Aug. 18, 1959 C. M. L. L. BOURCIER DE CARBON 2,899,685

RESILIENT STILTS

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FIG. 1.

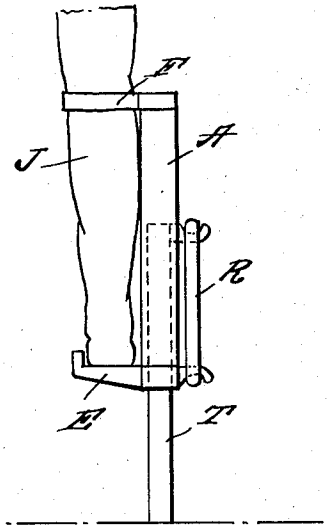
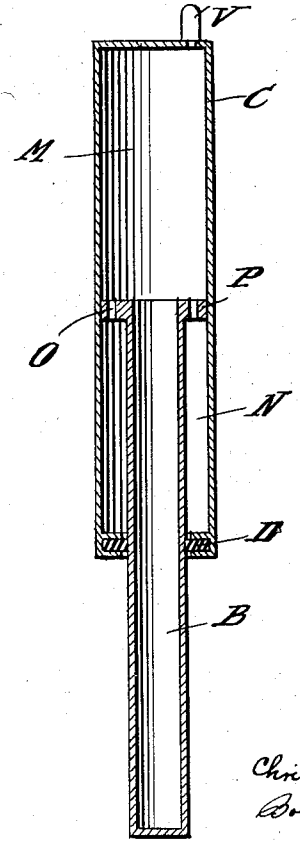


FIG. 2.



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RESILIENT STILTS

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2 Claims. (Cl. 3—4)

This invention relates to resilient stilts and has for its general object the provision of novel and improved resilient or elastic stilts which involve the use of pneumatic cushioning devices.

Caricaturists and humorists have already dreamed of arranging coil springs, that is to say, metal helical springs, under the sole of the shoes of imaginary personages so as to thus constitute a kind of portable springboard, making it possible to effect spectacular jumps, for example to jump over the roofs of houses. In this simple form, this idea actually constitutes only a Utopian dream and this for several reasons:

(1) In order to jump to a certain height simply because of the elastic strength of the spring, it is necessary to have a sufficiently long stroke of spring. Under such conditions of length, a coil spring would not be laterally stable and would become deformed in all directions, giving rise to the well-known phenomenon of buckling when one would try to make it work.

(2) In order to permit the making of appreciable jumps, that is to say, in order for a man to jump to a certain height, the spring would have to be able to store a corresponding quantity of power, that is to say, a considerable number of kilogram-meters. Now a metal spring can store without breakage, only a comparatively small quantity of kilogram-meters, per kilogram of metal. If one calculates the order of magnitude, one easily realizes that in order to make jumps of considerable height, it would be necessary to place under each foot some rather heavy springs and therefore, it would be very uncomfortable.

In the over-simplified form of a metal coil spring, the elastic sole is therefore only a humorous idea of Utopian quality, without any practical interest, because it constitutes a contradiction with the actual properties of matter and in particular, the properties of metal springs. However, this Utopian idea, provided that it is assisted by a suitable technical analysis, may be considered as containing latently, the germ of one of the most curious inventions, namely, the pneumatic stilt, and actual seven-league boot.

From the preceding analysis, it results as a matter of fact that a jumping skate or a portable jumping board must, first of all, comply with the following two conditions:

(1) It must permit a rather long expansion stroke, vertically, and a stroke as large as possible.

(2) It must allow the sole to move only longitudinally in the direction of the leg and it must absolutely prevent any transverse displacement.

These two absolute requirements can be complied with and this is the first aspect of the present invention—by making the jumping apparatus in the form of a stilt with an elastic leg.

Other objects and features of novelty will be apparent from the following specification, when read in connection with the accompanying drawings in which one embodiment of the invention is illustrated by way of example.

In the drawings:

Figure 1 is a view in elevation of a stilt having elastic or spring supporting means; and

Figure 2 is a vertical sectional view of a pneumatic device which is used in providing a pneumatically supported stilt in accordance with the invention.

Referring to Figure 1, the invention essentially consists of a stilt consisting of two parts:

(1) A framework A which is substantially rigid with the leg J (Figure 1) and, for example, is fastened to the latter on the one hand by a stirrup E on which the foot will rest or by any other equivalent fastening system, and on the other hand, by a belt F tightly secured to the leg below the knee.

(2) A vertical rod T which is rigid and is arranged so as to extend beyond the leg as in the conventional stilt, is so mounted as to be capable of sliding in the framework A and is elastically connected with this framework, so as to flex to a greater or lesser extent under the load like a spring.

The core of this elastic connection could be a metal spring, for example, a coil spring which would have the drawback already pointed out of being rather heavy.

In order to reduce the weight, one could use a rubber spring, such a spring making it possible to store a greater amount of energy for the same mass of matter. Such a rubber spring could be made, for example, by a ribbon or tape R, Figure 1, or a ring or a series of rubber rings.

However, the spring which for a given weight makes it possible to store the greatest quantity of mechanical energy, is the pneumatic spring. The preferred form or shape of the elastic stilt is therefore the pneumatic stilt and this also is one of the most important aspects of the present invention.

