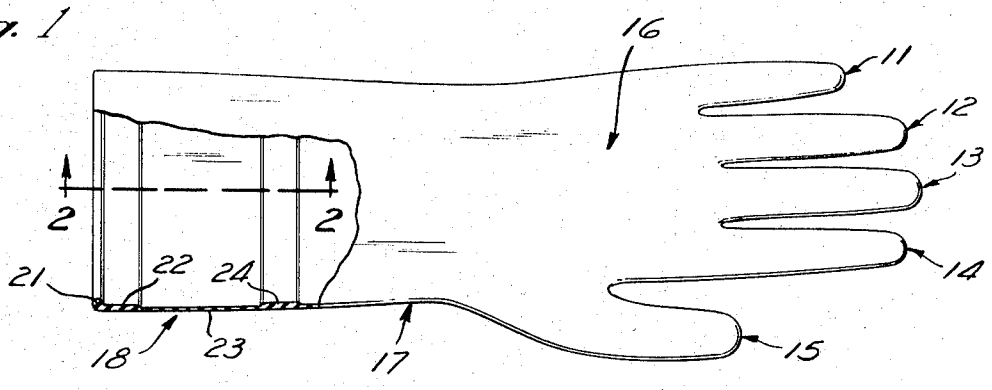
Jan. 19, 1971 E. MISKELL ET AL 3,555,564

