United States Patent [19]

Moore

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[54] **BUFFER COIL**

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[52] **U.S. Cl.** **267/152**
[51] **Int. Cl.** **F16g 1/36**
[58] **Field of Search** .... 267/152, 153, 33; 206/46 FC; 215/100 R

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[57] **ABSTRACT**

A coil having a core fashioned from a strip of coiled spring steel and a thick jacket, completely surrounding the core, of flexible polyurethane foam. The coil can be easily wound by hand around the support rod for an intravenous feeding bottle to provide a buffer between the rod and a swinging bottle and eliminate the noise and possibility of breakage which would be present if the bottle banged into the bare rod. The spring steel core is formed into a flat, radially outwardly expanding coil with individual loops of equivalent normal diameter. As a result of this core design, the coil can be wound on the intravenous bottle support rod in the form of a helix which tightens itself axially and constrictively grips the rod to provide a wrapper capable of remaining in place without slippage. The polyurethane foam jacket acts as a sound and shock absorbing barrier around the rod on which the coil is installed.

10 Claims, 9 Drawing Figures

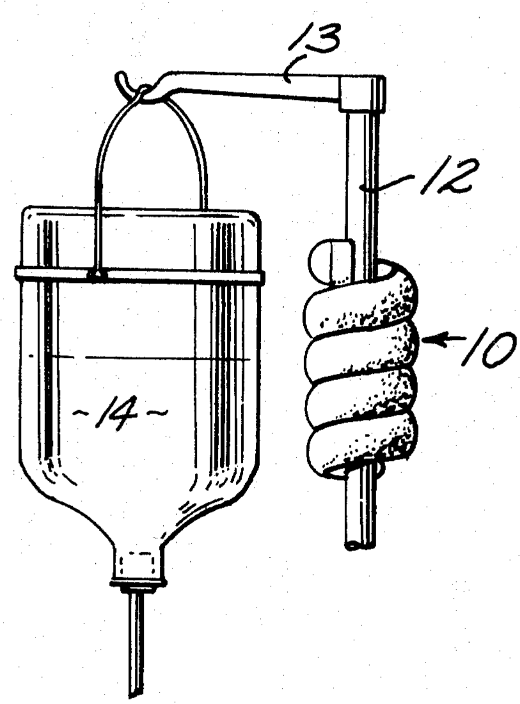


FIG. 1.

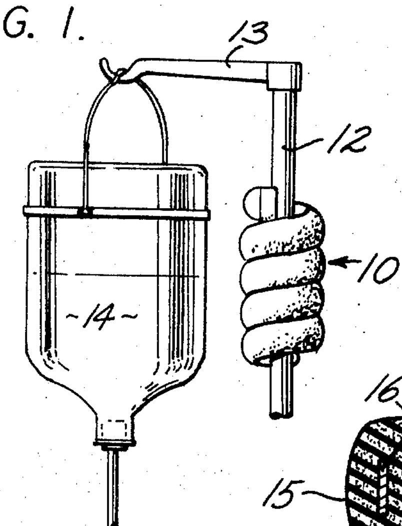
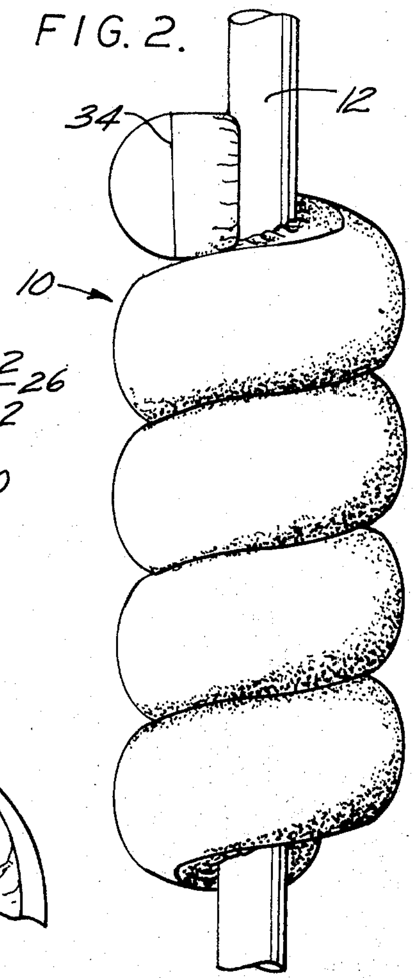


FIG. 2.



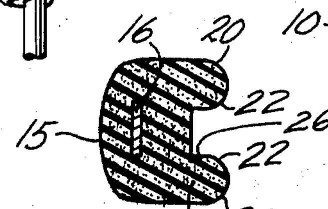


FIG. 3.

