Sept. 24, 1929. L. M. C. CHARNAUX 1,729,502

APPARATUS FOR CONTAINING OR RETAINING THE HUMAN BODY OR THAT OF ANIMALS, FOR MEDICAL, SURGICAL, AND HYGIENIC PURPOSES

Filed Dec. 26, 1924 4 Sheets-Sheet 1

Fig.1A.



Fig.1.

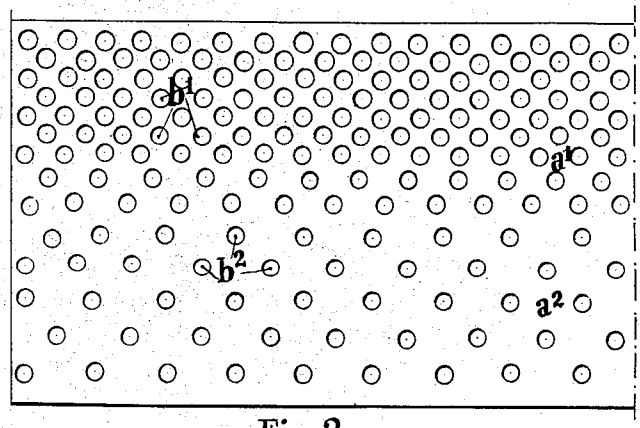


Fig.2.

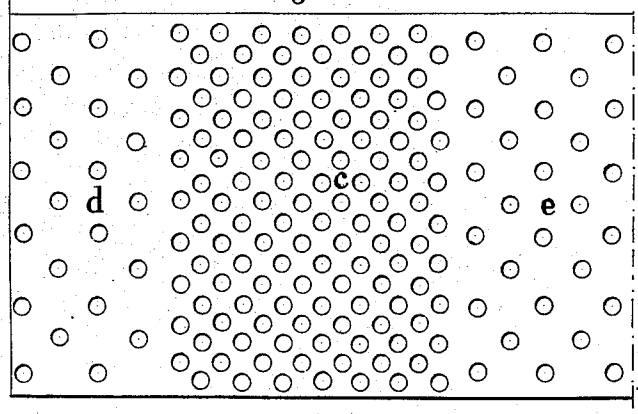
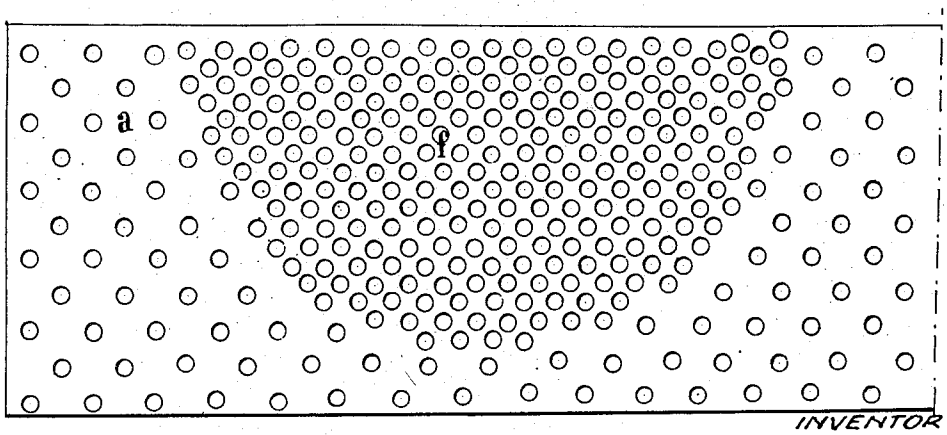


Fig.3.



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Fig. 4.

