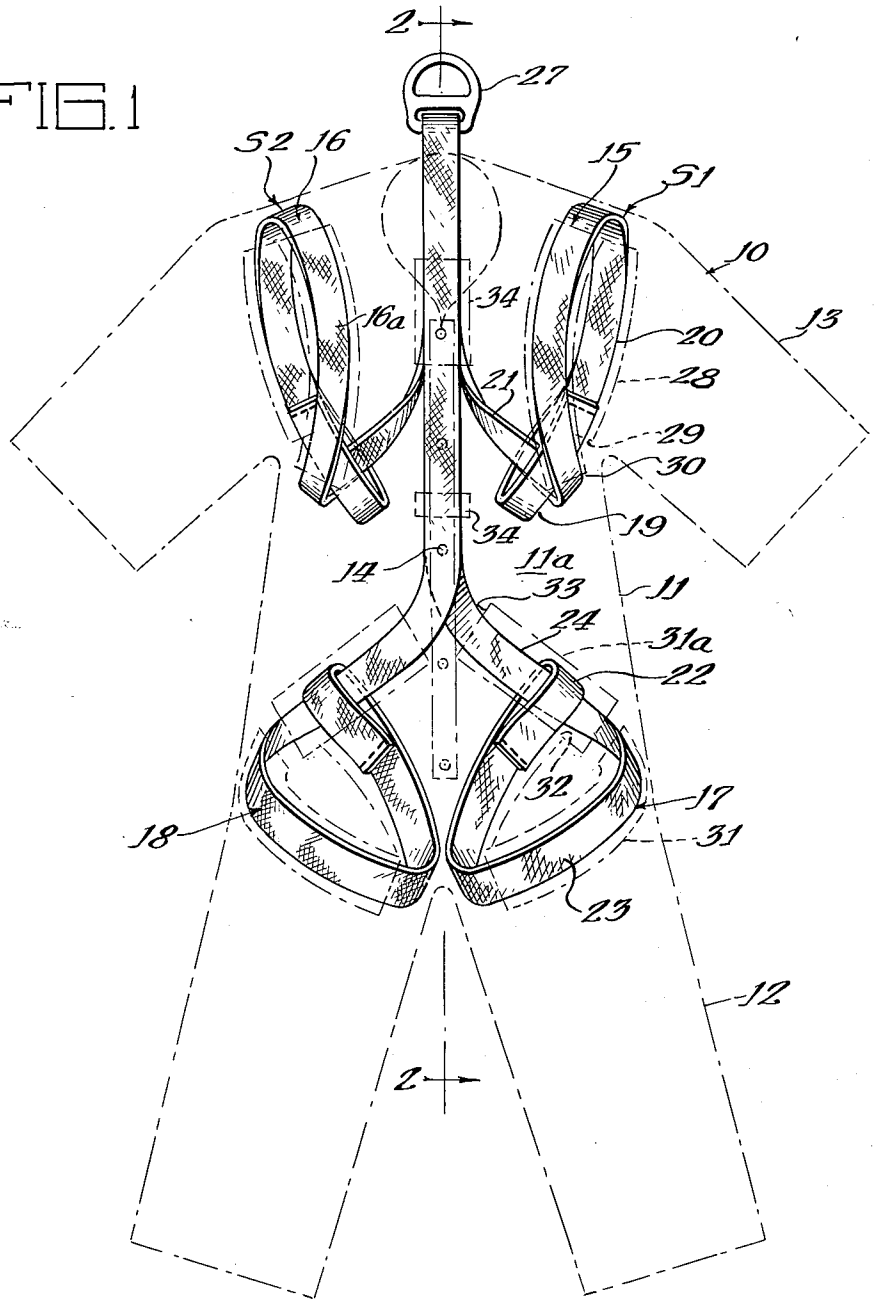
April 11, 1961 E. J. HOAGLAND ET AL 2,979,153