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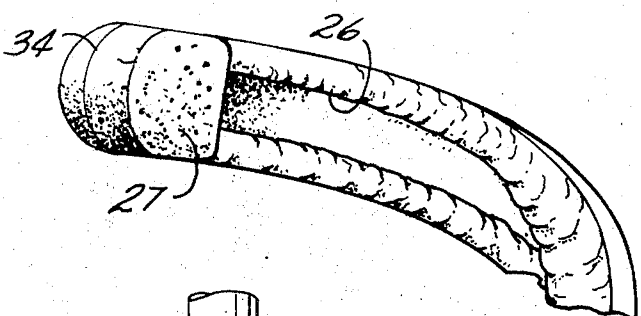


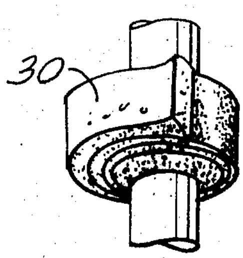
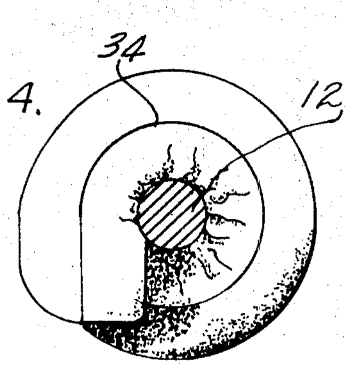


FIG. 6.

FIG. 4.



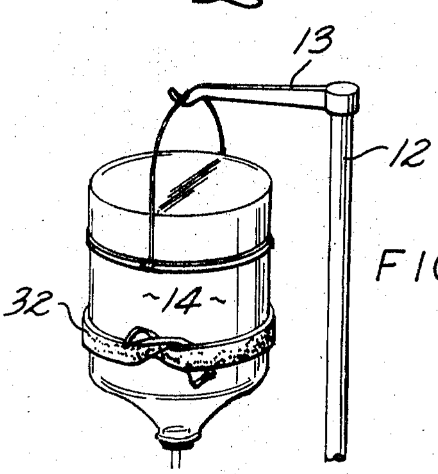


FIG. 7.

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FIG. 9

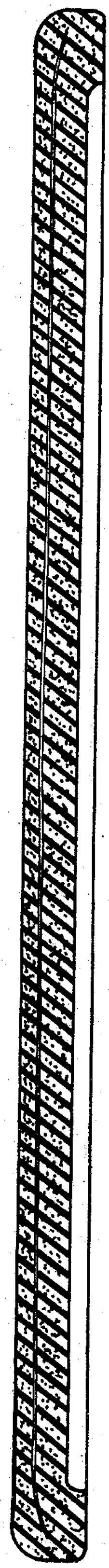
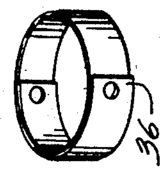


FIG. 8



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BUFFER COIL

BACKGROUND OF THE INVENTION

This invention relates generally to sound and shock absorbing cushioning means for use on an object subject to impact by other objects, and more particularly to a coiled form of such means which can be easily wrapped around a support rod for intravenous feeding bottles and has sufficient constrictive force to permit it to grip the rod and remain in place thereon without slipping.

Large numbers of patients in hospitals, nursing homes, etc., are fed intravenously every day. These patients receive their sustenance from liquid solutions in intravenous feeding bottles, which are typically suspended from cross arms, held in position by support rods, during the feeding process. This process is relatively slow, and it is frequently necessary to move patients from one place to another while it is in progress. At such times, it is not uncommon for the feeding bottles, which are normally suspended so as to swing freely about their points of support, to sway back and forth, frequently banging into their support rods to the dismay of the helpless patients umbilically joined thereto.

Swinging contact of intravenous feeding bottles with their support rods, which latter are generally made of a hard metal such as steel, creates a great deal of noise, to the annoyance of patients and others nearby, such as, for example, hospital employees. Sometimes this noise passes beyond mere annoyance and causes actual harm to patients, especially where the patients are gravely ill, or extremely vulnerable to the effects of shock, as, for example, during periods immediately following serious operations. Furthermore, there is always a danger of bottle breakage when an intravenous feeding bottle hits its support rod. While such breakage is not frequent, because intravenous feeding bottles are usually manufactured from shock resistant glass, should it occur the results could be, in some cases disasterous.

For the above-indicated reasons, doctors, nurses, hospital attendants, etc., have long recognized the desirability, and, in some instances, the necessity, of preventing shock impact between the swinging intravenous feeding bottles of patients being moved from one location to another and the support rods of these bottles. Various ways of accomplishing this, such as, for example, the wrapping of towels or rags around support rods, have been tried, but never, to my knowledge, with very satisfactory results. Although the use of a towel or rag as a shock absorbing support rod wrapper has some merit as a temporary expedient, it is a poor substitute for a truly effective solution to the problem. For one thing, the tying of a towel or rag to a support rod is not particularly easy or simple, and, once tied, the towel or rag often has a tendency to slip on the rod and is only partially effective as a buffer because of its limited cushioning or shock absorbing ability.

