Feb. 8, 1944. M. KASSNER 2,340,964

KNAPSACKS, HAVERSACKS, AND THE LIKE

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Fig. 1

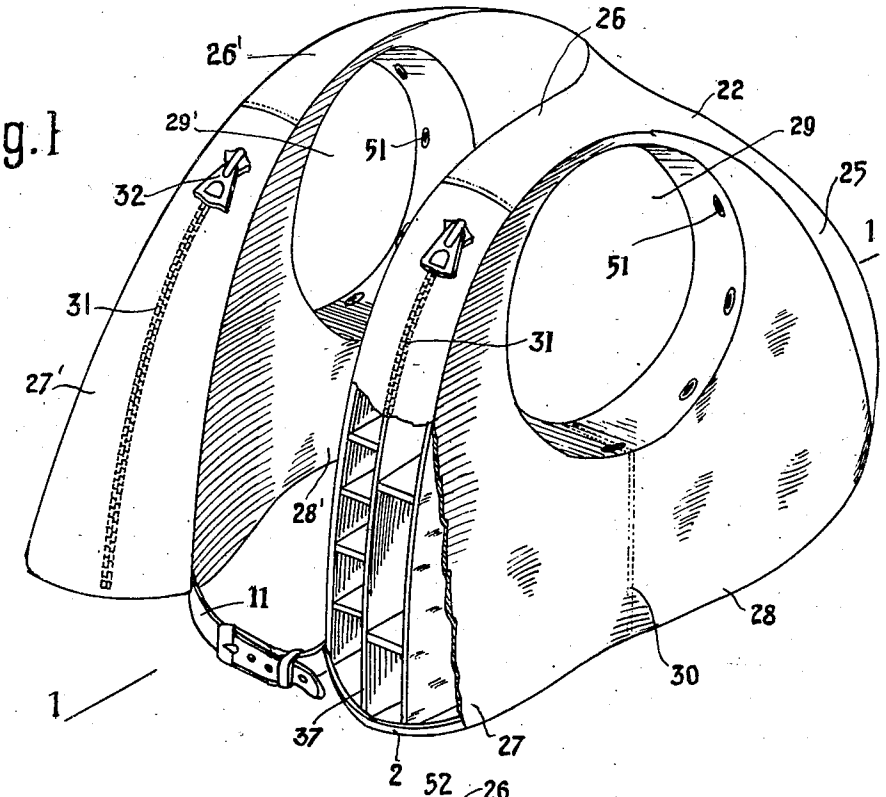
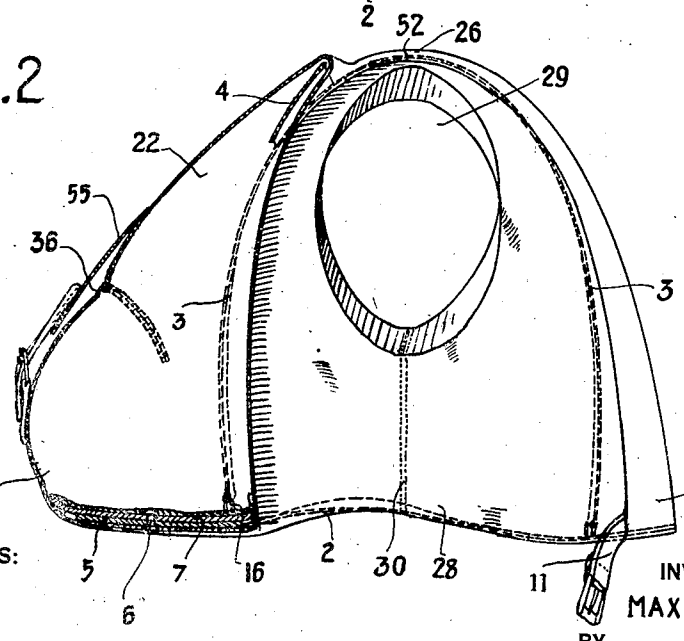



Fig. 2




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KNAPSACKS, HAVERSACKS, AND THE LIKE