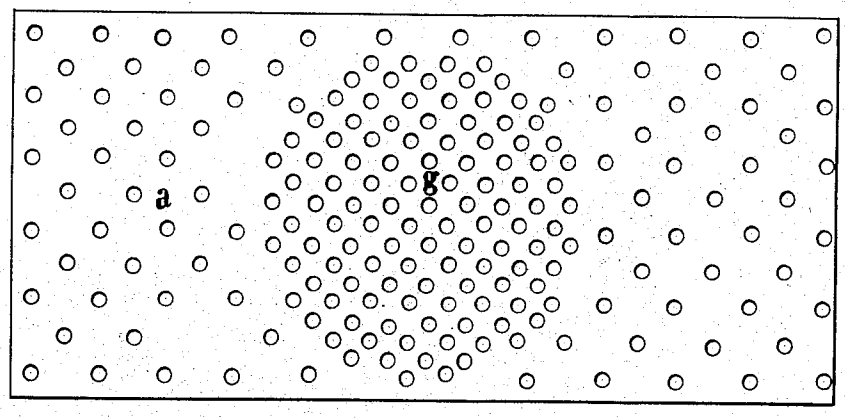


Fig. 5.

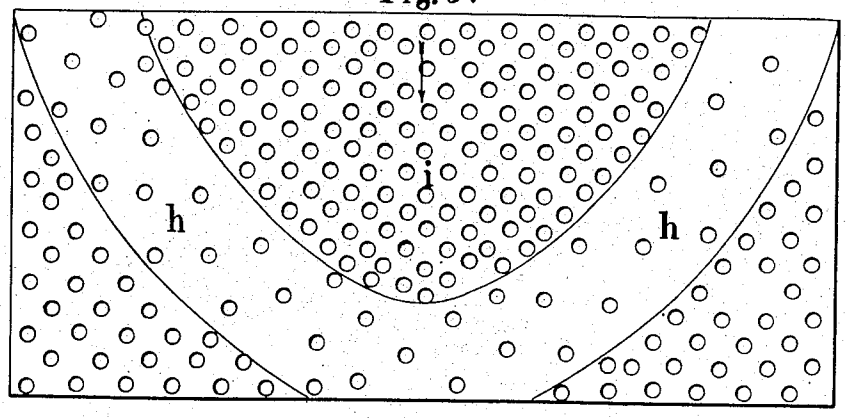


Fig. 6.

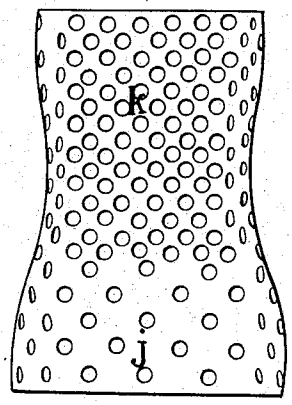
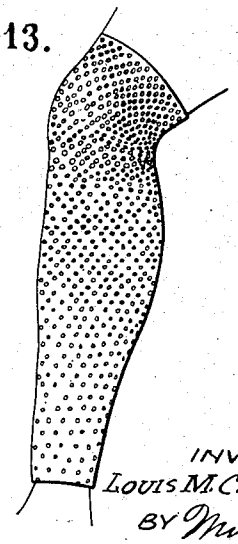


Fig. 13.



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Fig.7.

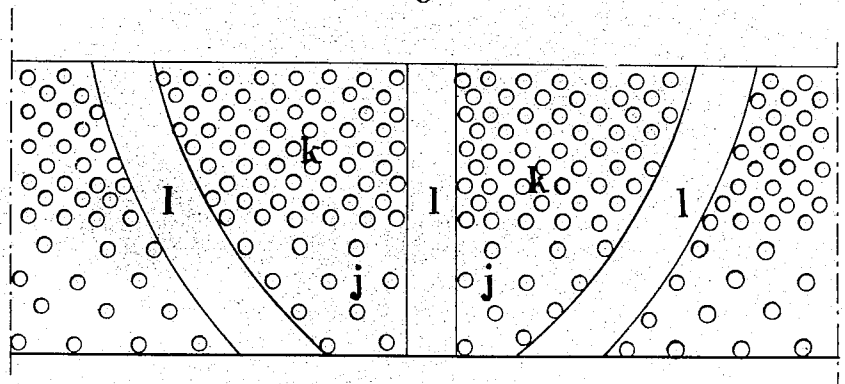


Fig.9.