RUBBER GLOVE

Filed Sept. 12, 1969

Fig. 1



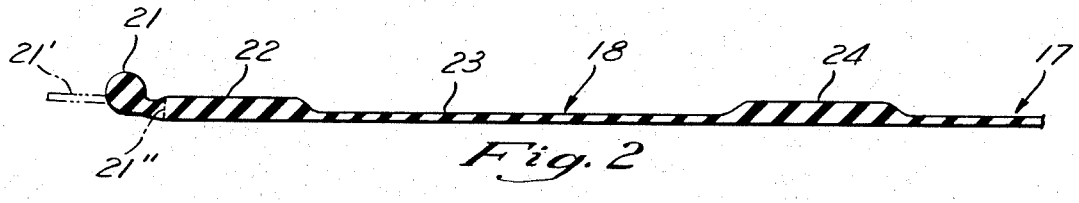


Fig. 2

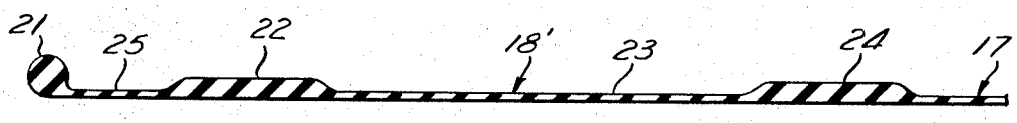


Fig. 3



Fig. 4

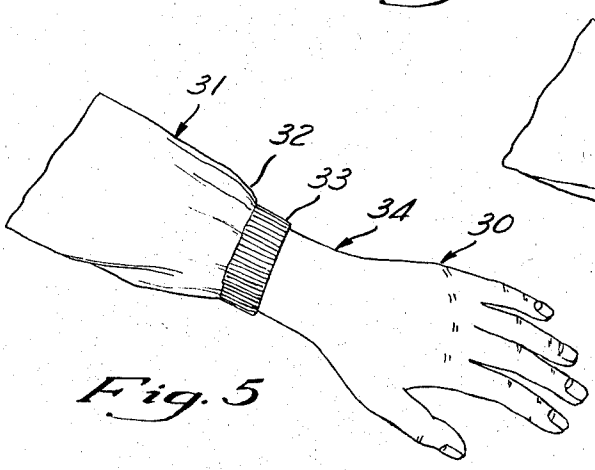


Fig. 5

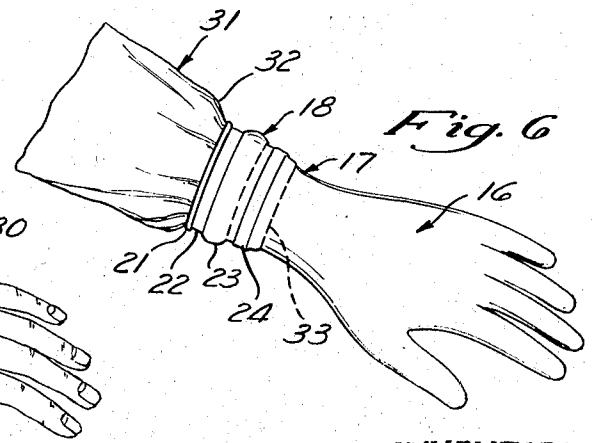


Fig. 6

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3,555,564

RUBBER GLOVE

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Filed Sept. 12, 1969, Ser. No. 857,495
Int. Cl. A41d 19/00
U.S. Cl. 2—168 10 Claims

ABSTRACT OF THE DISCLOSURE

A molded surgical glove or the like of thin, elastic, rubber or rubber-like material has spaced circumferential bands about the cuff portion adjacent its open end that are thicker and, therefore, more resistant to stretching than the material of the remainder of the glove body. When the cuff portion of the glove is pulled over the end of a loose, bulky sleeve, a ring of bunched-up sleeve material is trapped and maintained between the two thickened bands and prevents the cuff portion from slipping and working down off the sleeve toward the wearer's hand. If a terminal bead is formed about the open cuff end of the glove, it may serve as the endmost one of the spaced thickened bands, or be adjacent or contiguous thereto, or be substantially spaced therefrom.

This invention relates to rubber gloves and, more particularly, to gloves for use by doctors and surgeons of the type generally known in the trade as surgical gloves. It will be evident from the ensuing description of the invention, however, that the invention is not necessarily limited to gloves specifically sold for use by doctors and surgeons, but may have other applications in which the functions and attributes of the invention may be employed with comparable benefits.

BACKGROUND OF THE INVENTION

As is well known, surgical gloves are desirably made with the finger, thumb, and hand portions as thin as is reasonably possible in order that the surgeon can operate with a sensitive feel through the gloves and with minimum restriction of movement. Since the desired smooth fit of a surgical glove over the finger, thumb, and hand portions thereof can best be obtained by a glove fit that involves some stretching of those glove portions, making those portions of minimum practical thickness consistent with the required strength contributes materially to obtaining the desired smooth fit without undue restriction of movement.

As is also well known, surgical gloves must be donned by the surgeon after the gloves have been sterilized and without touching the outer glove surface against either the surgeon's hands, the hands of an assistant nurse, or any other unsterile object or surface. To facilitate donning the gloves, therefore, the gloves are packaged in a highly sanitary condition in a package that is closed by folding, with the cuff of each glove turned inside-out and back toward the hand portion thereof.

The gloves, in their sanitary packages, are normally sterilized in active live steam. After the conventional hand scrubbing, the surgeon or an assistant nurse opens the glove package without touching the gloves and holds one glove at a time by the cuff portion for insertion of the surgeon's hand on which the glove is to be applied. The particular technique by which the glove is held for insertion of the hand varies somewhat according to whether or not the surgeon donning the gloves does so alone or with assistance. In either case, however, only the cuff portion of the glove may be held as the surgeon's hand is pushed through the cuff opening and fully into the glove and as the folded back cuff portion is unfolded

and pulled over the open end of the sleeve of the surgeon's gown.

The sleeve end of the surgeon's gown is somewhat loose and bulky above a stretchable knitted cuff portion that may closely surround the surgeon's arm at or just above the wrist. Some of the bulky sleeve material is generally received within and elastically surrounded by the cuff portion of the glove, which is stretched as it is pulled up and about the sleeve. It is important that the glove cuff remain in place about the gown sleeve throughout the operation the surgeon is to perform in order to insure that any portions of the gown sleeve that may have been touched by a hand as the glove is being donned remains covered by the cuff portion of the glove and to confine the bulky portion of the sleeve far enough up on the surgeon's arm so that its bulk does not interfere with the operation in any manner. As the surgeon works, the portions of his gloves toward the cuff ends thereof commonly brush repeatedly against the sides of his gown, and this, together with the movements of his hands and lower arms within the gloves, sometimes tends to work the glove cuffs down off or partially off of the lower ends of the sleeves with one or another of the undesired consequences mentioned above. This has constituted a problem for the surgeon, and it is this problem to which the present invention is primarily directed.