No one has yet, to my knowledge, come up with an easily installable, highly effective sound and shock absorbing buffer for use on intravenous feeding bottle support rods, although a critical need for such a buffer has long existed in the medical profession.

SUMMARY OF THE INVENTION

I have, by this invention, provided a novel buffer coil uniquely suitable for use on an intravenous feeding bottle support rod absent the above-noted disadvantages of the makeshift prior art rag or towel. Thus, the buffer coil can be quickly and easily installed on a support rod by anyone of average manual dexterity, with one hand if necessary, and once so installed, the buffer is self-gripping to a sufficient extent to remain in place on the rod with practically no possibility of slippage. Moreover, the buffer coil has maximal shock absorbing and sound deadening ability for the protection of bottles which bump into it, and the ear drums and nerves of patients, and others, who would otherwise be exposed to the jangling noises of contact between the bottles and the bare rod.

In addition to possessing the above-noted advantages, the buffer coil of this invention is of simple construction and relatively inexpensive to produce, as well as being of interesting and attractive appearance. It is also strong, durable and suitable for use on intravenous bottle support rods of varying shapes and sizes. The buffer coil holds itself in position on a support rod largely, as will be seen, by an inherent constrictive force and it is not limited to use on rods, or similarly shaped objects. Thus, the buffer coil can be employed on an object of other than round cross section, and is capable of holding itself in position thereon, even though it does not make uniform pressing contact around the sides of the object. A rod or post of square, octagonal, or other noncircular cross section would be an example of such an object.

My novel buffer coil has a coiled inner core formed from spring steel, or the like, which is principally responsible for its constrictive ability to hold itself in place on an intravenous feeding bottle support rod, and a thick-walled jacket of a resilient sound and shock absorbing material, such as, for example, flexible polyurethane foam, serving as a cushion around the core which gives the coil its buffering properties. As will be seen, the jacket is form-fitting in the sense that it follows the coils of said core, and therefore does not hide or camouflage the coiled character of the latter, although its thick walls impart a swollen appearance to these coils. The core is fashioned from a thin strip of spring steel, or the like, somewhat in the shape of a flat coil spring with radially outwardly extending loops of successively larger diameter. The core differs, however, from a conventional coil spring in that its loops are of equivalent normal diameter (although all but the inner one of the loops are, of course, expanded to successively larger diameter sizes when the core is in its normal flat, or radially wound, form), so that the buffer coil has substantially uniform constrictive force throughout its length when wound around an intravenous feeding bottle support rod in its preferred position os use, which, as will be seen, is in the form of a helix.

For reasons made clear hereinafter, the preferred helical configuration of use of my novel buffer coil is made possible by the jacket of shock absorbing material around the core of the buffer coil, since the thick side walls of the jacket prevent the core, or core spring, as it will hereinafter be called, from assuming its normal flat, or radially wound, configuration when the buffer coil is helically wound around an intravenous feeding bottle support rod, or the like. The core spring in the helically wound buffer coil is, of course, biased toward its normally flat, radially wound shape, and this is advantageous in helping to draw the loops of the buffer coil helix more closely together into a tight wrapper around the support rod. The loops of the core spring in the buffer coil helix are generally distended radially outwardly in use and this creates the aforesaid constrictive force, which causes the buffer coil to constrictively embrace the support rod and hold itself in position thereon. Very little stretching deformation (radial expansion) of the core spring loops is required to give the buffer coil an adequate frictional hold on the support rod since the coil is extremely light in weight and there is a certain amount of frictional holding potential in the jacket of the coil itself, which is resiliently compressible to exert gripping force on the support rod when compressed against the walls of said rod in use.

From the foregoing, it will be apparent that my novel buffer coil is sufficiently versatile to fit intravenous feeding bottle support rods, or the like, of a fairly wide variety of sizes. The relatively light weight of the buffer coil, plus the potential holding force in the buffer coil jacket, referred to above, and the thick character of the jacket walls, make it possible to use the buffer coil on very slender rods in which the core spring is stretched or expended only slightly, if at all, as well as on much thicker rods (where the core spring is greatly stretched or expanded by the rod shafts). Although the lightweight character of my novel buffer coil has not heretofore been stressed, it should be pointed out that this, for reasons now believed obvious, is an important feature of my invention. The buffer coil is, of course, light in weight because the material from which its shock absorbing jacket is made is typically a flexible plastic foam, such as, for example, flexible polyurethane foam, and it is common knowledge to those skilled in the art, that such materials have a low density cellular structure.