SAFETY SUIT

Filed Jan. 24, 1958 2 Sheets-Sheet 1

FIG. 1



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SAFETY SUIT

Filed Jan. 24, 1958 2 Sheets-Sheet 2

FIG. 2

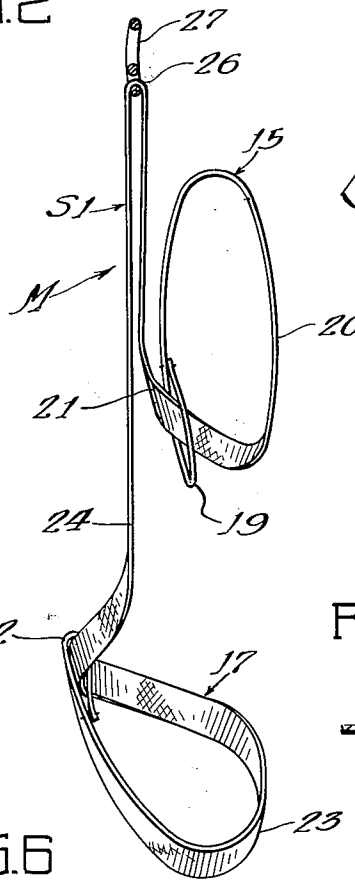


FIG. 3

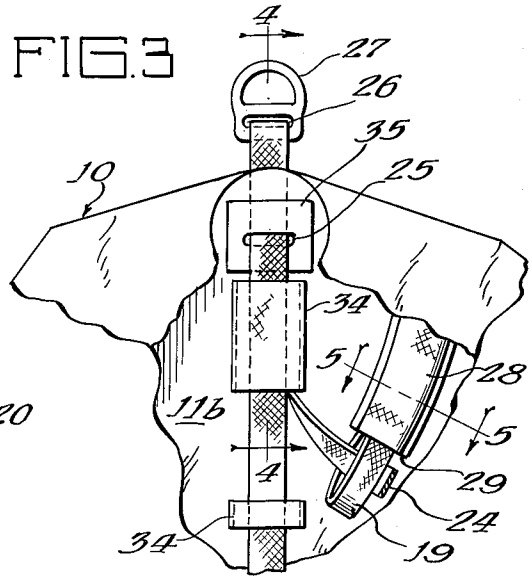


FIG. 5

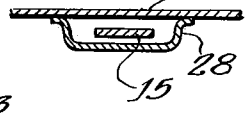


FIG. 4

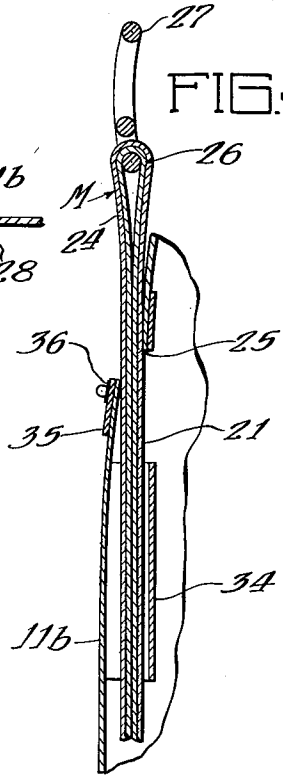
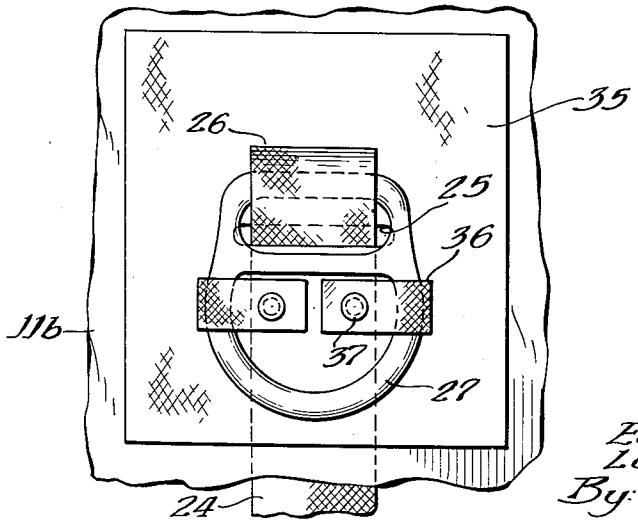


FIG. 6



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SAFETY SUIT

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11 Claims. (Cl. 182—3)

This invention relates to personnel safety devices and in particular to a safety suit.