Insertion of the surgeon's hand, wrist, and lower forearm into the glove, while stretching the relatively small diameter wrist portion to permit passage of the hand therethrough and while stretching the hand, finger, and thumb portions to fit the hand as described above, involves the application of considerable force. Since this force must be resisted solely by pulling on the cuff portion of the glove closely adjacent the opening thereof, it is also important that the cuff portion be sufficiently strong and resistant to tearing to withstand such rather rugged treatment. Thus, the present invention aims to solve the problem first described above while also providing a cuff portion for the glove that is sufficiently strong to resist tearing during its application.

Thickening of the cuff portion of a surgical glove over varying distances from the open end thereof has been proposed by U.S. Pats. Nos. 2,683,263 and 2,814,069 to Lenhart and No. 3,396,265 to Ansell. However, well this expedient may remedy the problem of glove tearing, it does not, in our view, provide a sufficiently effective solution to the problem of keeping the glove cuff in place about the gown sleeve.

SUMMARY OF THE INVENTION

As indicated above, the principal object of the present invention is to provide a glove construction such that the cuff of the glove will more securely remain in place over the lower end of a bulky garment sleeve, particularly the bulky lower portion of the sleeve of a surgeon's gown. A secondary objective of the invention is to provide a glove construction such that the cuff portion will sufficiently resist tearing while the glove is being donned.

In accordance with the present invention, the foregoing objects are achieved in a unitary, molded, elastic, rubber-like glove having finger, thumb, and hand portions adapted, with only moderate stretching, to smoothly fit the wearer, preferably with a relatively close fit also about the wearer's wrist, and having a lower forearm portion adapted to receive and surround the end of a garment sleeve. Retention of the forearm portion of the glove about the lower end of the garment sleeve is achieved by providing that portion of the glove with spaced circumferential bands adjacent the open end thereof that are of substantially greater material thickness than the portion between said bands and most or all of the remaining forearm, wrist, thumb, finger, and hand

portions. Various embodiments of such a glove construction and how such construction functions to achieve the objects of the invention are disclosed in detail hereinafter with reference to theaccompanying drawing.

Although the invention is not limited to any particular method or apparatus for forming the gloves, they may be made, for example, by the latex dipping method and apparatus disclosed in a copending application of Lawrence Povlacs and Richardson W. Howe, Ser. No. 766,246, filed Oct. 9, 1968. While a feature of the invention of that copending application is the production of so-called neuter or ambidextrous gloves, it will be evident that the invention of the present application is applicable to conventional gloves as well as to neuter or ambidextrous gloves, and the present invention is illustrated herein with reference to gloves that are conventional in that regard.

BRIEF DESCRIPTION OF THE DRAWING

In the drawing:

FIG. 1 is a plan view of one form of glove embodying the present invention;

FIG. 2 is an enlarged fragmentary section through the cuff portion of the glove of FIG. 1 and also shows, in phantom outline, the open end of the cuff prior to rolling it into a bead in the course of manufacturing the glove, the view being taken as indicated by the line **2—2** in FIG. 1;

FIG. 3 is a view similar to FIG. 2 but showing another embodiment of the invention;

FIG. 4 is a view similar to FIG. 2 but showing a third embodiment of the invention;

FIG. 5 is a view of a hand and lower forearm with the end of the sleeve of a surgeon's gown shown on the lower forearm; and

FIG. 6 is a view similar to FIG. 5 but showing a glove embodying the present invention as applied to the hand and lower forearm of FIG. 5 and about the lower end of the garment sleeve shown in FIG. 5.