It is a principal object of this invention to provide sound and shock absorbing means which can be easily installed on intravenous feeding bottle support rods, is capable of remaining in place on the rods when so installed, and is capable of cushioning or buffering the impact of those swinging intravenous feeding bottles which would otherwise bang into the rod, to prevent the noise and possibility of bottle breakage otherwise resulting from the impact.

It is another object of the invention to provide such shock absorbing means of interesting appearance and intriguing convertibility into a number of different shapes, at relatively low cost.

Other objects, advantages and features of the invention will become apparent in the light of subsequent disclosures herein.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevation of an intravenous feeding bottle hanging from an arm on a support rod, the support rod being shown fragmentarily and a preferred embodiment of a buffer coil in accordance with this invention being shown in an installed position of use on the rod.

FIG. 2 is an enlarged view of the support rod and buffer coil of FIG. 1, the rod being shown fragmentarily.

FIG. 3 is a cross section of the helically wound buffer coil taken at about its midpoint.

FIG. 4 is a top view of the buffer coil in its FIG. 2 position on a support rod, the support rod being shown in cross section.

FIG. 5 is a perspective view of an end segment of the buffer coil, as seen from the underside.

FIG. 6 is a perspective view of another embodiment of the buffer coil wound in overlapping loops around a fragmentary segment of a rod.

FIG. 7 is a perspective view of the FIG. 1 intravenous feeding bottle and support rod assembly with a buffer coil similar to that shown in FIG. 6, drawn to a reduced scale, fastened around the intravenous feeding bottle with its ends tied in a way to assure constrictive embracing of the bottle by the buffer coil.

FIG. 8 is a perspective view of a core spring element of the FIG. 2 buffer coil, showing the element as it appears in its natural configuration apart from the coil.

FIG. 9 is a longitudinal sectional view of the FIG. 2 buffer coil, as it appears when stretched to its full length.

DESCRIPTION OF PREFERRED EMBODIMENTS

Considering now the drawings in greater detail, with emphasis first on FIGS. 1–5, 8 and 9, there is shown generally at **10** a preferred embodiment of a buffer coil in accordance with this invention. FIG. 1 shows buffer coil **10** installed helically around a support rod **12** for an intravenous feeding bottle **14** hanging from an arm **13** affixed to the upper end of the support rod.

Buffer coil **10** is made up of an inner core spring **16** and a thickwalled surrounding jacket **18** formed from a shock absorbing plastic foam material, preferably flexible polyurethane foam. The core spring **16** is formed from a thin strip of spring steel in the general shape of a coil spring with a plurality of radially wound turns, or loops, as shown in FIG. 8. The core spring differs from a conventional coil spring, however, in that all of its turns, or loops, are shaped to circles of equivalent normal diameter, by which is meant the loop circles are of equivalent diameter when the loops are formed, not when they are wound into the shape shown in FIG. 8.

The shock absorbing jacket **18** completely envelopes core spring **16**, so that no part of the latter is visible. The jacket has a groove **26** running for most of the length of its bottom, but terminating an equivalent distance short of either end thereof, as illustrated in FIG. 9. Buffer coil **10** is of substantially the same cross-sectional size and shape throughout most of its length, differing in such size and shape only in those end segments beyond the ends of groove **26**, where the bottom of the coil is substantially flat, as shown at **27** in FIG. 5.

Because core spring **16** is of normally flattened (radially wound) shape (as shown in FIG. 8), rather than of helical shape, it has an inherent urge to return to this shape when axially deformed, as by being pulled into the shape of a helix. Furthermore, since the loops, or coils, of the spring are of uniform normal diameter, each exerts essentially the same constrictive force as any other on an object of given size and shape embraced in the same manner thereby. The presence of jacket **18** around the core spring makes it possible to coil the spring helically, as illustrated in FIGS. 1, 2 and 4 of the drawings. While the thick walls of jacket **18** prevent core spring **16** from flattening into its normal radially wound shape, the spring has an inherent bias toward this shape, as a result of which it tends to draw its loops, or coils, tightly together. Also, because of the thickness of the bottom wall of jacket **18** the buffer coil has a relatively small axial opening when it is wound into the helical configuration illustrated in the drawings. While this helical configuration has been illustrated in the form of a winding around a rod in the drawings, it should be understood that the buffer coil can be formed into a helix in the absence of a rod, or other encircled object, and will remain in that shape until it is twisted into another one. In this connection, the buffer coil can be easily twisted, or formed, into any of a variety of shapes, some of interesting character, to give it an added dimension of appeal as an intriguing toy or novelty item. As will by now be evident, buffer coil **10** can be wrapped helically around any rod of larger diameter than the aforesaid axial opening of the resulting helix, and will exert sufficient constrictive force on the rod to hold itself in position thereon. Furthermore, the helical wrapping can be made to run in either direction (clockwise or counterclockwise, as viewed from above), because the physical character of the core spring permits such diversity of twist direction in the buffer coil, and ready convertibility of the coil from one to the other twist direction by a simple hand manipulation of a type obvious to anyone after a few moments of experimentation with the buffer coil.