In certain occupations, as underground servicing or installation of public utilities, tank cleaning, etc., the worker is within an enclosure such as a manhole or tank having limited accessibility to the interior thereof. Should something happen to the worker, such as asphyxiation or being struck by a falling object, which renders the worker incapable of removing himself from the interior of the enclosure, it is desirable to provide means permitting persons outside of the enclosure to effect removal of the incapacitated worker.

One method of accomplishing this is to secure a line, such as a rope, around the worker prior to his entering the enclosure so that, if necessary, he may be withdrawn from the enclosure by means of the line. Such a method is rather crude and unsatisfactory due to the fact that the line may not be properly secured around the worker and may slip off or constrict itself too tightly about the worker's waist or neck, causing further injury to the worker. Another problem with such a method is that it requires the time consuming operation of effecting a securing of the line around the worker each time he enters such an enclosure, and in occupations where the worker frequently enters the same or different enclosures, the use of such a line is often foregone.

A method heretofore employed for simplifying the attachment procedure and thus increasing the use of the safety line has been to provide a coverall garment having body encircling straps secured thereto by means such as stitching and a connecting ring secured thereto adjacent the neck of the garment for ready attachment of the hoisting line. However, this structure has not been found to be completely satisfactory as it does not properly support the body but, rather, permits injurious pressures to be applied to different body portions such as the areas adjoining the crotch, neck and shoulders. Further, such structures tend to arrange the body when being hoisted transversely to the direction of movement, making the withdrawal of the body through the conventionally narrow outlet of the enclosure hazardous and difficult.

The principal object of this invention is to provide a new and improved body hoisting means.

Another object is to provide such a body hoisting means comprising a safety garment or suit.

A further object is to provide such a safety suit having strap means associated therewith arranged to embrace a selected portion of the body to support the same in a safe manner during a hoisting thereof.

Still another object is to provide such a safety suit including means on the garment portion thereof for guiding strap means into a tight, body embracing, annular configuration during a hoisting thereof.

A further object is to provide such a safety suit having a plurality of such body embracing strap means cooperatively associated to effect a concurrent embracing support of a plurality of different body portions precluding injurious pressure from being applied to the body and assuring a safe hoisting thereof.

A still further object is to provide such a safety suit which disposes the body in substantial longitudinal alignment with the line during the hoisting thereof.

Other objects, features and advantages of the present invention will be apparent from the following description of the preferred embodiment illustrated in the accompanying drawings, in which:

Fig. 1 is a front elevation of a safety suit embodying the invention, the garment portion thereof being shown in broken lines;

Fig. 2 is a vertical section of the strap means thereof taken substantially along the line 2—2 of Fig. 1;

Fig. 3 is a fragmentary elevation of the neck portion thereof, with portions of the garment means broken away;

Fig. 4 is an enlarged vertical section taken substantially along the line 4—4 of Fig. 3;

Fig. 5 is an enlarged transverse section taken substantially along the line 5—5 of Fig. 3; and

Fig. 6 is a fragmentary, enlarged rear elevation illustrating the arrangement of the connecting ring when not in use.

In the illustrated embodiment of the invention as disclosed in the drawings, a new and improved means for effecting a safe hoisting of a person's body is shown to comprise a safety suit. The garment portion thereof may be a conventional coverall garment such as is customarily used by persons working in enclosures such as manholes and tanks. Inside the garment adjacent the junction of the arms and legs with the body portion thereof is a plurality of annularly extending straps defining body embracing nooses. The annular arrangement of the straps is maintained by suitable guide means secured to the garment to form annular guide channels or tunnels through which the straps slidably extend. The guide means retain the straps adjacent the inner surface of the garment so that the person's arms and legs may be passed through the nooses into the arms and legs of the garment in the conventional manner.

During a hoisting of the body, the nooses are tightened so that the straps firmly embrace the body portions encircled thereby. During this tightening operation, the guide means maintain the nooses in proper position around the desired portion of the body. Thus, while it is the straps which effect the support of the body during the hoisting, the garment assures an automatic proper dispositioning of the straps during the tightening thereof around the desired body portions.