Such a pneumatic stilt is essentially constituted on the one hand by cylinder C, Figure 2, closed at its upper end, this cylinder playing the part of the framework A of Figure 1, and on the other hand by a cylindrical rod B (corresponding to part T in Figure 1) which slides in cylinder C and protrudes partly outside of the latter, these two members movable with respect to each other, thus constituting an inner receptacle of variable volume due to the packing D carried on the lower part of cylinder C.

Also, the cylinder C is provided with an inflating valve V making it possible to inject inside the said receptacle air under pressure so as to extend the rod B outwardly thus constituting a veritable pneumatic spring. The rod B may be solid but should preferably be tubular as shown in Figure 2.

Furthermore, in order to assure the guiding of the cylindrical rod B, the latter may be provided at its upper part with a flange or pseudo-piston P, sliding without any appreciable play inside the cylinder C and perforated with openings O so as to provide relatively unrestricted communication between the receptacles M and N. The whole rod and flange assembly constitutes a plunger member having a sealed or packed sliding relation with the cylinder member, and is of a volume which causes an appreciably increased compression of the compressible fluid in the cylinder when the two members are telescoped and successive increments of the plunger enter the cylinders.

Furthermore, also, a few cc. of oil could be injected above the packing gasket D so as to lubricate the gasket.

The pneumatic stilt which is the subject matter of the present invention will make it possible to make very spectacular jumps because it will operate like a portable jumping board which is perfectly elastic and the reaction force and the extension stroke of which may be as great as desired. The sole loss of energy or power at each jump will be the one due to the friction of the gasket D under rod B, but today we know how to make packing gaskets the friction of which is very low.

The elastic stilt may also be used to improve the performances in running races and walking—the essential reason being that the speed of man on his own legs is very limited and is especially fatiguing so that running is nothing but a succession of leaps and at each leap, the energy of the vertical component of motion must first of all be entirely destroyed due to the negative muscular work (negative work which also causes as much fatigue as positive work as is well known by all those who traveled long stretches down mountains), before it is again reconstituted by positive work of the same muscle. This is the essential reason why the energy yield when running races is very low and this is also why performances in racing remain very limited even when the slope favors the run because in such a case although the positive muscular work is reduced, this is almost compensated from the point of view of fatigue by the increase in negative work which absorbs power or energy and which also creates fatigue.

This poor yield of power in running explains why a man on a bicycle can move more rapidly with less fatigue by simply using his muscular energy in spite of the resistance to the rolling of the tire on the ground, which resistance is not negligible. The elastic stilt operates particularly without any dissipation of energy, the energy of the fall not being destroyed but only stored and made available for the next jump. The use of elastic stilts will, therefore, permit man to walk or to run much faster and with much less fatigue. The progress in this field will probably be comparable to that obtained by the use of a bicycle, with the advantage of being able to jump without any difficulty above obstacles and of being able to use any ground provided that it is sufficiently firm, while a bicycle demands ground which must be prepared for this purpose and in practice, cannot be used except on roads and highways.

Actually, there is concerned in this connection an entirely novel sport of many varied aspects which will enable the user of the stilt, thanks to displacement in three dimensions, to experience an entirely novel sensation which might be termed that of semi-flight. This is the dream of the seven-league boot finally made into a reality due to a rational technical analysis.

However, the more spectacular and more sensational aspect of this new mode of locomotion is that of a novel down-hill sport which could be to a certain extent compared with skiing. As a matter of fact, the reason why skiing, and in particular mountain skiing, is so successful, is because of the sensation of space and of motion and even one could say of trajectory which it permits its fans to experience. It is obvious that sensations of this kind and perhaps even more intense than those experienced when simply sliding on skis can be expected from this new sport if it is considered as a down-slope sport. As a matter of fact, it will be possible to make jumps of

considerable magnitude very easily and almost without fatigue, inasmuch as the necessary energy is automatically supplied at each jump or leap as a result of the difference in levels.

In order to make it possible to retain one's equilibrium, it will be advantageous to practice this downhill sport with a supporting stick in each hand as is done when skiing, and this, furthermore, increases the similarity between the two sports. Finally, the same means for reascending mechanically which are used in winter for skiing could be used in summer for this new down-hill sport.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent is:

1. A jumping device particularly for sport use comprising a hollow cylinder closed at the top, a plunger rod entering the cylinder through the lower end thereof and adapted to reciprocate therein, an airtight sealing packing at the lower end of the cylinder through which the plunger rod passes, the lower end of said plunger rod comprising the ground contacting portion of the device, a supply of gas under pressure in said cylinder, said plunger having at its upper end portion a flange, the peripheral margin of which is in free sliding contact with the inner wall of the cylinder for the purpose of axial guidance only, the flange being provided with openings large enough for the free passage of gas therethrough so as to place the space in the cylinder above the flange and the space beneath the flange between the flange and said packing and surrounding the plunger in free communication with each other.

2. The jumping device as set forth in claim 1 in which the plunger member is hollow, having a closed lower outer end and having an open upper inner end communicating with the compressed air-filled interior of the cylinder, thus serving to increase the volume of compressed air within the system, and in which the cylinder is provided with means for securing it to one of the lower limbs of the user.

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