As explained below, jacket **18** is cast as a straight molding rather than a coiled one. Core spring **16**, which is, of course, embedded in the molded jacket, as a part of the finished buffer coil, thereafter forces the latter into its coiled configuration. It will thus be apparent that the lower half of jacket **18** is normally in compression, and its upper half in tension, as a result of this coiled shape. The presence of groove **26** in the bottom of jacket **18** increases the pliability of the bottom portion of the buffer coil to permit tighter and more effective coiling, and utilization, of the latter. Groove **26** is not a critical feature of the buffer coil, however, but only contributive to more effective functioning thereof. It is thus within the scope of my invention to provide buffer coil jackets without bottom grooves, or with bottom depressions or hollows of different character than groove **26**. Such depressions, for example, could be formed by casting buffer coil jackets having bottom grooves divided into separate segments by means of uniformly spaced cross partitions. The casting of buffer coil jackets with bottom depressions such as these can be readily accomplished through the use of properly designed molds.

While the size and shape of my buffer coil can, of course, vary within the scope of my invention, the preferred coil configuration, as presently contemplated, is the same as that illustrated in FIGS. **1–5** and **9** of the drawings. Preferably, the cross-sectional dimensions of this configurational embodiment of the buffer coil correspond to those of a 1-inch square with its corners rounded and a depression with rounded edges (defining the cross section of a groove such as groove **26**) in its lower side. The rounding of its top corners is such that the periphery of the upper portion of the buffer coil cross section, when the buffer coil is in its straight (molded) form, corresponds to a semicircle of ½-inch radius, although the semicircle is somewhat flattened in the coiled buffer coil because of the above-noted tension in the upper portion of the buffer coil when it is in this (coiled) form (see FIG. **3**, which illustrates at **15** the flattening effect of coiling on the top of the buffer coil). The rounded outer corners of the bottom of the buffer coil cross section correspond to arcs of a circle of ⅜-inch diameter, as do the rounded edge corners of the aforesaid groove depression. These rounded bottom and depression edge corners are shown at **13** and **17**, respectively, in FIG. **3**.

The length of the straight (uncoiled) buffer coil is preferably 22 inches, but could, of course, vary from this throughout a relatively wide range. Jacket **18** of the buffer coil extends beyond the ends of the core spring of the coil to form a protective cushion therearound, primarily to eliminate the possibility of contact between the ends of the core spring, which might be sharp or jagged, and the hands of persons using the coil. I have made a number of buffer coils of the above-specified size and shape and found extension of the resilient jacket corresponding to jacket **18** ⅜-inch beyond each end of the core spring adequate to provide a suitable cushion over the ends of the core spring for the protective benefit of individuals using the buffer coil.

The spring steel from which core spring **16** is formed is preferably blued steel of the type employed for the manufacture of clock mainsprings. This material is commercially available in uncoiled strip form. I have found that permanent coils of the desired diameter can be set in a strip of steel such as this by rolling the strip around a rod until the proper coil forming tension is created in the metal. In those buffer coils referred to above which I have made in accordance with preferred size and shape specifications (the shape being like that of illustrated buffer coil **10**), the core springs were fashioned from blued steel strips of about ⅜-inch width and 0.008-inch thickness, and had free coil diameters of one inch. By free coil diameter is meant the normal diameter of a coil or loop under no stress to cause its deformation, such as the stress an outer loop of a core spring is under when the spring is in its normal radially wound configuration. The thickness of core spring **16** is exaggerated in FIG. **3** for better illustrative effect. This is of significance, however, only insofar as preferred spring thickness is concerned, since this dimension is not critical so long as the core spring functions generally in accordance with the teachings herein. The same thing is true of the material from which the core spring is made, and it can be fashioned from any material, metallic or otherwise, having suitable properties for the intended purpose.

