 9—11, it is to be understood that the embodiment depicted therein may, if desired, be provided with lateral ribs substantially identical in structure and function to ribs 24 illustrated in FIGS. 7 and 8, such ribs being positionable intermediate the length of protuberant portion 117 and on opposite sides thereof for insuring complete occlu-

sion of the tube's lumen when interruption of fluid flow is desired, all in the manner previously described.

While in the foregoing specification embodiments of the invention have been disclosed in considerable detail for purposes of illustration, it will be understood by those skilled in the art that many of these details may be varied without departing from the spirit and scope of the invention.

What I claim is:

1. A clamp for resilient tubing comprising rigid upper and lower jaws, one of said jaws being provided with an elongated channel of generally semicylindrical configuration facing the other of said jaws for receiving a length of resilient tubing longitudinally along said channel, said channel having approximately the same radius of curvature as the outer surface of the tubing adapted to be received therein, said other of said jaws having an elongated protuberant portion of generally semicircular cross section extending longitudinally of said channel and positioned to be receivable in said channel when said jaws are closed, said protuberant portion and said channel each having a length exceeding three times the radius of curvature of said channel, said protuberant portion being longitudinally curved at its ends, and means for urging said jaws towards each other into selected positions of adjustment.

2. The clamp of claim 1 in which said channel is substantially longer than said protuberant portion.

3. The clamp of claim 1 in which said protuberant portion has a radius of curvature substantially less than that of said channel.

4. The clamp of claim 3 in which said protuberant portion has a radius of curvature approximately equal to the radius of curvature of said channel less two times the wall thickness of the resilient tubing receivable therein.

5. The clamp of claim 1 in which said lower jaw defines said channel and is generally U-shaped in configuration, said upper jaw comprising a separate element received by said lower jaw, and guide means provided by said upper jaw for limiting relative longitudinal movement of said jaws and for guiding said upper jaw towards and away from the channel of said lower jaw.

6. The clamp of claim 5 in which said upper jaw is tippably mounted within said lower jaw, said means for urging said jaws towards each other comprising a knob-equipped shaft threadedly secured to said lower jaw and bearing downwardly against said upper jaw at the longitudinal midpoint thereof.

7. The clamp of claim 1 in which said protuberant portion is provided intermediate its length and at opposite sides thereof with a pair of laterally extending ribs engageable with a resilient tube received between said jaws when said jaws are substantially fully closed.

8. A clamp for resilient tubing comprising rigid upper and lower jaws, one of said jaws being provided with an elongated channel of generally semicylindrical configuration facing the other of said jaws for receiving a length of resilient tubing longitudinally along said channel, said other of said jaws having an elongated protuberant portion of generally semicircular cross section receivable in said channel when said jaws are closed, said protuberant portion and said channel each having a length exceeding three times the radius of curvature of said channel, and means for urging said jaws towards each other into selected positions of adjustment, said upper and lower jaws having free end portions and having ends opposite said free end portions connected by spring hinge means with a pivot axis generally parallel to said channel, said means for urging said jaws towards each other comprising an upstanding threaded stem secured to said lower jaw adjacent the free end portion thereof, said upper jaw being provided with a recess adjacent its free end for receiving said stem, and a knob threadedly mounted on said stem above said upper jaw for urging said jaws towards each other as said knob is screwed downwardly along said stem.

9. A clamp for resilient tubing comprising rigid upper and lower jaws, one of said jaws being provided with an elongated channel of generally semicylindrical configuration facing the

other of said jaws, said other of said jaws having an elongated protuberant portion of generally semicircular cross section receivable in said channel when said jaws are closed, said protuberant portion and said channel each having a length exceeding three times the radius of curvature of said channel, means for urging said jaws towards each other into selected positions of adjustment, said upper and lower jaws having free end portions and having ends opposite said free end portions connected by spring hinge means, said means for urging said jaws towards each other comprising an upstanding threaded stem secured to said lower jaw adjacent the free end portion thereof, said upper jaw being provided with a recess adjacent its free end for receiving said stem, and a knob threadedly mounted on said stem above said upper jaw for urging said jaws towards each other as said knob is screwed downwardly along said stem, said lower jaw being provided with a free end portion and a pair of arms extending downwardly and outwardly from opposite sides of said free end portion, said arms being spaced to receive a user's finger snugly therebetween for the supporting of said clamp for one-handed operation.

10. The clamp of claim 9 in which said arms each extend outwardly at an angle from the vertical falling within the range of approximately 10 to 30°.

11. The clamp of claim 10 in which each arm extends outwardly from the vertical at an angle of approximately 20°.

12. A clamp for resilient tubing comprising rigid upper and lower jaws, one of said jaws being provided with an elongated channel of generally semicylindrical configuration facing the other of said jaws, a length of resilient plastic tubing extending longitudinally through said channel between said jaws, said channel having approximately the same radius of curvature as the outer surface of said tubing, said other of said jaws having an elongated protuberant portion of generally semicircular cross section extending longitudinally of said channel and positioned to be receivable therein in engagement with said tubing when said jaws are closed, said protuberant portion and said channel each having a length exceeding three times the radius of curvature of said channel, and means for urging said jaws towards each other into selected positions of adjustment.

13. The clamp of claim 12 in which said channel is substan-

tially longer than said protuberant portion.

14. The clamp of claim 12 in which said protuberant portion has a radius of curvature substantially less than that of said channel.

15. The clamp of claim 14 in which said protuberant portion is longitudinally curved at its ends.

16. The clamp of claim 14 in which said protuberant portion has a radius of curvature approximately equal to the radius of curvature of said channel less two times the wall thickness of said resilient plastic tubing received therein.

17. The clamp of claim 12 in which said upper and lower jaws have free end portions and have ends opposite said free end portions connected by spring means with a pivot axis generally parallel to said channel, said means for urging said jaws towards each other comprising an upstanding threaded stem secured to said lower jaw adjacent the free end portion thereof, said upper jaw being provided with a recess adjacent its free end for receiving said stem, and a knob threadedly mounted on said stem above said upper jaw for urging said jaws towards each other as said knob is screwed downwardly along said stem.

18. The clamp of claim 12 in which said lower jaw defines said channel and is generally U-shaped in configuration, said upper jaw comprising a separate element received by said lower jaw, and guide means provided by said upper jaw for limiting relative longitudinal movement of said jaws and for guiding said upper jaw towards and away from the channel of said lower jaw.

19. The clamp of claim 18 in which said upper jaw is tippably mounted within said lower jaw, said means for urging said jaws towards each other comprising a knob-equipped shaft threadedly secured to said lower jaw and bearing downwardly against said upper jaw at the longitudinal mid point thereof.

20. The clamp of claim 12 in which said protuberant portion is provided intermediate its length and at opposite sides thereof with a pair of laterally extending ribs engageable with said resilient plastic tubing when said jaws are substantially fully closed.

45

50

55

60

65

70

75