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Fig. 3

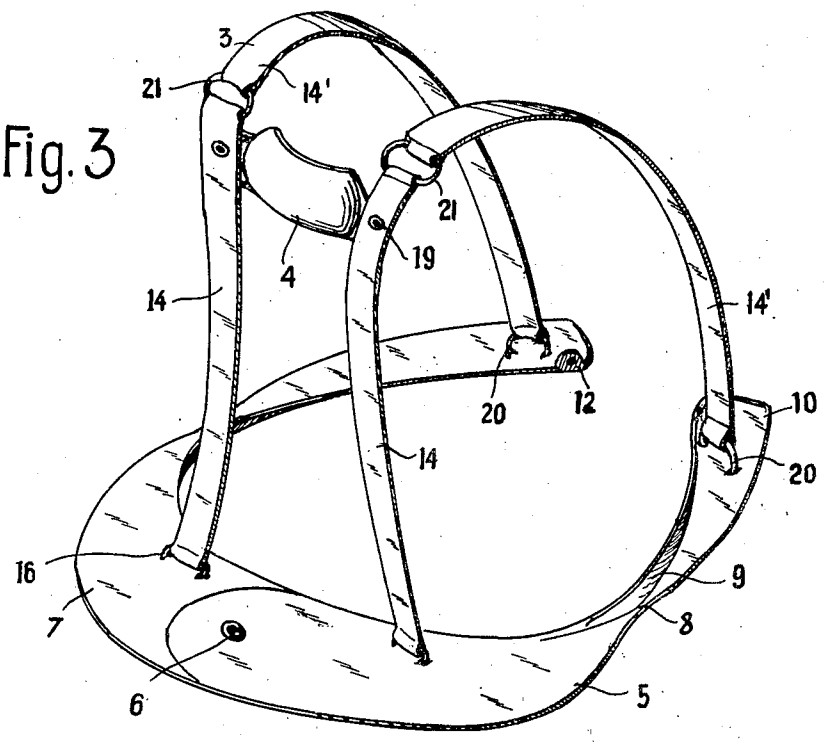
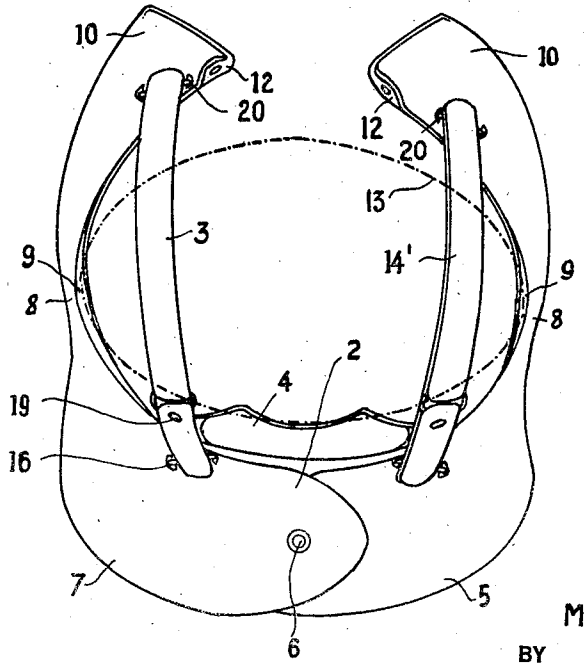



Fig. 4




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KNAPSACKS, HAVERSACKS, AND THE LIKE