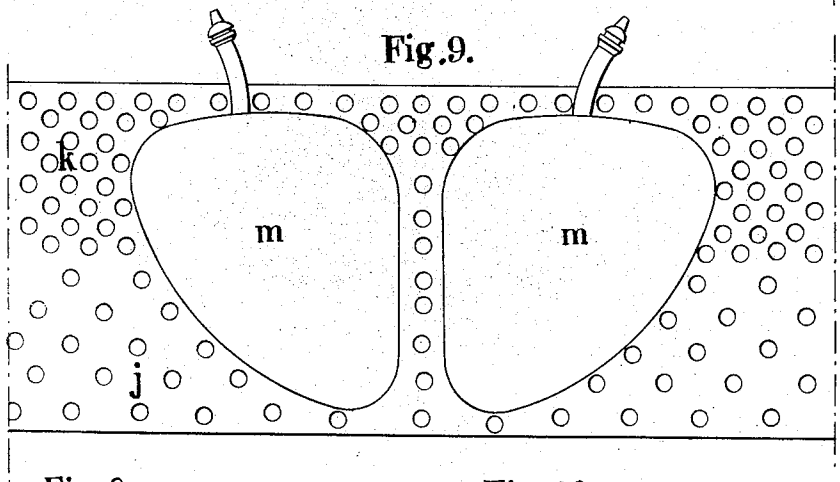
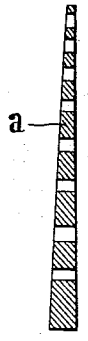


Fig.8.

Fig.10.



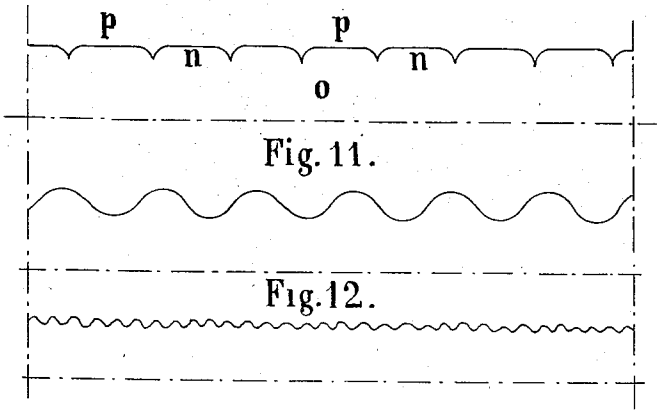


Fig.11.

Fig.12.

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Fig. 14.

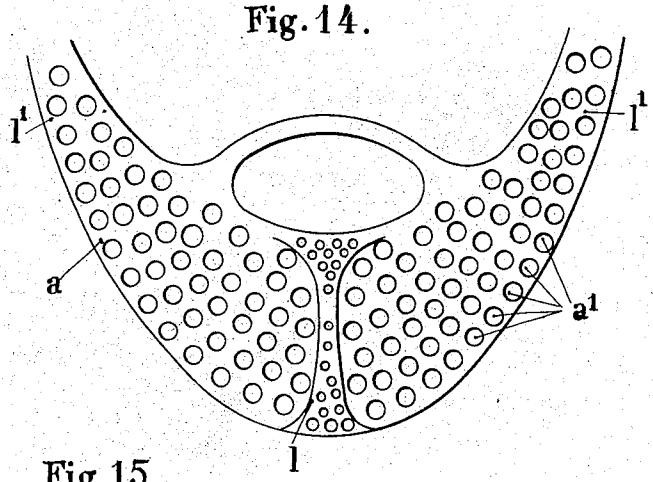


Fig. 15.