To effect the desired constricting of the nooses, each noose is provided with an elongated portion extending slidably through an opposite, looped end and to a point adjacent the neck portion of the garment. Each of the elongated strap portions is brought out through a suitable opening in the back of the neck portion of the garment. The elongated portions are joined to define a continuous mid-portion of the strap and a suitable connecting ring is associated therewith for attachment thereto of a suitable hoisting line. Thus, by pulling the connecting ring upwardly, a drawing of the mid-portion of the strap effects an equalized tension in each of the elongated portions. This causes the resulting embracing of the different body portions encircled by the several nooses to effect a proper and safe support thereof and permits the body to extend generally longitudinally in alignment with the hoisting line during the hoisting operation.

More specifically, the safety suit comprises a coverall garment 10 of substantially conventional construction. Garment 10 may be formed of a strong fabric such as denim or other material suitable for the particular occu-

pation of the person. The garment may be provided with a suitable body portion **11**, leg portions **12** and arm portions **13**. To facilitate the getting into and out of the garment, the front **11***a* of the body portion is made open and is provided with suitable closure means such as snap fasteners **14**.

As discussed above, the means for supporting the body during a hoisting thereof comprises a plurality of nooses associated with the garment **10** in a new and improved manner. Four such nooses are provided; two nooses, namely nooses **15** and **16**, being disposed in the upper portion of the garment adjacent arms **13**, and two nooses, namely nooses **17** and **18**, being disposed in the lower portion of the garment adjacent legs **12**. The left-hand nooses **15** and **17** comprise a single continuous strap **S1**, and the right-hand nooses **16** and **18** comprise a second continuous strap **S2**. The straps are preferably formed of a strong web material such as cotton belting. Strap **S1** is a mirror image of strap **S2** and thus, for a complete understanding of the structure of the individual straps, a description of strap **S1** will suffice.

As best seen in Figs. 1 and 2, upper noose **15** includes a loop end **19**, an annularly arranged mid-portion **20** and an elongated portion **21** extending through loop **19**. Noose **17** similarly comprises a loop end **22**, an annularly arranged mid-portion **23** and an elongated portion **24** extending through loop **22**. Portion **24** extends upwardly along the back **11***b* of the garment body portion **11** and through an opening **25** provided in the garment back adjacent the upper end thereof. Portion **21** extends from loop **19** out through opening **25** to join portion **24**. The juncture **26** of outwardly extending portions **21** and **24** passes freely through a metal connecting ring **27** comprising a **D**-ring device. Depending upon the spacing of the upper torso portion from the lower torso portion of the particular person wearing the safety suit, the relative length of portions **21** and **24** is varied by urging the **D**-ring outwardly, while permitting the strap to pass therethrough, until each of the elongated portions **21** and **24** is fully extended. Thus, the mid-portion M of each strap, namely the portion between the nooses defining the opposite ends of each strap, is automatically adjusted to provide an equal strain on each of the nooses during a hoisting of the body.

As briefly alluded to above, the straps **S1** and **S2** are retained against the inner surface of garment **10** and are guided into a body embracing arrangement during a hoisting of the body by guide passage means secured to the garment. The guide passage means comprises suitable strips of material, similar to the material comprising garment **10**, secured to the inside of the garment body portion **11** to form four, generally annular tunnels or channels adjacent arms **13** and legs **12** thereof. As best seen in Fig. 1, the guide passage means **28** adjacent arms **13** comprise annularly arranged strips defining a first guide passage end **29**, from which loop **19** of noose **15** extends, and a second guide passage end **30** from which the portion **21** extends to pass through loop **19**. The disposition of guide passage ends **29** and **30** is such that loop end **19** is disposed adjacent the back **11***b* of the garment and the portion **21** extends inwardly through loop **19** toward the mid-portion of the garment, thereby assuring that the portions of the strap **15** extending from the guide passage ends will be drawn toward the person's torso during a tightening of the noose **15**, precluding a slipping of the noose therefrom. It should be noted that guide passage means **28** arranges noose **15** to extend annularly over the shoulder and around the side under the armpit of the person's body, adjacent the inner end of arm **13**. As noose **15** is thus urged about a portion of the person's torso rather than around his arm, the arms are not pulled upwardly as is common in known hoisting means. Instead, the shoulder torso portion is firmly embraced whereby a safe, non-injurious support is obtained.