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Fig.5

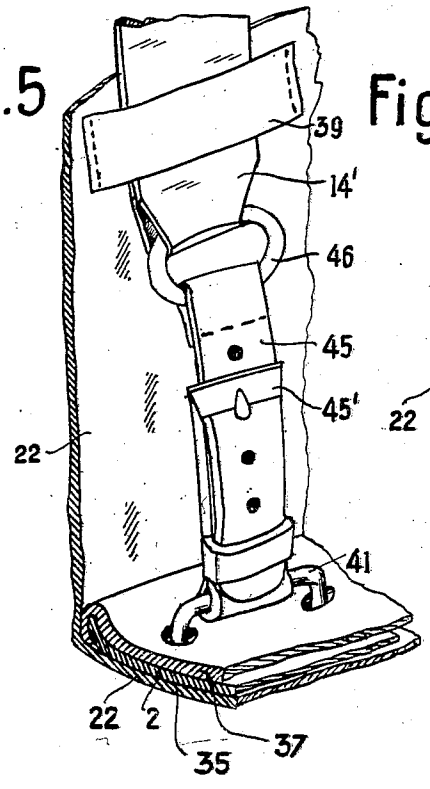
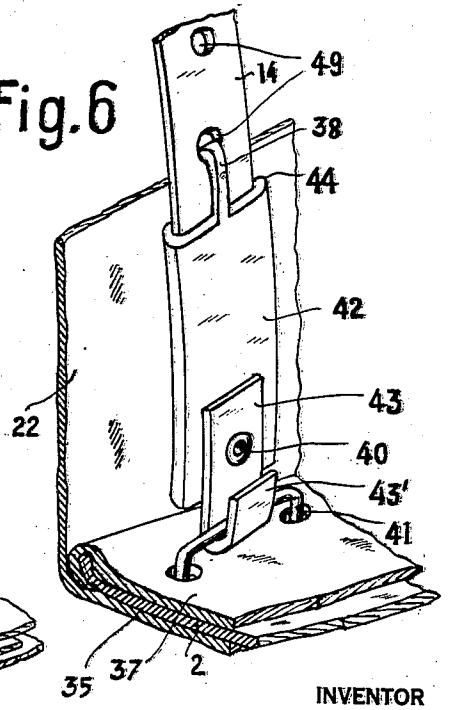



Fig.6




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Patented Feb. 8, 1944

2,340,964

# UNITED STATES PATENT OFFICE

2,340,964

## KNAPSACK, HAVERSACK, AND THE LIKE

Max Kassner, New Rochelle, N. Y.

Application March 20, 1941, Serial No. 384,273

7 Claims. (Cl. 224—8)

This invention relates to knap-sacks, haversacks, military valises and similar articles to be carried on the back and it has for its general object to improve the carrying capacity by providing an effective distribution of the load to be carried, by further providing means for regulating said distribution of weight by more or less eliminating the eccentricity of the load with respect to the plane in which the body of the person carrying the knapsack is supported on the legs and by improving the shape and arrangement of the article.

With knapsacks, haversacks and similar bags carried on the back, as hitherto used, the load rests on the back or shoulder straps and is thus mainly or exclusively carried by the shoulder region of the carrier. Other parts of the body are participating to a very small, almost insignificant, extent only. It is however undesirable to throw the entire weight on the shoulder region. The maximum weight that can be carried by a person differs from that which can be carried on the shoulders without inconvenience, a fact which is due to anatomical reasons and is confirmed by experience. Where it is necessary to make a person carry a high total load without inconvenience a distribution of the load among several bags, containers or receptacles carried in different ways is resorted to; for instance belts strapped around the waist are used to carry some objects or separate bags or special waist coats or hunting coats, fishing coats, skirts or the like with pockets or with bags or containers attached to them are used to accommodate part of the load.

The usual type of knapsack, haversack or the like has a relatively large surface in close contact with the body through which a small part of the load can be transmitted. This surface is however in a nearly vertical position, so that the component of the load which finds its support is very small when the person carrying the load stands erect. A certain tendency towards effecting a distribution of the load is however noticeable when the person carrying the knapsack leans forward during the march or ascent. This tendency is suppressed where, for hygienic reasons, a frame supporting the knapsack or the haversack is used in such a manner that a free space permitting air circulation is created between the sack and the body. The use of such a frame has therefore the drawback that the entire load contained in the knapsack is again thrown on the shoulder region.

Attempts to distribute the weight carried in a knapsack by suspending the container or bag simultaneously on shoulder straps and on a belt strapped around the waist did not prove to be successful. A double suspension does not effectively distribute the load in a definite manner under varying conditions and a belt compressing soft parts of the body can carry a limited strain only. Attempts to transmit part of the load to stronger parts of the body by frictional contact have likewise failed to produce the desired result, as transmission of load by friction is largely governed by the position the body of the carrying person will assume. This position changes, however, almost continuously. The object of obtaining an effective and permanent distribution of the load, proportionate to the carrying capacities of the regions of the body participating in the carrying effort has therefore not been attained.

The object of this invention is therefore to provide a knapsack, haversack, rucksack, military valise or other container to be carried on the back with which an effective and permanent distribution of the load over several regions of the body of the person carrying it is obtained.

