Sept. 29, 1953 G. H. MYRICK 2,653,787

PINCH CLAMP

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Fig. 1.

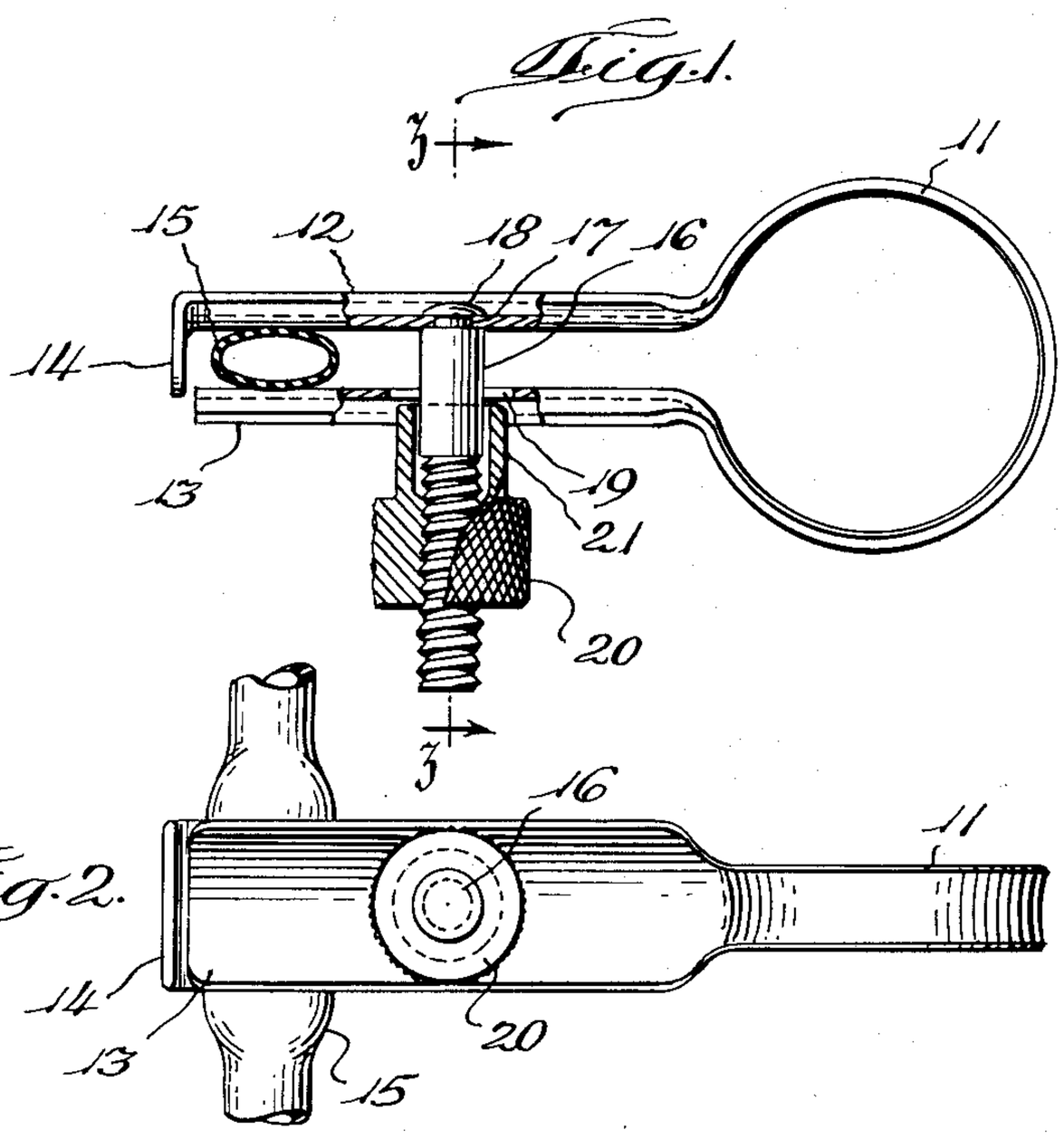


Fig. 2.

Fig. 3.