Buffer coils in accordance with this invention can, as previously indicated, be utilized in other than the helical configuration illustrated in FIGS. **1**, **2** and **4** of the drawings, two such other configurations being shown in FIGS. **6** and **7**. In FIG. **6**, a buffer coil **30** is shown wound radially outwardly around a support rod to form a coil approximating, in appearance, the natural coil of its core spring. Buffer coil **30** differs from buffer coil **10** in having a rectangular cross-sectional shape with square, rather than rounded, corners, and no groove in its bottom, but is similar to buffer coil **10** in having a flat core spring with a thick-walled surrounding jacket of a resilient plastic foam. Buffer coil **10** could, if desired, be wound around a rod, or similar object, in the same way buffer coil **30** is so wound in FIG. **6**. FIG. **7** shows a buffer coil **32**, of similar character to buffer coil **30**, encircling intravenous feeding bottle **14**, with its ends so looped, or entwined, as to pull against each other and tighten the coil around the bottle.

The buffer coil of this invention is preferably made by casting a suitable plastic foam around a core spring of predetermined length to form a sound and shock absorbing jacket, such as jacket **18**, therearound. Any means of accomplishing this can, of course, be employed within the scope of the invention, but I prefer to carry out the casting operation in a two-piece mold in which the core spring has been stretched to its full length and is held in position while the plastic foam is formed and cured around it. When the finished buffer coil is removed from the mold, it automatically assumes a coiled position as a result of the coiling energy in its embedded core spring. I have prepared a mold suitable for the casting of buffer coils shaped similarly to buffer coil **10** in this manner, and satisfactorily formed a number of such buffer coils therein. This mold was made with separable top and bottom halves capable of being clamped together, each of the halves having an elongate depression which forms, with the depression in the other half of the clamped mold, a hollow in which the buffer coil jacket is formed. The elongate depression in the bottom half of the mold has a central ridge running for most of its length which serves to form a groove, such as groove **26**, in the bottom of the buffer coil jacket. The use of a mold such as this, with top and bottom halves, generally results in the formation of a line around the sides and ends of the molded buffer coil where the two halves meet, such a line being shown at **34** in the drawings.

As previously indicated, the preferred material of construction for the resilient jacket of the buffer coil of this invention is a flexible polyurethane foam. Many such polyurethane foams are known to the art, all of which are prepared by reacting organic ocmpounds having as their sole reacting groups isocyanate (NCO) groups, other organic compounds having as their sole reacting groups hydroxyl (OH) groups, and a small amount of water. The isocyanate containing compounds react with the hydroxyl containing compounds to form urethane polymers. The water which is present reacts with terminal NCO groups on the isocyanate compounds, thus releasing CO_2. The released CO_2 forms bubbles in the polymerized mass, which imparts a cellular or foamed structure thereto.

The hydroxyl containing reactants of the polyurethane reaction mixture, hereinafter referred to simply as polyols, are typically glycols, polyesters or polyethers of moderately high molecular weight and low degree of branching. The preferred polyols are polyethers having hydroxyl numbers in the range of 40 to 70. These polyethers are typically condensates of polyhydric alcohols, such as glycerol, sorbitol, trimethyolpropane, or the like, often reacted with small amounts of ethylene oxide, propylene oxide, or mixtures thereof, to provide terminal primary hydroxyl groups for increased reactivity.

The isocyanate containing starting materials of the polyurethane reaction are typically diisocyanates, and can be selected from a large group of such compounds well known to those familiar with the technology of resins and plastics. Preferably, the diisocyanate starting material will be a blend of 2,4-tolylene diisocyanate and 2,6-tolylene diisocyanate, although either of these compounds can be employed alone if desired. The blend most generally used consists of 80 percent of the 2, 4 and 20 percent of the 2,6 isomers of tolylene diisocyanate.

Catalysts are employed in the polyurethane reaction to accelerate the foaming action and obtain the proper cure. Various materials are well known to organic chemists as suitable catalysts for this purpose, among which are the tertiary amines, such as, for example, triethyamine; triethylenediamine; N,N,N'N'-tetramethylethylenediamine; N,N,N'N'-tetraethylethylenediamine; N-methylmorpholine; and the like; and mixtures thereof. The amount of catalyst employed is generally within the range of about 2.0 percent by weight based on the total weight of reactants in the polyurethane foam reaction mixture. Additives of various types, such as, for example, surface active agents, cell stabilizers, flame retardents, dyes, inert fillers, and the like, are employed in the formulation of flexible polyurethane foams. These additives are all well known to those skilled in the art, and need not be identified in further detail here. Also, a small amount of a volatile halogenated hydrocarbon can be employed as a blowing agent in the polyurethane mixture, in conjunction with water, if desired.

Polyurethane foams are typically prepared by the so-called one-shot method, or by a prepolymer technique, both of which are conventional procedures, well known in the plastics art. In the one-shot method, all of the reaction components are brought together in the proper proportions and processed in accordance with conventional mixing techniques employing conventional equipment such as mechanical blenders, mixing nozzles, and the like. After thorough blending has been achieved, the mixture (which is fluid at this stage) is transferred to a mold, and allowed to foam and cure therein. One or more of the polyol components of the reaction mixture can be preblended with each other and/or any of the additive ingredients (see above) of said mixture. Such preblending is, of course, confined to ingredients which show no significant tendency to interreact.