A further object of the invention consists in providing means, distributing the load contained within the knapsack as evenly as possible around the body of the carrier with the resultant weight acting as closely as possible to or substantially within the vertical plane in which the body is supported and which passes through the joints of the hip and approximately through the crest of the hip bones. Thereby the straining of muscles is minimized and fatigue is reduced; the carrying capacity of a person over a protracted period is thus materially improved.

A further object of the invention consists in providing a knapsack with a frame comprising a load supporting bottom or base plate on which the entire load is supposed to rest and which surrounds part of the body and thereby allows to obtain symmetrical load conditions and a balancing of the entire load with respect to the plane passing through the hip joints. This base plate is provided with facilities permitting to seat it on the hip bones substantially within said plane.

A further object of the invention consists in providing a knapsack having front parts permanently accessible to the person carrying the load without stopping during a march and without removing the knapsack from its position.

A further object of the invention consists in a knapsack having a skeleton frame which comprises not only a load supporting bottom or base plate surrounding part of the body above the pelvic region but also strips or strap like frame members connecting the front and rear parts of the supporting plate and running over the shoulder region. These strips or strap like frame members permit to throw part of the load on the shoulder region, if so desired, but their important function is that of keeping the supporting bottom or base plate in its balanced and substantially horizontal position.

A further object of the invention consists in

providing means, preferably associated with the strips running over the shoulder region, capable of transmitting part of the load to the spine near the nape of the neck, whereby a further region of high carrying capacity can participate in the load carrying effort.

A further object of the invention consists in so shaping the parts of the frame that a free space is created between the body of the person carrying the knapsack and the walls of the bag or container. Thus a free air circulation adding to the comfort of the person carrying the knapsack is obtained. Moreover, this space can be utilized for the attachment or for the accommodation of certain objects which have to be carried separately.

Many features mentioned are of special advantage in the case of a knapsack or haversack used for military purposes. It is especially to be noted that the front parts of the knapsack permit to carry some articles such as arms, ammunitions, cartridges and other articles within the sack in such a fashion that they are permanently at hand so that separate cases or bags can be dispensed with or can be used for another purpose.

Further features and objects of the invention are described in the following specification and shown in the accompanying drawings which illustrate several modifications of the invention.

Fig. 1 shows a perspective view of a knapsack.

Fig. 2 shows a cross section through the plane of symmetry indicated by the line 1—1 on Fig. 1.

Fig. 3 shows a perspective view of the frame.

Fig. 4 shows a top view of the same.

Figs. 5 and 6 show modifications of details in perspective view.

According to the modification shown in Figs. 1 to 4 the knapsack consists of a container or sack 22 provided with a skeleton frame which carries the load and transmits part of the same to various regions of the body. This frame mainly consists of a base or bottom plate 2 for supporting the load and of shoulder strips 3 secured thereto in a manner to be described. A neck plate 4 may be arranged between the shoulder strips 3 and fastened thereto.

The load supporting plate 2 may consist of two arc shaped members 5 and 7 connected by a joint 6 or a similar connection allowing relative movement of the parts. Near the rear part of the load supporting plate 2 the width of these members increases and is approximately equal to that of the sack when fully loaded (Fig. 2). The adjoining side parts of the members 5, 7 are tapering towards a narrow zone 8 (Figs. 3 and 4). This zone is to be seated on the bones of the pelvic region and its inner edge is therefore bent upwardly so that a conical seating surface 9 is formed. The front parts 10 of the members 5, 7 are again wider than the zone 8 and form the base for the front parts of the knapsack. The members 5, 7 may be moved towards each other turning in the joint 6 until part 9 is firmly seated in the region of the hip bones and they may be fixed in this position by bands, clasps or straps 11 attached to projections 12 provided with eyelets for this purpose. These straps 11, by holding the members 5, 7 in a position in which they are seated permit a substantial part of the weight to be thrown on the pelvic region. The load carried by the pelvic region is supported, like the body itself, approximately in the vertical plane of support passing through the hip joints. This is a marked advantage as the knapsacks, haversacks and other load carriers hitherto known are eccentric loads which have to be counterbalanced by permanent muscular strain. By adjusting the length of the straps 11 the members 5, 7 are allowed to move outwardly and gradually they lose their firm seat whereby a larger and larger part of the weight can be thrown on the shoulder strips 3, if desired, while that part of the weight which is carried by the pelvic region decreases.

