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ROLLER FOR MOVING HEAVY OBJECTS

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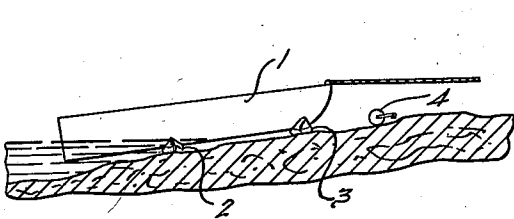


FIG. 1.

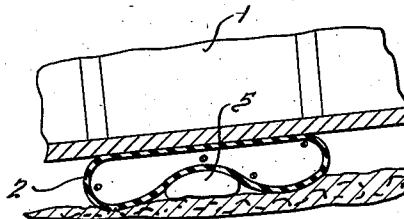


FIG. 2.

FIG. 4.

FIG. 3.

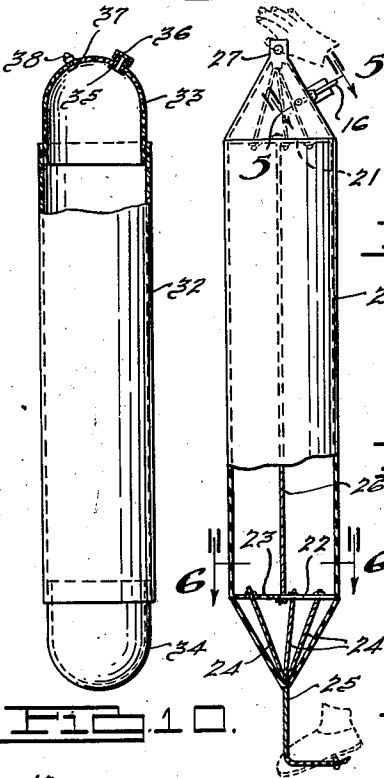


FIG. 10.

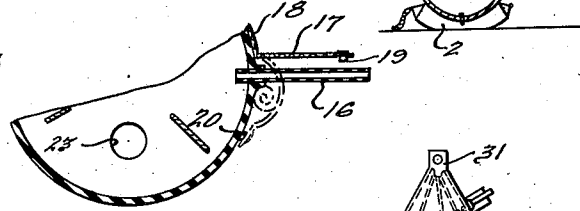


FIG. 5.



FIG. 6.

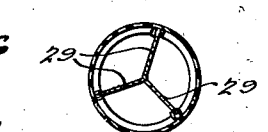


FIG. 7.

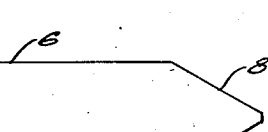


FIG. 8.

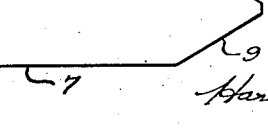


FIG. 9.

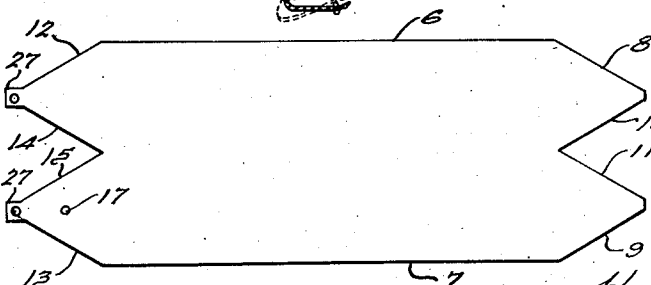


FIG. 7.

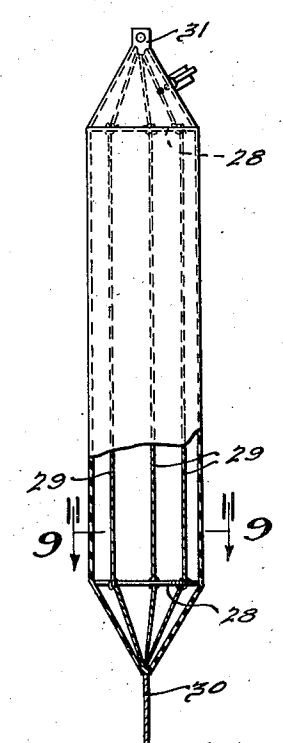


FIG. 8.