The guide passage means **31** for guiding noose **17** comprises a slightly modified annular arrangement of strips. To provide improved guiding action, the guide passage end **32**, from which loop **22** of noose **17** extends, opens into a portion **31***a* of the guide passage adjacent the end **33** of the passage from which the portion **24** of strap **17** extends. Thus, strap portion **24** passes through loop **22** within portion **31***a* of the guide passage means. To facilitate the threading of the straps through the guide passage means and installing them in garment **10**, strips **28** and **31** may be made discontinuous, effectively comprising a plurality of spaced portions.

It should be noted that this arrangement of guide passage means **31** disposes loop **22** adjacent back **11***b* of the garment and causes the portion **24** of noose **17** to extend inwardly and upwardly from guide passage end **33**, thereby causing noose **17** to embrace the torso of the person's body at the upper end of the thigh, around the buttock and under the crotch thereof. Thus, during a hoisting operation, the lower portion of the torso is firmly supported without injurious pressure being applied to adjacent portions of the person's body. Further, the support is around the torso rather than merely under the crotch so that a firm embracing of the torso over a substantial area is obtained.

To retain the strap portions **21** and **24** in place against the back **11***b* of garment body portion **11**, a plurality of guide strips **34** are secured to back **11***b* along the center line thereof. Strips **34** guide the strap portions **21** and **24** to opening **25** so that a free sliding movement of the strap mid-portion M through the opening may be effected. As seen in Figs. 3 and 6, opening **25** is provided with a reinforcing means **35** which may comprise a piece of reinforced fabric secured to the body portion back **11***b*.

When the person wearing garment **10** is not working in a hazardous location so that it is not necessary to secure a safety line to him, it is desirable to prevent a free swinging movement of **D**-ring **27** which could, otherwise, strike and injure the person. For this purpose, a pair of tabs **36** are provided on the exterior of reinforcing means **35**. Securing means, such as snap fasteners **37**, are associated with the tabs **36** and reinforcing means **35** to secure the tabs about the ring and retain the **D**-ring in place against the reinforcing means. When it is desired to utilize the **D**-ring in connecting a safety line thereto, the fasteners **37** may be readily unsnapped, allowing the **D**-ring to swing free.

To utilize the safety suit of the instant invention, the person merely dons the garment in the conventional manner. Straps are retained out of the way by the guide passage means and guide strips so that the arms and legs of the person may be inserted into the arm and leg portions of the garment without interference. If the wearer is occupied in a non-hazardous location, the **D**-ring **27** is held against the reinforcing means by means of the tabs **36** and the garment is worn in the conventional coverall manner. Whenever the person is to work in a hazardous location, such as in a manhole or tank, a suitable safety line (not shown) is attached to **D**-ring **27** while the same is held down by the tabs **36**. The person may then perform his work in the hazardous area as desired. Should he, for any reason, become incapacitated, he may be withdrawn from the hazardous area by a hoisting operation effective through the attached hoisting line. As tension is applied to the hoisting line, the pulling of the **D**-ring **27** upwardly first causes the **D**-ring to move away from opening **25** to the limit allowed by the strap portions **21** and **24**. As the **D**-ring is freely movable on the strap mid-portion M, it automatically adjusts its positioning thereon so that the length of each portion **21** and **24** is proper to effect a proper concurrent pull on each of the nooses of that strap. A further pull on the **D**-ring effects a tight constriction of each of the nooses about the associated body portion. Thus, the upper nooses **15** and **16** effect a firm embracing support

of the person's upper torso portion over his shoulders and around his side below the armpits. Nooses 17 and 18 effect a firm embracing support of the lower portion of the person's torso around the buttocks and around the thighs. A further pull on the elongated portions of the straps effected through the hoisting line causes the weight of the body to be supported by the straps from the embraced body portions only. As the body is lifted above the surface on which it had lain, it assumes a position in alignment with the extension of the hoisting line. Thus, if the body is being lifted from directly overhead, the body assumes a substantially vertical position with its arms and legs hanging freely and thereby avoiding interference with surrounding obstructions. The body may then be hoisted from the hazardous area as desired.

The release of the tight embracing support effected by the straps is automatically effected by the release of the hoisting tension on the mid-portions of the straps. Thus, when the hoisting operation is completed, the nooses release their embracing hold on the body permitting ready removal of the person's clothing or necessary resuscitating action.

The foregoing detailed description has been given for the clearness of understanding only and no unnecessary limitation should be understood therefrom, for some modifications will be obvious to those skilled in the art.