The members 5, 7 are moreover shaped in such a way that, when the two lateral portions 8, 9 are seated the inner edges of the remaining parts of the members 5, 7 are located at a certain distance from the body of the person carrying the knapsack. This will be clear from Fig. 4 where the contour of a cross section of the body is indicated at 13 in dotted lines. The sack which is fixed to the frame is thus kept at such a distance from the body of the person carrying the knapsack that an abundant air circulation between these parts is possible.

Two shoulder strips 3 are hinged to the fore and aft part of the base or supporting plate 2. Their ends 16, 20, attached to the load supporting plate 2 are practically in the same horizontal plane when the knapsack is in operative position and they, therefore, assist in balancing the bottom plate. The hinges may either be of the usual type or, as shown, may consist of bails, clamps or clips 16 projecting from the members 5, 7 supporting plate 2 or passed through holes in these members and engaging eyelets in the strips 3.

The shoulder strips must be capable of a limited movement in two different directions, one of these directions being in parallel to the plane of symmetry of the knapsack (line 1—1, Fig. 1) while the other is at right angles thereto (8—8, Figs. 3 and 4). Joints permitting such a movement may be inserted, but it is preferable to use hinges or connecting links 20 permitting both movements. This may be obtained by means of rings passing through correspondingly shaped eyelets or sleeves gripping only part of the periphery of the ring. A plurality of points of the bottom plate may be supported, either by arranging the rings or joints transversely as shown in Fig. 3 or by providing auxiliary rings or clamps and auxiliary straps (not shown).

Between the shoulder strips 3 a neck plate 4 may be inserted, which is either integral with the strips or is joined to them by rivets 19. The neck plate is slightly curved to conform itself to the shape of the human body and it is arranged at a place where it can bear upon the back of the person carrying the knapsack. Where such a plate is used the shoulder strips preferably consist of two parts 14 and 14' with a joint 21 inserted between them. The neckplate is secured to the rear parts 14 of the strips 3 while the fore parts 14' are connected on both sides to the members to which they are attached by means of joints 20, 21 permitting the required lateral movement of the strips. The rear parts 14 of the strips may be provided in this case with a hinge 16 allowing movement in one direction only. The neck plate acts as a stop which prevents tilting of the bottom plate and of the knapsack towards its front end.

Where the strips are made of a pliable or soft material all the connections may be made in such a way that they will allow movement in one direction only as the pliability or elasticity of the material used will secure a sufficient freedom in the other direction.

The load supporting plate 2 is preferably made of rigid or semi-rigid material such as metal (preferably a light metal or a light metal alloy) plastics, Celluloid, plywood or pressed card board bonded by plastics or other means or the like or it can be made of elastic material such as rubber. In the latter case it may consist of one piece only which can be deformed. The shoulder strips may be either made of some rigid or semi-rigid elastic material, such as metal, Celluloid or the like or they may be made of a soft and pliable material, such as a fabric, leather, rubber or the like. This material may be used also where stiff and elastic strips are to be used and in this case they are reinforced by stiffening means on part of their length or on their entire length so that they will retain a definite shape.

The sack or bag consists of some fabric 22 covering the frame and is secured thereto in a manner to be described later. It consists of a plurality of parts. The rear part 25 is similar in shape to the usual type of knapsack or haversack but is closed at the top. It is connected to two shoulder parts 26, 26' running over the shoulders to the front. The shoulder parts are joined to the two front parts 27, 27' of the sack or bag which surround the front parts 10 of the supporting plate. A lining 52 of soft material or a cushion may be provided beneath the strips 3 in the shoulder parts in order to avoid inconvenience or pressure when the strips are made of rigid or stiff material. The top of the rear part between the two shoulder parts may likewise contain a lining or a cushion beneath the neck plate to avoid pressure or inconvenience.

The lower portions of the front parts 27, 27' are again connected with the rear part 25 by means of lateral portions 28 which are provided with sleeve like passages or holes 29, 29' permitting passage of the arms.