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ROLLER FOR MOVING HEAVY OBJECTS

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2 Claims. (Cl. 280—3)

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The present invention relates to a roller for use in moving heavy objects and particularly useful in hauling out boats.

Cylindrical rollers have been used from time immemorial to move heavy objects. Such rollers have been employed frequently to facilitate pulling boats up on the land when they are too heavy to be carried conveniently by hand. The use of such rollers greatly facilitates the operation of moving any object, but it is subject to the disadvantage that the rollers do not roll freely on irregular surfaces. Since the shore line of most bodies of water is rather rough and irregular or is undesirably soft, it is generally necessary, when hauling out a boat, to provide ways on which the rollers rest. The necessity of providing not only relatively large and heavy rollers but also the ways required for such operations has entirely prevented the use of rollers on most occasions when it is desirable to pull a boat up on a shore.

Accordingly, it is the general object of the present invention to provide an improved roller for the purpose mentioned which not only rolls freely on extremely irregular surfaces and soft or sandy ground but which is convenient to transport or stow in a boat and which, if desired, may be used as a life preserver.

A further object of the present invention is to provide a roller in the form of an envelope which may be inflated with air or liquid, and to provide in connection with such a roller means to facilitate inflation.

Another object of the invention is to provide a special roller of the type mentioned suitable for use in moving other forms of heavy objects, such as machinery, pianos and the like.

Other objects and advantages of the invention will become apparent from the following specification, the drawing relating thereto and the claims hereinafter set forth.

In the drawing:

Figure 1 is a side elevational view, partly in section, showing the manner in which the improved roller of the present invention is used for hauling a boat out on the land;

Figure 2 is an enlarged longitudinal section through the bottom portion of the supported boat showing the manner in which the roller operates over irregular terrain;

Figure 3 is a transverse section through a boat supported on the roller of the present invention;

Figure 4 is a side elevation of one form of the improved roller;

Figure 5 is a fragmentary section taken on the line 5—5 of Figure 4;

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Figure 6 is a transverse section taken on the line 6—6 of Figure 4;

Figure 7 is a developed view showing one form of blank from which the roller may be formed;

Figure 8 is a side elevation of a modified form of the roller;

Figure 9 is a transverse section taken on the line 9—9 of Figure 8; and

Figure 10 is a side elevation of a further form of roller adapted for use in moving other forms of heavy objects.

In accordance with the present invention, rollers employed in moving heavy objects, such as boats, are constructed in the form of a closed air-tight envelope formed of flexible sheet material in such a manner that when inflated they form a generally cylindrical roller. The preferred form of roller which is peculiarly adapted for use in handling rowboats and sailboats of a size not exceeding approximately twenty feet in length is preferably inflated only at or very slightly above atmospheric pressure. Consequently, it flattens to a very material extent under load, thus distributing the weight over a relatively large ground area and also conforming to the shape of the hull of the boat and distributing the supporting force over a relatively large area on the boat. A minimum of two rollers and preferably three is used in the usual manner to support the boat while it is pulled upwardly on the shore. Thus, as shown in Figure 1, the boat 1 is supported on a pair of rollers 2 and 3, which rollers are carrying the entire weight of the boat while it is being pulled upwardly. A third roller 4 is placed upon the shore ahead of the boat in a position to receive the weight thereof shortly before the boat rolls off the rear roller 2. It will be observed that the unloaded roller 4 is circular in cross section, whereas the loaded rollers 2 and 3 are flattened to a material extent, as indicated in connection with the roller 2 in Figures 2 and 3. As there shown, the roller is so flattened that it not only distributes the weight over a large ground area and conforms to the shape of the hull to distribute the supporting force uniformly over a large hull surface, thus avoiding load concentrations on the hull, but it also conforms to irregularities in the ground surface. Thus, as shown in Figure 2, the roller may roll freely over a relatively large boulder 5, which would be difficult or impossible to traverse with a rigid roller. In this respect, the action is similar to that of track-laying devices, but would be more accurately described as "road-laying."