In the prepolymer method of polyurethane foam preparation, the isocyanate containing starting material (polyisocyanate) is first reacted with a portion of the polyol to give an isocyanate-terminated prepolymer from which the polyurethane foam is subsequently prepared through reaction of the prepolymer with the remainder of the polyol in the presence of additives such as catalysts, blowing agents, and the like.

The buffer coil of the present invention is not limited to any particular method of preparation. I have found, however, that a buffer coil similar to buffer coil **10** can be made quickly, easily and relatively inexpensively in a mold such as that described above by first providing means for the removable installation of a pair of upright pins in the ends of the aforesaid depression in the bottom half of the mold, a feat easily accomplished by those skilled in the plastics molding arts in the light of present teachings. To the top of each pin is affixed a small hook, and each end of the core spring is provided with a small hole through which the hook easily fits. Prior to the casting operation, the core spring is stretched substantially flat, and the hole in each end slipped over a separate one of the hooks affixed to the pins so that the distended spring is held, by its own coiling tension acting on the anchored hooks, in outstretched position within the cavity of the assembled mold. The position of the spring is such that it is closer to the top, than the bottom, of the mold cavity, to assure good coiling flexibility in the jacket of the finished buffer coil.

In the above connection, I have discovered that too much jacket thickness above the core spring in the buffer coil tends to stiffen the latter and prevent it from coiling to best effectiveness. Where the buffer coil is of the preferred shape and dimensions set forth above, a ¼-inch core spring depth in the buffer coil jacket has been found most effective for good coiling flexibility in the buffer coil. The laterally arched shape of the top of the buffer coil jacket also contributes to this coiling flexibility. While the core spring is, as indicated above, held substantially flat during the jacket casting operation, there is, nevertheless, a slight longitudinal bow in the out-stretched spring because of its coiling bias. The core spring is mounted in the mold with the concave side of this bow down, in the manner illustrated in FIG. 9 of the drawings. A hook engaging core spring hole of the above-mentioned type is shown at **36** in FIG. **8.**

One other feature of the core spring of this invention, at least in its preferred form as described previously herein, is an inherent bias toward a slightly crowned configuration when stretched to its full length. This configuration (bowed in cross section) is believed to add stability against buckling or twisting to the distended bow spring after it is mounted in the lower half of the mold for the above-described jacket casting operation. The core spring, when so mounted, has the concave side of its crown down. This is not to imply that a core spring which is flat in cross section, rather than crowned, when mounted for the jacket casting operation would be unsatisfactory for use in my buffer coil, since any such spring capable of incorporation in the buffer coil, and of serving the needs of my invention as taught herein, can be employed in the buffer coil within the scope of said invention.

After the core spring has been stretched and positioned on the two pins removably anchored in the bottom half of the mold, as described above, the proper quantities of polyurethane foam ingredients are carefully weighed out and mixed vigorously, then poured into the depression beneath the spring in said bottom half of said mold. The polyurethane mixture has, by this time, reacted to a sufficient extent to begin its foaming action, and the top half is rapidly positioned over the bottom half of the mold, then the two halves are clamped together. The mixture in the mold continues to foam and swell until it fills the mold hollow, after which the mold is kept closed until the resulting foam has cured. The mold is then unclamped and the buffer coil and pins are removed from the bottom half of the mold. The hooks are worked free from the core spring of the buffer coil, and the pins pulled out through the bottom of the buffer coil jacket. While this leaves small openings in the jacket, the natural resiliency of the flexible polyurethane foam causes these openings to close and be effectively hidden from view. It is, howevr, a simple matter to permanently close the outlet ends of the openings with a suitable sealant, if desired. For all practical purposes, however, this is unnecessary.

Polyurethane casting resins suitable for my purpose are readily available from any of a number of commercial sources. I have employed several of these resins, typical of which is a formulation manufactured by the CPR Division of The Upjohn Company under the proprietary designation CPR 2018 polyurethane foam. CPR 2018 polyurethane foam consists of two component mixtures, one designated as Component R (a viscous liquid resin mixture) and the other as Component C (comprising a portion of the total polyol starting material in the formulation and a catalyst). Component R is a resinous tolylene diisocyanate-polyether mixture, the tolylene diisocyanate being initially present in the form of its 2, 4 and 2, 6 isomers and the polyether comprising most of the polyol in the CPR 2018 formulation. Component C is made up of a minor portion of the polyol and the aforesaid catalyst. As will now be apparent, the use of the CPR 2018 formulation involves a prepolymer casting technique, with component R constituting the necessary prepolymer. Where the CPR 2018 formulation is employed for the casting of a buffer coil jacket of the preferred size and shape set forth above, I have determined that a mixture of 30 grams of Component R and 1.8 grams of Component C is adequate to fill the mold and form a shock absorbing jacket of superior suitability for the purpose.