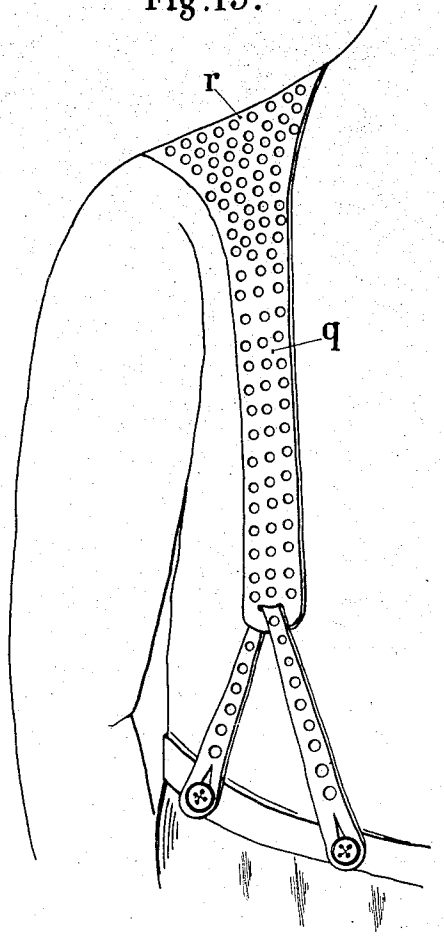
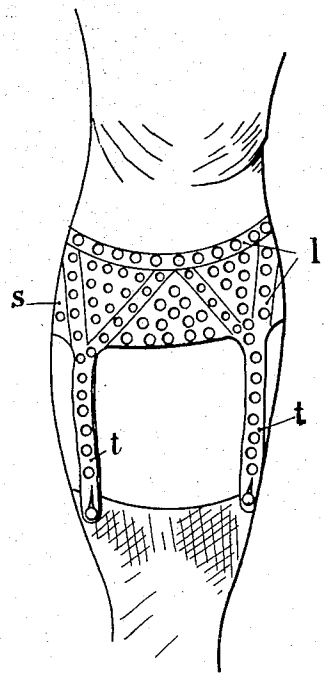


Fig. 16.



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UNITED STATES PATENT OFFICE

LOUIS MARIE CLÉMENT CHARNAUX, OF VICHY, FRANCE

APPARATUS FOR CONTAINING OR RETAINING THE HUMAN BODY OR THAT OF ANIMALS, FOR MEDICAL, SURGICAL, AND HYGIENIC PURPOSES

Application filed December 26, 1924, Serial No. 758,197, and in France July 1, 1924.

The apparatus for containing or retaining the human body and that of animals, for medical or hygienic purposes, such as belts, bands, corsets, bandages, are most frequently made of elastic woven fabric, which presents many disadvantages. It very rapidly becomes slack and only permits insufficient access of air to the skin. On the other hand, it is almost impossible to clean it. Moreover, from the mechanical point of view, it produces a uniform action at all points and in all directions and does not respond to the requirements of construction of such articles.

It is evident that if one substitutes for this india-rubbered fabric, that is to say, formed of a fabric comprising indiarubber threads, bands or sheets of indiarubber, either pure or only containing a small proportion of other substances (factice) incorporated therewith, one would obtain a superior and more constant elasticity, and a much greater flexibility, which would enable these articles to adapt themselves very accurately to the contours of the body. Moreover, and this is very important from the hygienic point of view, whilst it is almost impossible to clean articles formed of fabric with indiarubber threads, on the contrary nothing is easier than to clean bands of indiarubber without injuring them in the least.

But such bands of indiarubber, when applied to the body, would prevent the cutaneous evaporation from taking place. On the other hand, their action would be from a mechanical point of view the same as that of woven fabric containing indiarubber threads, that is to say uniform in all directions.