In order to facilitate the rolling action, particu-

larly over irregular terrain, it is essential that the material of which the roller is formed be as flexible as possible. The preferred material is sheet rubber reinforced by fabric covering, although other flexible sheet-like materials, such as unreinforced rubber or fabrics impregnated with rubber or other plastic materials capable of rendering them air-tight, may be used. Armored treads and the like may also be secured to the roller, if desired.

In order to obtain the most satisfactory rolling action, the main load carrying or central section of the roller should be approximately cylindrical in form because all points on the top portion of a cylindrical roller, even though it is flattened to varying degrees along its length, travel the same distance for a given arc of rotation of the roller. This eliminates twisting of one portion of the roller about its own axis relative to another portion. In this connection, some small deviation from the true cylindrical form is permissible. Thus, the roller may be of double conical form; that is, formed of two truncated cones joined either at their bases or at their smaller sections, provided the included conical angle does not exceed approximately twenty degrees. Such a roller is regarded as approximately cylindrical within the meaning of the present application.

In addition to the above, in order to prevent departures from the approximately cylindrical form of the roller in its free inflated state, it is important that the material of which the roller is formed be relatively inelastic. By that it is meant that under the loads and conditions of use the material should not stretch to any material extent. Thus, if the roller is formed of unreinforced rubber, the thickness and character of the rubber should be such that no appreciable stretching occurs under the maximum pressures encountered in normal use. In the case of the preferred form of roller for use in handling boats not exceeding twenty feet in length, hereinafter described in greater detail, it is preferred that the roller be inflated at or only slightly above atmospheric pressure. Such rollers, when supporting the weight of a boat, collapse to such an extent that the maximum internal pressure does not exceed approximately five pounds per square inch in any case. Such low pressures, however, are ample to carry the necessary loads in view of the large area of contact between the roller and the boat and supporting surface. Consequently, for such a roller, the unreinforced rubber material need only be sufficiently strong to withstand internal pressures of approximately five pounds per square inch without material stretching.

For best results with an atmospheric pressure inflated roller of the type described above for use on small boats, the diameter of the roller should be between six and eighteen inches and the ratio between its length and diameter between three and seven to one. With these proportions, the degree of flattening which results in use and the maximum pressure developed as a result of such flattening will not be excessive. It will be appreciated, however, that within the range of sizes specified it is preferable to use the larger rollers for larger boats, and vice versa. Boats in excess of twenty feet in length are seldom hauled out of the water except where dry-docking equipment is available and, accordingly, the principal need for a roller of the present invention is in connection with boats of smaller size.

The roller of the present invention may be constructed in any desired manner, so long as it embodies a central approximately cylindrical section, closed end portions and suitable means for inflation and sealing. However, it is desirable to provide a roller which, when deflated, will fold flat without any wrinkling. Consequently, for this purpose the roller may be formed from a single sheet of material cut in the form illustrated in Figure 7. As there shown, the material is cut in generally rectangular form with a pair of projecting tapered end sections at each end. This material is then rolled in the form of a cylinder and the edge 6 bonded, stitched or otherwise secured to the edge 7 in an air tight manner. The tapering edges 8 and 9 are similarly secured together, as are the edges 10 and 11, the edges 12 and 13, and the edges 14 and 15. The resulting roller has a true cylindrical center section when inflated, but the end sections, while of conical form, have shoulder corners which do not blend with the surface of the cylinder. As a result, some wrinkling will occur at the ends of the roller. This has no adverse effect upon the performance of the roller in actual use, since the end portions do not ordinarily carry any load. The slightly impaired appearance of the inflated roller is a minor disadvantage compared with the fact that the roller will fold completely flat without wrinkles when deflated and thus may be more conveniently stored than a roller having true coaxial conical ends. It will be appreciated, however, that, if desired, other forms of end constructions may be employed which will produce an inflated roller free from wrinkles if the flat fold-in characteristic is not desired.