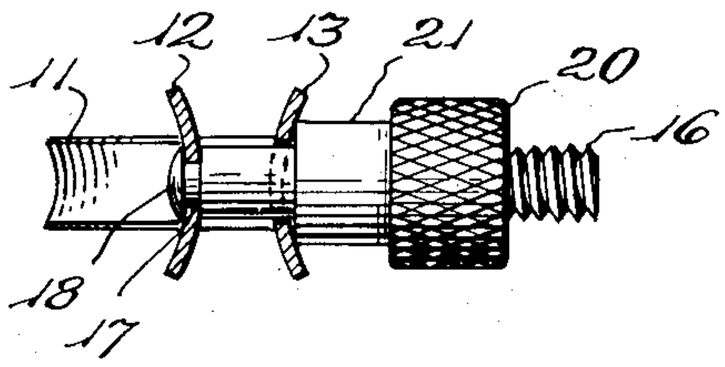
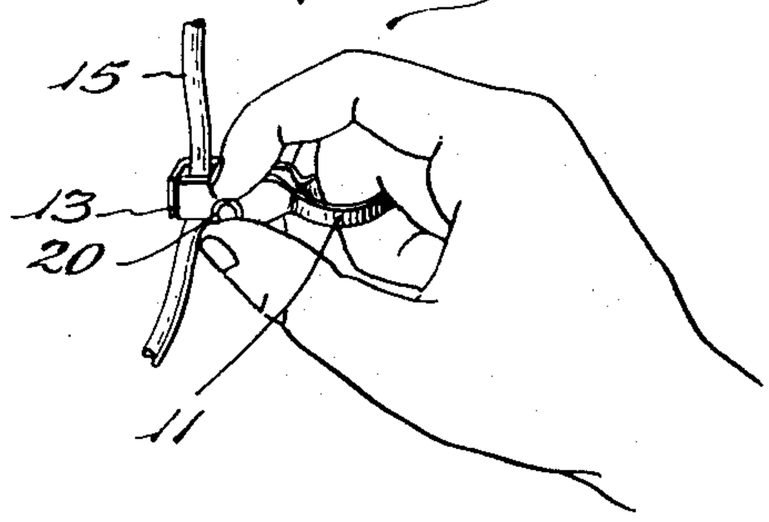


Fig. 4.



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UNITED STATES PATENT OFFICE

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PINCH CLAMP

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2 Claims. (Cl. 251—5)

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The present invention relates to ring pinch clamps for opening, regulating, and closing the flow of liquid through a flexible tube, the device being particularly useful and desirable in intravenous therapy.

In introducing any liquid into the body intravenously, such as blood plasma, saline solutions, and medicinal preparations, extreme care is required in regulating the rate and quantity of flow of the material into the vein. Often the quantity and rate of flow must be regulated in accordance with the patient's response or lack of response to the treatment. A skilled attendant must be present almost constantly to observe the patient's reaction to treatment, to remedy instantly any dislodgement of the intravenous needle or nozzle, and to regulate the rate and quantity of flow of the intravenous solution. The patient in such cases often requires additional treatment or attention, and it is important, therefore, that the attendant have as much freedom of action as possible in order to perform properly such a multitude of duties.

In such cases it is common practice to have a vessel or receptacle containing the fluid to be introduced into the body, a hollow needle or nozzle whose open end is introduced into the vein of the patient, and a tube, usually made of rubber or other flexible material, connecting the needle to the receptacle and providing a conduit for the flow of the material from the receptacle into the vein.

Numerous expedients have been used heretofore to regulate the rate and quantity of flow of the material through the tube. Quantities of gauze, to obstruct partially the tube passage, is sometimes used with many obvious disadvantages. Pinching of the tube by the attendant with his fingers is often resorted to to restrict or regulate the flow. But obviously such procedure is uncertain and irregular.

A common mechanical pinch clamp which completely shuts off flow through the tube is sometimes resorted to, the fluid in such cases being permitted to flow intermittently by alternately opening and closing the clamp. More recently, a pinch clamp adjustable by a thumb screw has been used, and such means has proved a great improvement over older means, since it permits mechanical adjustment of the rate of a constant flow of such liquid.

Such means as heretofore constructed, have had a number of objectionable features, such as causing injury to the tube, because of the large areas constricted and the shape of the clamping

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jaws, inaccessibility for ready use, because the clamp slides off the tube or down the tube to the floor, and such devices have been awkward to handle and adjust accurately, frequently requiring both hands of the operator or attendant.

An important object of by present invention is to provide a new and improved mechanically adjustable pinch clamp which will permit fine adjustment of the flow or drip through a tube, which will be positive and accurate in its action, and yet instantly readjustable to decrease or increase the rate of flow.

Another object is to provide a new and improved pinch clamp which can be attached to the finger of the attendant, as well as to the tube, making it instantly available, and it can be so positioned as to permit instant adjustment by the thumb and index finger of either the right or left hand of the attendant.