The present invention has for its object an improvement in the various articles used for containing or retaining the human body or that of animals, permitting of such articles being constructed by means of indiarubber in the form of bands or sheets with all the properties which it possesses, at the same time ensuring access of air and cutaneous evaporation, and providing them with special new qualities from the point of view of the intensity of the elastic force and its direction in the different zones of the articles considered. The support, the retention, and the compression of the parts of the body can thus be ensured to a degree of perfection which has not been approached heretofore.

The invention consists essentially in perforating the band or piece of indiarubber with a large number of holes which ensure simultaneously the following results:

From the point of view of aeration and evaporation, linen or other materials protect the rear face of the band and isolate it from the skin, draining off the sweat which evaporates through the holes. The surface for aeration and evaporation is proportional to the number and the dimensions of the holes. It thus gives better results than fabrics containing indiarubber threads which only allow air to pass through them with great difficulty.

From the mechanical point of view, the properties of the band of indiarubber are modified. The retaining force is reduced whilst the flexibility and the elasticity or facility of adapting itself to the contours of the body are increased. These effects are greater accordingly as the number of holes and their dimensions are increased.

Moreover, the increase of flexibility or elasticity may be different in different zones or parts of the retaining article. By increasing the number of holes in certain parts, they can be given the maximum flexibility, whilst by reducing the number in other parts, the latter may be allowed to have a greater retaining force.

Finally, it is possible to obtain different directions of action by suitable distribution of the holes, by distributing them along predetermined lines, or by giving them unsymmetrical forms. For example, if the holes are of an elongated form, the band has more flexibility in the direction of the length of the holes than in a direction transverse thereto.

In this manner it is possible to obtain mechanical actions of compression, retention, support, or lifting actions, of which the intensity on the one hand and the direction on the other hand can be regulated at will.

In order to enable these principles to be understood, there have been shown in the accompanying drawing, which has been given

by way of illustration only, some examples of carrying the invention into practice.

Figure 1 is a plan view of a band illustrating my invention,

Figure 1^A is a vertical cross section thereof,

Figures 2, 3, 4 and 5 illustrate modified forms of the belt, in which the elasticity of the belt is varied, according to positioning of the apertures,

Figure 6 illustrates my invention as applied to a corset,

Figure 7 is a modified form thereof,

Figure 8 is a vertical cross section thereof,

Figure 9 is a still further form of abdominal support, embodying inflatable means,

Figures 10, 11 and 12, illustrate preferred forms of borders for my belt,

Figure 13 illustrates my invention as applied to a surgical hose,

Figure 14 illustrates my invention as applied to a suspensory,

Figure 15 shows an application of my device to suspenders,

Figure 16 depicts my invention as embodied in a hose supporter.

Figure 1 shows a band of indiarubber, of comparatively small thickness, as shown in the transverse section, Figure 1^A, in which are formed two series of holes b^1 and b^2, the holes b^1 being much closer together than the holes b^2. The band is thus more flexible and elastic; whilst the other, the lower strip, is much stronger and possesses a greater retaining force.

Instead of producing differences of flexibility in the direction of the height, the band or other retaining device or article can also be formed with vertical strips of different flexibility. This has been shown in the example Figure 2. There will be seen a vertical zone c provided with a large number of holes which render it very flexible, whilst the vertical zones d, e which enclose it, have fewer holes, so that their retaining force is greater.

The strips or zones of different flexibility can be connected by parts forming a transition from one to the other by suitably grading the number of holes. Such transition parts can be made so as to be unnoticeable or on the other hand they may be sudden.

The zones or strips such as a^1, a^2, d, e may be not only horizontal or vertical, but in absolutely any direction. Moreover their width may vary as desired. Finally the form of the zones of given flexibility can be adapted to each particular application; their contour may be rectangular, rounded, oval, lozenge-shaped, semi-circular, triangular etc., according to the action to be produced.

The variety of effects which can thus be obtained is still further increased by reason of the possibility of giving the holes special forms such as oval, lozenge-shape, rectangular, etc. and making them of larger or smaller dimensions, which may be varied according to the positions which they occupy. By these combined means, one is in a position to vary to an infinite degree the flexibility, elasticity, the retaining force and the power of aeration. More especially the desired mechanical action may, in all cases, be that which is suited to the object to be attained.