As best shown in Figures 4 and 5, an inflating device is provided at one end of the roller 2. This device comprises a flexible rubber tube 16 which is passed through an opening 17 located in the position best shown in Figures 4 and 7 and suitably bonded to the material in an air tight manner. The tube 16, which is preferably formed of rubber, is soft and flexible and has relatively thin walls and a relatively large internal diameter. The tube is preferably so molded or otherwise formed that when straightened in the manner shown in Figure 5, it will tend to remain open in order to facilitate filling of the roller from the atmosphere, in the manner hereinafter described. After the roller is inflated, the tube 16 may be rolled upon itself, in the manner indicated in dotted lines in Figure 5, and then clamped against the adjacent surface of the end portion of the roller by means of a flap 17, which is secured at one end at 18 to the roller and is provided at its opposite end with a suitable fastening device, such as a snap 19 adapted to co-operate with a mating snap fastener 20 secured to the roller on the opposite side of the tube 16. The rolling of tube 16 effectively closes and seals the opening in an air tight manner, and the flap 17 prevents unrolling of the tube.

The roller may be inflated by mouth, if desired, but, since initial internal pressure in excess of atmospheric pressure is unnecessary, the roller may be inflated by simply causing or permitting it to assume its fully inflated form while the tube 16 is open, since this will draw in an adequate quantity of atmospheric air. Any suitable means may be provided, if desired, to facilitate such mechanical expansion of the roller for the purpose of drawing in the necessary air, such as the provision of suitable hoops or disks

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mounted at the ends of the cylindrical section of the roller, which tend to hold the ends in a form which is circular in cross section. If such hoops or disks are secured to the roller at the bases of the conical end portions, it is only necessary to apply tension to the ends of the roller to cause the hoops or disks to occupy spaced parallel planes, in which they fully expand the roller and draw in the necessary atmospheric air. It will be appreciated, however, that hoops or disks which are secured to the ends of the cylindrical portion of the roller will cause wrinkling in the center section when the roller is deflated. Consequently, in Figures 4 and 5 is shown an alternative arrangement which eliminates wrinkling of the center section of the roller. As there shown, the roller is provided with a pair of parallel disks 21 and 22 having suitable perforations 23. The disks are not connected to the roller except by means of three ropes or other tension members 24, which are connected at one end to equally spaced points about the periphery of the disk and are joined together and connected to an externally extending rope 25 at the apex of the conical end portion of the roller. The two disks 21 and 22 are also connected at their central points by means of a rope or tension member 26. With this arrangement, the application of tension to the rope 25 and a tab 27 formed on the opposite end of the roller forces the two disks 21 and 22 into spaced parallel planes and expands the roller into its fully inflated position, shown in Figure 4. The required end tension may be effected conveniently by stepping on the rope 25 and pulling upwardly on the tab 27, in the manner indicated in dotted lines in Figure 4. As soon as the roller has assumed its fully inflated form, the filling tube 16 may be rolled up and secured at the dotted line position of Figure 5. The roller will then be filled with air at atmospheric pressure and in condition for use.

A modified form of expanding device is illustrated in Figures 8 and 9. As there shown, the ends of the roller are provided with internal rings 28 which are secured together by three ropes or tension members 29 spaced equally about the periphery of the rings. The ropes 29 are wrapped around and tied to the respective rings and then extended and joined together at the apex of each conical end section, the joined ends at the lower conical end portion, as viewed in Figure 8, being connected to an externally extending rope 30, while the joined ends at the upper conical end portion are secured to the tab 31. This form of expanding device operates in the same manner as that described in connection with Figures 4 and 6.