We claim:

1. Means for safely supporting a person's body in an upright manner during a hoisting thereof, comprising: a garment arranged to extend around the torso of the body; means secured to the garment to define therewith generally annular guide passages, a first pair of said guide passages being arranged to extend around opposite sides of the upper torso over the shoulder and under the armpit thereof and a second pair of said guide passages being arranged to extend around opposite sides of the lower torso over the thigh, around the buttock thereof; and strap means defining a plurality of nooses one each extending through each guide passage and having a loop at one end and an elongated portion passing freely through said loop and extendnig outwardly from the guide passage, said nooses being guided by said guide passages tightly around said torso portions when the elongated portion of each is drawn through the loop thereof.

2. The device of claim 1 wherein the elongated portions of the nooses in the first pair of guide passages pass therefrom adjacent the side of the person's chest under the armpits and the elongated portions of the nooses in the second pair of guide passages pass therefrom adjacent the buttocks.

3. The device of claim 2 wherein the loops are disposed adjacent the back of the garment.

4. The device of claim 3 wherein the elongated portion of each noose extends through the loop thereof to adjacent the upper back portion of the garment.

5. The device of claim 4 wherein means are provided on the back of the garment to guide the elongated portions to the upper back portion of the garment.

6. The device of claim 4 wherein an opening is provided in the upper back portion of the garment outwardly through which each of the second ends of the straps is brought.

7. The device of claim 1 wherein one end of each of the second pair of guide means opens into a portion of the guide means adjacent the other end and the strap loop is disposed in said portion.

8. Means for safely supporting a person's body during a hoisting thereof, comprising: a strap having a first noose portion at one end, a second noose portion at the other end, and a mid-portion joining the noose portions; a garment having guide means associated with each noose to guide the noose into a tight embracing of a portion of the torso of a person which may be safely embraced; and a ring slidable on said mid-portion adjustably positioning itself thereon when urged outwardly from said noose portions to adjust the length of the mid-portion extending from each noose portion so that equal hoisting forces are delivered to each noose portion, said first noose portion being arranged to extend around the side of the upper torso over the shoulder and under the armpit, and the second noose portion being arranged to extend around the side of the lower torso over the thigh around the buttock.

9. Means for safely supporting a person's body during a hoisting thereof, comprising: a garment extending adjacent the upper torso portion of the person's body; strip means secured to the inside surface of the garment portion to define a generally annular guide passage, said guide passage being arranged to extend over the shoulder and around the side under the armpit of the torso portion; and a strap extending through the guide passage and having a loop at one end and a second end extending outwardly from the guide passage and passing freely through said loop, said strap being guided by said passage into a tight noose configuration around said torso portion when said second end is drawn from said guide passage and through said loop.

10. Means for safely supporting a person's body during a hoisting thereof, comprising: a garment extending adjacent a lower torso portion of the person's body; a strip means secured to the inside surface of the garment portion to define a generally annular guide passage, said guide passage being arranged to extend over the thigh around the buttock and under the crotch thereof; and a strap extending through the guide passage and having a loop at one end and a second end passing freely through said loop and extending outwardly from the guide passage, said strap being guided by said passage into a tight noose configuration around said torso portion when said second end is drawn through said loop and from said guide passage.

11. A suit arranged to be worn by a person in the manner of a conventional article of clothing and serving, in an emergency, to permit the person to be hoisted with his body extending in a substantially vertical direction, comprising: a coverall garment; means associated with the garment to provide a plurality of guide channels, a first pair of such guide channels being arranged to extend around opposite sides of the upper torso over the shoulders and under the armpits of the person's body and a second pair of said guide channels being arranged to extend around opposite sides of the lower torso over the thighs and around the buttocks of the person's body; and a plurality of of nooses, the loop portions of which are disposed one each in the guide channels, the free end of each noose in the first described guide channels extending upwardly from under the person's armpits, and the free end of each noose in the latter described guide channels extending upwardly from behind the person's buttocks, said garment further having guide means for directing the free ends of the nooses to a common point behind the neck of the person, whereby the free end may be secured when desired to a hoisting means, such as a rope, at said point to effect a hoisting of the person's body while maintaining the person's body in a vertical disposition.

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