By increasing the number of holes and their size, one may proceed up to the point of transforming the sheet of indiarubber into a network. On the other hand, speaking generally the unperforated parts occupy a larger area than that of the holes.

The drawing shows several examples in the most simple cases, where one can utilize the differences in the properties of the different parts of belts or bands.

Figure 3 shows for example how a belt a can be made in which there is arranged a more flexible zone f, of substantially circular contour, serving to provide for a substantial belly or protuberance.

Figure 4 shows a similar application wherein a more flexible zone g is formed in a belt a, this zone being that of the region of the appendix in the case where the latter is unhealthy.

Figure 5 shows a portion of a band or belt having stronger oblique bands or strips h. It will be understood that with such an arrangement the part i can fit on to a rounded part of the body, and the stronger strips h ensure a support against a load or action exerted in the direction of the arrow.

Figure 6 is an example of the application of the same principle to an article such as a corset. The latter comprises a stronger lower part j and a more flexible upper part k, which enables this article to fulfil its purpose efficaciously.

Figure 7 is a modification of the above arrangements. The article comprises, as above, more flexible parts k, less flexible parts j and strips l of which all the resistance has been preserved by not forming any hole therein. These strips may moreover be reinforced by pieces of indiarubber forming an extra thickness, or by leather, or by whale bones or any other equivalent means.

In all cases, the flexible band, or corset, is formed by a band or sheet of thin indiarubber, of pure Pará rubber, or containing in suitable proportion various materials which are incorporated in indiarubber. As the new articles are intended to be applied to the body, it is preferable only to employ as factice substances which are innocuous.

The thickness may be uniform, or it may be varied. Figure 8 shows a belt a of which the lower part is thicker than the upper part. The variations of thickness may be gradual or more or less sudden.

The variations of thickness may be along vertical or oblique lines, or in sections or zones etc.

These variations are combined with the distribution of the holes and the number and nature of these holes in order to produce any desired mechanical results.

Moreover, the various parts of the band, belt or other articles can be reinforced by linings, strips of leather, whalebones etc. as has been mentioned with reference to the particular case of Figure 7. Similarly, the article can be made, partly with perforated indiarubber, partly of woven fabric or other suitable materials.

Finally, the novel retaining article or device can be provided at all suitable points with pockets capable of being inflated by blowing into them. Thus Figure 9 shows a belt provided with two pneumatic pockets *m*, *m*.

The band or belt may have pockets or bulbs of other kinds and, speaking generally, may be combined with all the means or devices employed in orthopedy, hygiene, etc.

Preferably, the border of the band or other articles or device is not cut straight, which would determine a limit of action that was too definite and too hard and would be liable even to wound. It is cut with teeth or noches *n* as shown in Figure 10. In this manner, each small element *n* lengthens and bends more or less in contact with the body, at the same time supporting the parts in contact therewith, but making a transition between the zone *o*, where the fabric has a large amount of elasticity, and the unsupported region *p*.

The toothed parts *n* are capable of being of greater or smaller size as are the spaces which separate them.

They can be reduced to small undulations as shown in Figures 11 and 12.

The fixing of the bands, belts etc. made according to the invention, is effected by any suitable means, preferably by means of a plurality of lugs which enable the tightness to be better regulated in the various parts.

Endless belts can also be made such as are already made in woven fabric.

The invention is applicable in all cases where there is occasion to exert a supporting, retaining or compressing action. It is thus possible, according to the principles above mentioned, to make ordinary corsets, band or belt corsets, medical and surgical bandages, hygienic and sporting belts, medical belts, belts for ptosis, certain ruptures, hernias, etc.