While the above described expanding devices are advantageous in that they eliminate the need for inflating the roller by mouth, they are not essential because, due to the low pressure required, inflation by mouth is not difficult. While under most circumstances air inflation of the roller is preferred, it will be apparent that the roller may also be filled or partially filled with liquid, such as water. This may be advantageous when it is necessary to move a boat in shallow water, since it is somewhat difficult to sink an air inflated roller into position beneath a boat.

Boat rollers of the type described may not only be folded and stored in a very small space when not in use, but are useful as life preservers and dock buffers during ordinary operation of water-

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craft and hence may be carried to advantage in inflated condition.

For extremely heavy duty moving operations, such as would be required in the moving of heavy machinery or pianos, higher internal pressures and smaller roller diameters are preferred. Thus there is illustrated in Figure 10 a modified form of roller adapted for this type of usage. As there shown, the roller is formed with a cylindrical portion 32 and end sections 33 and 34 which are suitably bonded to the center section to provide an airtight envelope. In order to withstand the higher pressures encountered in the use of this type of roller, substantially heavier materials are employed and the end sections are preferably provided with hemispherical ends, as illustrated. One suitable type of material for use as the central body section is the type of material used in heavy duty fire hose, which consists of a seamless woven casing and a rubber innerliner bonded thereto. The end sections may be made of similar material in molded form.

In view of the relatively heavy pressure required and the large amount of energy stored in a roller filled entirely with compressed air, which energy is, of course, released upon any rupture of the roller, it is preferred for most purposes to fill such rollers largely with a liquid, such as water, leaving only sufficient air under pressure to permit the desired degree of flattening of the roller under load. Accordingly, there is provided on the end section 33 a fitting 35 adapted to fit a hose or pipe coupling and having a closure sealing cap 36. The fitting 35 may be used to make suitable connections to a source of water or other liquid under pressure for filling the roller. In order to permit escape of a desired quantity of air during the liquid filling operation, the end section 33 of the roller is also provided with an air fitting 37 having a sealing cap 38. The fitting 37 may be left open during a portion of the liquid filling operation and then closed during the completion of the liquid filling operation, in order to build up a limited volume of air pressure. The fitting 37 may also be used for filling the roller entirely with air or other gas when desired.

The form of roller illustrated in Figure 10 and described above is used in the same manner as the boat roller previously described. It is particularly advantageous when it is required to move heavy objects over irregular ground, uneven floors, door sills or other similar obstructions which would otherwise seriously impair the effectiveness of rigid rollers.

While several forms of the invention are illustrated and described herein, it will be apparent that variations in the design and details of construction may be indulged in without departing from the spirit of the invention or the scope of the appended claims.

What is claimed is:

1. A roller for use in moving heavy objects over irregular surfaces, comprising an airtight envelope formed of flexible sheet material which is incapable of appreciable stretching, said roller having an approximately cylindrical central load carrying portion and closed end portions, the end portions of said roller being tapered and each being formed by a sheet of material which when developed flat is in the form of two isosceles triangles, the bases of said triangles being connected to the end of said cylindrical portion and the sides of said triangles being connected together in the completed roller so that the roller as a whole will fold flat without wrinkling when

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deflated, and means in one of said end portions defining a closable inflating opening.

2. A roller for use in moving heavy objects over irregular surfaces, comprising an airtight envelope formed of flexible but relatively inelastic sheet material with an approximately cylindrical central load carrying portion and closed end portions, means in one of said end portions defining a closable inflating opening, means associated with said envelope for mechanically expanding it from a flattened form in order to draw fluid into the same at atmospheric pressure, said last mentioned means comprising a pair of circular members of the same diameter as said cylindrical portion and positioned within the same at its ends for causing the cylindrical portion to assume cylindrical form when the two circular members are held in spaced parallel planes, tension elements within the envelope connecting said circular members together, and additional tension elements connecting at least three equally spaced

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points about the circumference of each circular member with the adjacent end portion of the envelope whereby said circular members are pulled into spaced parallel planes by the tension elements when tension is applied to the ends of the envelope.

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