While, as I have indicated, flexible polyurethane foam is a preferred cushioning or buffering material for use in my buffer coil jacket, I wish to make it clear that the invention is not limited to the use of this particular type of foam, and any other foam, or equivalent, material possessing the necessary qualities of resiliency, strength, durability, etc., for purposes of the present invention can, if desired, be used in lieu thereof. An example of one such other material is flexible polyethylene foam.

While I have shown and described in considerable detail what I believe to be preferred embodiments of my invention, it will be understood by those skilled in the art that the invention is not limited to, and may take various forms other than, these particular embodiments. Moreover, although I have herein stressed the intravenous support rod applicability of my buffer coil, it will be understood that the buffer coil is not limited to this particular type of use, and can be employed in any capacity to which its unique versatility suits it. For example, the buffer coil can be employed to hold the stems of flowers together in a bouquet; the fastening of bottles, bundles, etc., together; the wrapping of cryogenic fuel lines for insulation purposes; as a shock absorbing spacer for units of various type; and in numerous other applications of a practical character as will suggest themselves to those skilled in the art in the light of present teachings. Finally, the unusual shape and intriguing physical characteristics of the buffer coil suggest its use as a toy or novelty item. One end of the buffer coil could, for example, be painted to resemble the head of a snake or worm to give it added appeal to small children as an interesting plaything.

In conclusion, the scope of the present invention is intended to embrace all variant forms thereof except insofar as limited by the language of the following claims.

I claim:

1. Buffer coil means in the form of an elongated resiliently coiled member which can be helically wound about an object to provide an energy-absorbing cushion or buffer therearound capable of remaining in place on the object, when so wound, through inherent constrictive force; said buffer means comprising a coiled core spring embedded in a relatively thick-walled, form fitting jacket of a resilient, energy-absorbing material.

2. Buffer coil means in accordance with claim **1** in which said core spring is formed with a plurality of radially wound coils from a strip of spring metal and said relatively thick-walled, form fitting jacket is of molded flexible plastic foam construction.

3. Buffer coil means in accordance with claim **2** in which said plurality of radially wound coils are of substantially equivalent free diameter.

4. Buffer coil means in accordance with claim **3** in which said spring metal is blued steel and said flexible plastic foam is flexible polyurethane foam.

5. Buffer coil means in accordance with claim **4** in which said relatively thick-walled, form fitting jacket extends beyond the ends of said core spring to provide a cushion thereover for the protection of those using the buffer coil means against contact with said ends.

6. Buffer coil means in accordance with claim **5** in which said relatively thick-walled, form fitting jacket has a transversely central groove running for most of the length of its bottom to provide better coiling flexibility thereof.

7. Buffer coil means in accordance with claim **6** particularly adapted for helically wound emplacement on the support rod for intravenous feeding bottles as a buffer against contact between the rod and swinging intravenous bottles supported by said rod, in which said relatively thick-walled, form fitting jacket has a generally semicircular top periphery, as seen in cross section when held in its straight or uncoiled form, to provide improved coiling flexibility in said buffer coil means, and in which said core spring is disposed in the flexible polyurethane foam of said relatively thick-walled, form fitting jacket at a minimum depth equal to approximately one fourth the distance from top to bottom of said jacket, when said buffer coil means is held in said straight or uncoiled form.

8. Buffer coil means in accordance with claim **7** in which said relatively thick-walled, form fitting jacket is approximately 22 inches in length, has maximum top-to-bottom and side-to-side dimensions of 1 inch each and in which said semicircular top periphery is of ½ inch radius.

9. Buffer coil means in accordance with claim **8** in which the bottom outer corners of said relatively thick-walled, form fitting jacket, and the edges of said central groove in the bottom of said jacket, are rounded to arcs of approximately 3/16 inch radius.

10. A method of making buffer coil means in accordance with claim **1** in the form of an elongate coiled member comprising a coiled core spring embedded in a relatively thick-walled, form fitting jacket of a resilient, energy-absorbing material; said method comprising the steps of stretching said coiled core spring into substantially straight form and holding it thereat; introducing a predetermined quantity of a mixture of flexible plastic foam-forming ingredients to the space surrounding the stretched core spring; confining said mixture to an elongate area defining the shape of said jacket; permitting said mixture to foam and cure within said area to form said jacket surrounding said core spring; and freeing the core spring from its stretched condition, whereby the resulting jacket with its embedded core spring assumes a coiled shape under the coiling inducement of said core spring.

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