Another object is to provide a new and improved pinch clamp which will retain the hose securely without danger of accidental removal therefrom by outward lateral movement of the hose or movement of the attendant's hand, and which will prevent the hose from inward lateral movement so as to become entangled with the attendant's hand, thus permitting the attendant to use his hands freely for other matters which may require his attention.

A further object is to provide a pinch clamp which will not injure or damage the hose in its pinching action.

Other objects inherent in my improved pinch clamp will be apparent from the following description of my invention.

Referring to the accompanying drawing for a detailed description of one embodiment of my invention:

Fig. 1 is a top elevational view of my pinch clamp with a portion thereof and the tube shown in section;

Fig. 2 is a side elevational view of my pinch clamp, looking at the adjusting nut side of the device. A short portion of the tube is shown compressed between the clamp jaws;

Fig. 3 is a cross sectional view of my pinch clamp, taken along the line 3—3 of Fig. 1, and illustrating particularly the transverse curvature of tube clamping portions; and

Fig. 4 is an illustration of my pinch clamp with the ring mounted on the middle finger of the right hand of the user, and illustrating the adjustability of the device by the thumb and index finger and the relative position of the parts when in use.

In the embodiment illustrated in the drawings,

the ring pinch clamp, exclusive of the adjusting means, may consist of a single strip of material, preferably made of stainless steel, and being flexible and springy in character. The strip is curved approximately intermediate its length to form a loop or C-shaped ring 11. This ring should be of a diameter to fit fairly loosely about the middle finger of a user, and is slightly curved and narrow, as illustrated best in Fig. 2, to facilitate insertion and withdrawal of the finger and movement of the clamp relative to the finger. Clamping jaws 12 and 13 projecting beyond the ring are slightly wider than the ring, as appears in Fig. 2, and extend for a distance to the side of the ring approximately one and one-half times the diameter of the ring when the latter is in the relatively closed position shown in Fig. 1. These jaws 12 and 13, with the exception of the abutment 14 on jaw 12, are preferably transversely curved, with the convex portions facing toward each other, as shown in Fig. 3. These convex portions, or at least the outer ends thereof, are smooth so as not to injure the tube clamped therebetween.

The end portion 14 of jaw 12 is preferably flat and is bent at a 90° angle to the jaw 12, as shown in Fig. 1, to form a flange-like retaining member which will prevent the hose or tube 15 from becoming disengaged from the clamp by outward lateral movement. Preferably this flange 14 should extend beyond the jaw 12 a distance slightly more than the radius of the tube 15. The jaw 13 is made somewhat shorter than the jaw 12, so that when clamped tightly to the jaw 12, there will be no engagement between the jaw 12 and the flange 14.

A stud 16 having a reduced neck 17 and a threaded shank is secured to the jaw 12 approximately intermediate the ring portion 11 and the flange 14. While it may be secured in any suitable manner, I prefer to insert the reduced neck 17 through a hole in jaw 12 of a diameter to insure a tight fit, riveting the head 18 so as to prevent rotation of the stud. The stud extends through an opening 19 in the jaw 13 about intermediate its length and opposite the hole in jaw 12. The opening 19 should be longitudinally elongated to permit the jaw 13 to be drawn tightly against the jaw 12, without there being any binding or frictional engagement between the jaw 13 and the stud 16. The stud 16 also acts as a stop to prevent inward lateral movement of the tube, and it is desirable that the portion of stud 16 which may contact the tube be smooth and unthreaded to avoid undue wear or tearing of the tube.

The stud 16 is threaded throughout the greater portion of its length, starting at its free end, but is unthreaded in that portion which may contact the tube, as has been previously described. To permit of fine and accurate adjustment, I prefer fine threads, in the order of 32 to the inch.

Mounted on the threaded end of the stud 16 is a knurled and internally threaded thumb nut 20. This may be of any convenient shape or size, but I prefer one whose diameter is approximately equal to the width of the jaws 12 and 13. A desirable form has a reduced and unthreaded neck 21, reducing the frictional resistance to make the thumb nut adjustable with little effort, and enabling adjustment of the jaws beyond the threaded portion of the stud.

When the thumb nut 20 has been mounted on the threaded portion of the stud 16, as shown in Fig. 1, I prefer to turn over the last thread on the stud 16 to prevent complete removal of the thumb nut.

In using the ring pinch clamp, the clamping jaws 12 and 13 are opened widely by backing off the thumb nut 20, and any convenient portion of the tube 15 is inserted over the flange 14 and between the jaws 12 and 13. The thumb nut 20 is then screwed down to close the jaws sufficiently to prevent the tube from becoming disengaged from the pinch clamp.