It is also applicable to elastic stockings for varicose veins etc. In this case, again the invention has not only the advantage of aeration, but above all the variation in the supporting action of the stockings. On principle, this force is greater below than above in order to facilitate the return circulation. Moreover, one can arrange in places more flexible zones, for example at the place where there is a varicose vein, where phlebitis has occurred, etc.

Figure 13 shows an example of a stocking made according to these principles. It will be seen that the holes are nearer together at the upper part and further apart at the lower part.

Fig. 14 shows a suspensory constituted by means of a rubber sheet *a* having a great number of perforations a^1 so as to ensure a very complete aeration. On the middle line is provided a band *l* having very few or no perforations, thus forming a corresponding reinforcement at this line. The perforations can also be less numerous in the portions l^1 serving for suspending the device.

The perforations can be uniformly or differently distributed, according to circumstances, in the various parts of the device. In this way, the compression can be rendered stronger on one side than on the other. By these means, it is possible to obtain a retaining action which has never been realized in any existing device.

The new system has, moreover, the great advantage that it can be washed and instantaneously, this permitting to immediately replace it in position.

It is also possible to constitute, in a quite similar manner, a breast-support having the same advantages.

Fig. 15 shows the application of the invention to braces.

As illustrated the entire brace *q* is perforated with a great number of small holes, still presenting the essential advantages which consist in ensuring the aeration and modifying the properties of resiliency.

The tabs can be made of perforated rubber or of fabric.

The new braces are provided on either side with a very wide shoulder piece *r* which prevents the cutting of the shoulder, the wear of the linen and the uncomfortableness produced by the narrow bands of ordinary braces bearing on the shoulders. With the present braces, the bearing is exerted on a large surface.

Rubber has the advantage of not slipping on the linen. The shoulder piece remains therefore perfectly in place, notwithstanding the movements of the person wearing these braces. The width of this shoulder piece further increases the adherence and fixedness of the braces.

The invention has another very interesting application for the constitution of suspenders for men.

The existing suspenders produce a compression of the superficial veins which is very injurious, as it produces varicose veins or aggravates them. Moreover, they slip along the calf if the latter is thin.

The suspender forming the subject-matter of the invention and shown in Fig. 16 com-

prises a sheath, having a diameter of 5 to 6 centimeters or even more. This sheath is provided with numerous and large openings so as to constitute real meshes. In fact, the pressure on the calf must be small. From place to place are provided reinforcing bands *l* which are connected to the suspension bands *t* of the sock.

With this suspender having a large surface, no strong compression is produced. Owing to the considerable suppleness obtained by forming numerous openings in the rubber sheet; the leg is compressed but very gently; the sheath follows the movements of the muscles and facilitates the circulation of the blood in the veins by slightly contracting after distension.

It adheres to the leg owing to the increase of surface and to the properties of adherence of rubber; the latter can moreover be striated for increasing these properties. In these conditions, although it does not compress the leg, the suspender cannot slip.

It can be made of rubber of various natures, pure Pará or mixed rubber and present any suitable colours or designs.

The sheath *s* can open and it is then provided with a fastener, or it can be continuous for forming a garter.

Finally, by means of bands of rubber perforated in the same conditions as those already described, it is possible to constitute garters having advantages similar to those indicated.

The above arrangements are only given by way of example; the forms, dimensions, materials and all detail arrangements can be varied without departing from the nature of the invention.

Claim:

In an abdominal retaining or like device, a band or strip made of rubber, said band or strip having perforations therein relatively arranged and related so as to produce a gradually increasing elasticity from one edge of the band or strip toward the opposite edge of the band or strip and so as to produce divergent narrow zones of relatively slight elasticity extending obliquely in the band or strip between said edges of the band or strip, said narrow zones of relatively slight elasticity diverging from the first named edge of the band or strip toward the opposite edge of said band or strip.

The foregoing specification of my "improvements in apparatus for containing or retaining the human body or that of animals, for medical, surgical and hygienic purposes," signed by me this 8th Day of December, 1924.

LOUIS MARIE CLÉMENT CHARNAUX.