The front parts 27, 27' are moreover provided with apertures or slits 31 which may be closed by a slide fastener 32 or by a flap 33. The flap may be used in conjunction with the slide fastener. These slits make the front parts of the sack easily accessible, so that these parts may serve the purpose to receive and store all the various articles that ought to be at hand permanently during a march and ascent or during military activity. A partition wall 36, shown in dotted lines, arranged near the narrowest zone of the side parts, may separate the rear part of the sack from the front parts 27, 27' in order to prevent creeping back of articles stored in the front parts.

Another slot 36 is provided in the rear part of the sack 25. A slide fastener may be used to close the slot. Preferably the slot is curved so as to give access to a large section of the sack when opened. The slot or opening may be covered by a flap 55 in the usual way.

The front parts 27, 27' may be provided with stiff partition walls 37 dividing them into small compartments to maintain a certain arrangement and to utilize fully the available space which is of rather limited lateral extension.

The fabric of the sack 22 is attached to the frame either by means of studs or rivets or similar means arranged at suitable distances on the strips 3 and on the base plate 2. Alternatively pockets 35 (Figs. 5 and 6) may be provided in the sack housing the frame. These pockets may be formed by part of the fabric of the sack 22 and by additional strips of fabric 37 sewn or otherwise attached thereto. Instead of continuous strips holding strips or loops 39 (Fig. 5) may be arranged at certain intervals. Where a firm connection between the frame and the fabric of the sack 22 is desired these loops or strips 39 may be drawn through slots (not shown) in the shoulder strips or the supporting plate.

Loosening of the strap 11 will however cause the supporting plate to seat itself less firmly on an inclined part of the hip bones and thus the capacity to transmit and to take up a load acting in a vertical direction decreases, the load being then thrown partially or fully on other regions mentioned.

Figs. 5 and 6 show two modifications of the connection of the shoulder strips with the base or supporting plate 2 which may be used either alone or in combination with other attachments.

Fig. 6 shows a connection between the supporting plate 2 and the shoulder strip 14 made by means of a cross bar or bail 41 on the plate 2 cooperating with a hook 43' attached to the shoulder strip itself or, as shown, to an intermediate member 42 provided for the purpose of adjustment. The hook 43' is attached to the carrying member by means of a stud, pin or rivet 40 passing through its base plate 43 and the member 42 thus permitting a movement of the shoulder strips 14, 14' in a transverse direction, perpendicular to the plane of symmetry of the knapsack, without leaving its position, retaining it by means of the cross bar. The intermediate member 42 is provided with flanges 44 gripping the member 14' and with a hook 38 that may be passed through holes 49 in the strip 14'. A plurality of holes 49 is provided one above the other in said strip and by hooking in the member 42 at different holes it is possible to vary the overall length between the two attachments of the shoulder strip 14 or 14' on the base plate 2.

Another arrangement for adjusting the overall length of the strips 14 and 14' is shown in Fig. 5. Straps 45 capable of adjustment as regards their length are inserted in this case between the cross bar 41 and the strip 14'. The adjustment of the length of the straps may be made by means of buckles 45' as usual. The strap 45 carries a ring or a semi-circular member 46 and the strips 14' are gripping the periphery of said rings in such a way that lateral displacement is possible.

In the sleeve like passages 29 (Fig. 1) through which the arms of the person carrying the knapsack are passing snap fasteners 51 or similar means are provided to which sleeves provided with corresponding fastening means may be attached. These sleeves, which are not shown in the drawings, are separate units carried within the knapsack, when not in use. The knapsack may thus be transformed into a kind of protective jacket or garment.

From the above description it will be seen that a knapsack, haversack or valise constructed according to the principles mentioned provides more space than the usual knapsack and almost doubles or materially increases the volume protected by the covering. The invention moreover consists in a knapsack, whose main container is in the back, which is nevertheless so arranged that part of its contents are permanently at hand and are within easy reach of both hands, so that they are accessible without even stopping on a march or during military operations.

The knapsack, as described, provides a perfect air circulation all around the body. It can accommodate a much greater load but in spite

of the heavier load transportation is easier and is attended by less inconvenience, muscular strain and fatigue. It is therefore possible to utilize the full carrying capacity of a person and it is unnecessary to provide a plurality of containers or to attach objects separately on other carrying means.

It is manifest that many details of the construction may be varied and modified in accordance with special purposes to be served without departing from the invention.