When the thumb nut 20 is screwed down on the threaded stud 16, the nut contacting the jaw 13 will compress it gradually toward the jaw 12, the tube 15 being compressed between the two jaws and the passageway therein becoming more and more restricted. When the thumb nut 20 is tightly fastened, the tube will be so compressed as to close off entirely the flow of liquid through it. When the thumb nut 20 is backed off, the spring action of the material, together with the natural spreading tendency of the ring 11, will cause the jaw 13 to move away from the jaw 12 following the nut 20. This, of course, gradually releases the pinching pressure on the tube, opening the conduit to a greater flow of fluid.

In the course of intravenous feeding or therapeutic treatment, the attendant inserts his middle finger on either hand in the ring so that the thumb nut lies conveniently adjacent his thumb and index finger, with which adjustments to back off or screw down the thumb nut can be made with ease. The spacing of the thumb nut from the ring, and its location at the side of the clamp rather than above or below it, contributes substantially to the ease of manipulation as it locates the thumb nut in the most naturally convenient place for rotation by the thumb and index finger.

Likewise, the location of the tube near the extremity of the clamping jaws is highly desirable, as it removes the tube from interfering in any way with the adjusting means or the fingers of the attendant.

Because of the curvature of the clamping jaws, it will be noted that substantially a line contact is made between each jaw and the tube rather than a long restricted passageway in the tube between the two jaws. This construction requires less pressure to pinch the tube and is less damaging to the tube than would be a wider pinching contact. But what is more important, the line contact results in a more constant flow of the intravenous solution and minimizes the possibility of clogging which may occur when two flat surfaces compress the tube over a relatively longer portion.

When adjustment has been made to the desired rate of flow, it will be apparent that the attendant's hands are free for other duties, the ring, however, keeping the pinch clamp instantly available for further adjustment at any time. When a steady flow of fluid is desired for a considerable length of time, the rate of flow can be suitably adjusted by the thumb nut and the ring can then be hung on a convenient hook while the attendant performs other duties.

While I have shown and described a preferred embodiment of my invention, it will be apparent that numerous variations and modifications thereof may be made without departing from the underlying principles of the invention. I therefore desire, by the following claims, to include within the scope of the invention all such variations and modifications by which substantially the results of my invention may be obtained

through the use of substantially the same or equivalent means.

I claim:

1. A pinch clamp for a rubber tube or the like comprising a C-shaped spring metal finger ring defining a nearly complete circle adapted to slide easily over the middle finger of a user, substantially parallel tube engaging jaws formed as extensions of said ring at the ends thereof and lying in the plane of said ring, said jaws, when unstressed, being spaced apart a distance slightly greater than the diameter of a tube to be clamped, one of said jaws being bent at substantially right angles at the free end thereof toward the other of said jaws to form a retaining member for preventing outward escape of an engaged tube from between said jaws, a second retaining member for preventing inward escape of a tube being clamped, said second retaining member comprising a stud attached to one of said jaws at a point spaced inwardly of the free end thereof a distance substantially greater than the diameter of a tube to be clamped, and extending at substantially right angles thereto through an opening in the other of said jaws, the free end of said stud beyond the outer face of the last said jaw being threaded to form a screw and a portion at least between the jaws and about as long as the diameter of said tube being smooth, a nut threaded to said screw having an unthreaded sleeve portion bearing against said other jaw and movable on said screw to force said jaws toward each other when tightened, said ring being spaced a substantial distance from said screw to bring said nut easily between the thumb and index finger of the hand having the middle finger extended through said ring, and at least one of said jaws being curved transversely so as to provide the last said jaw with a convex tube engaging surface.

2. A pinch clamp for a rubber tube or the like,

comprising a C-shaped finger ring defining a nearly complete circle having adjustable tube engaging jaws extending in generally radial directions from the ends of the ring, a stud attached to one of said jaws at substantially the center thereof and extending at substantially right angles thereto through an opening in the other of said jaws, said stud being smooth and unthreaded a distance about equal to the diameter of the tube to be clamped from the point of said attachment and threaded at its outer end to form a screw, the unthreaded portion of said stud forming a stop to limit the inward movement of a tube inserted between said jaws, and a nut threaded upon said screw to bear on one of said jaws and having an inner unthreaded portion dimensioned to clear the smooth portion of the stud, said nut being movable on said screw to force said one jaw toward the other jaw and engageable with one of said jaws for controlling the movement of the jaws relative to each other.

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