I claim:

1. A knapsack, haversack or the like, consisting of a container and a frame enclosed therein, said frame consisting of an arc shaped load supporting bottom plate, brought into a substantially horizontal position when the knapsack is in its operative position, and partly encircling the body of the person carrying the knapsack, said plate being provided with seating surfaces to be seated on the hip bones of the carrying person and with front and rear load carrying sections arranged on opposite sides of said seating surfaces, and of shoulder strips attached to said front and rear sections of the bottom plate, running over the shoulders of the person carrying the knapsack, the aforesaid container being arc shaped and provided with front rear and intermediate sections, corresponding to those of the bottom plate, accommodated therein, said sections partly encircling the body of the person carrying the knapsack, when the latter is in operative position.

2. A knapsack, haversack or the like, consisting of a container and of a frame, enclosed therein, the latter comprising a substantially arc shaped supporting plate forming the load supporting bottom of the container and extending in a substantially horizontal plane, when the knapsack is in its operative position, said bottom plate and said container encircling part of the body of the person carrying the knapsack said bottom plate and said container each having two front sections located in front of the pelvic region of the aforesaid person and a rear section located behind said region, the bottom plate being moreover provided with seating surfaces arranged between its front and rear sections for seating it on the bones of the pelvic region and means for adjusting the width of the arc along which the bottom plate encircles the body of the person carrying the knapsack.

3. A knapsack, haversack or the like according to claim 2, wherein said load supporting bottom plate consists of a plurality of connected parts, which are adjustable with respect to each other, their relative positions determining the width of the arc along which the body of person carrying the knapsack is encircled and wherein means are provided for adjusting the distance between the front sections of the bottom plate.

4. A knapsack, haversack and the like of the type specified, consisting of a container and a frame enclosed therein, the latter comprising a supporting plate at the bottom of the container to be maintained in an approximately horizontal position during use and supporting the load within the container, the inner edge of the bottom plate and the inner walls of the container respectively encircling the body of the person carrying the knapsack along an arc larger than 180° when in operative position and both the bottom plate and the container having front sections in front of the pelvic region and a rear section behind this region, the bottom plate having moreover seating sections for seating it on the pelvic region, the inner edges of said bottom plate being curved along the front and rear sections in such a way that these edges will be kept at a distance from the body of the person carrying the knapsack, when the latter is in operative position, the walls of the container being attached to the bottom plate and thus kept at a distance from the body of the aforesaid person, and said frame further comprising shoulder strips attached to said bottom plate.

5. A knapsack according to claim 4, wherein said shoulder strips are running from a point of attachment on the front section to a point of attachment on the rear section of the bottom plate, said points of attachment being so selected that the strips between the shoulders and the points of attachment are maintained at a distance from the body of the person carrying the knapsack, the walls of the container being fixed to said strips and being supported by them.

6. A knapsack of the type specified, comprising a container, a frame arranged within said container, said frame consisting of an arc shaped, load supporting bottom plate, encircling part of the pelvic region along an arc greater than 180°, with two front sections in front of the pelvic region and a rear section behind said region, intermediate sections provided with seating surfaces whereby the bottom plate is seated on the bones of the pelvic region, said frame further consisting of shoulder strips, each of which is attached to a front section and to a rear section of said bottom plate, said container comprising two front portions and a rear portion arranged above the front and rear portions of the bottom plate respectively, shoulder portions running along the shoulder strips in the shoulder region and connecting the rear and the front portions of the container respectively and lateral sections below the shoulder region provided with sleeve like passages, said last named sections being connected with the front the rear and the shoulder portions of the container.

7. A knapsack, haversack or the like consisting of a container and a frame enclosed therein, said frame comprising a load supporting rigid bottom plate, arranged at the bottom of said container which is to be kept in a horizontal position when the knapsack is in its operative position and which is provided with two seating surfaces to be seated on the hip bones of the carrying person, and with front and rear load carrying sections arranged on opposite sides of said seating surfaces, said frame further comprising shoulder strips attached to said front and rear sections of the bottom plate, and a neckplate attached to said shoulder strips in such a position as to act as a stop which will press against the neck of the person carrying the knapsack when the load in front of the hips tends to move the bottom plate out of the horizontal position, the aforesaid container being provided with front, rear, and intermediate sections, located above the corresponding sections of the bottom plate accommodated therein.

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