DETAILED DESCRIPTION OF THE INVENTION

Referring to the drawing, FIG. 1 shows a glove comprising four finger portions, a thumb portion, a hand portion, a wrist portion, and a lower forearm potrion, all generally designated in that order by the refernece characters **11** to **18**, inclusive. Whatever material thickness for the main body of the glove may be selected as suitable for production from a particular latex composition by a particular manufacturing process, e.g., from as little as .004 inch to as much as .008–.010 inch, this thickness may be substantially uniform except for thickened bands adjacent the open end of the cuff as hereinafter described in detail. Although the selected thickness for the main body of the glove may vary slightly as a result of intentional or unavoidable effects of certain steps in the usual dipping and drying or other manufacturing process, these latter thickness variations will generally be relatively minor and, for convenience in the ensuing description, will be ignored.

As shown in FIG. 1 and on an enlarged scale in FIG. 2, the lower forearm or cuff portion **18** of the glove is provided with a conventional bead **21** about the open end thereof. This bead is formed by rolling back on itself the terminal end **21'** of the latex deposit (shown in phantom outline in FIG. 2) while the deposit is on the mold in an unvulcanized condition, in accordance with known commercial practice.

Immediately adjacent the bead **21** is a thickened, circumferential band **22** which merges into a somewhat wider, unthickened, circumferential band **23**. The unthickened circumferential band **23**, in turn, merges into a second, thickened, circumferential band **24**, which, in turn, merges into the lesser thickness material of the main body of the glove adjacent the wrist portion **17**.

As indicated in FIG. 2, the latex deposit on the mold is formed by depositing the thickened circumferential bands **22** and **24** as integral, monolithic parts of the whole. This may be done by first applying corresponding circumferential bands of a suitable coagulant to the glove mold in the locations where the thickened bands **22** and **24** are to be formed, while leaving the balance of the mold free of coagulant. Upon dipping the mold one or more times in a latex solution to deposit the desired material thickness for the main body of the glove, the desired greater thicknesses of material deposit over the bands where the coagulant was applied. Any of various, conventional coagulant compositions may be employed to produce the desired deposit thicknesses in a particular dipping operation, as will be understood by those skilled in the art.

Alternatively, depending upon the characteristics of the latex dipping solution, the entire mold may be coated with a coagulant and dipped in a latex solution to form a uniform deposit thereon; a second coating of coagulant may be applied in the selected band areas over the initial deposit; and the mold may then be redipped in a latex solution to increase the overall thickness of the first deposit by a greater amount in the selected band areas than over the balance of the mold form.

As another procedural alternative, the mold form may first be coated over the entire area on which the glove is to be formed with a suitable coagulant and, after drying the coagulant, a second layer of the same or a different coagulant may be applied over the first layer in the selected band portions. When the form is then dipped in the latex, the thickness of the latex deposit will vary in a manner roughly proportional to the amount of coagulant on the different portions of the form.

These and other alternative procedures for forming selected areas of greater material thickness than other areas are disclosed or are obvious from U.S. Pat. No. 1,989,717 to Szegvari and No. 2,806,257 to Rosenberg. The most advantageous procedure will depend upon details of the particular latex dipping solution and of the dipping and drying procedures and apparatus to be employed, as well as upon the particular, relative, material thicknesses desired for the main glove body and for the thickened bands **22** and **24**.

Because the glove shown in the drawing is preferably molded inside-out and is turned right side out in removing it from the mold, the bead **21** and the thickened bands **22** and **24** in the several illustrated embodiments of the invention tend to protrude inwardly from the inside surface rather than outwardly from the outside surface of the finished glove, as particularly shown in FIGS. 1 and 2 of the drawing.

It is common for the main body of a surgical glove to have a thickness somewhere in the range of about 0.005 to 0.010 inch. Whatever that thickness or average thickness may be, the thickened bands **22** and **24** should be substantially thicker so as to be distinctly more resistant to stretching than the intervening, unthickened band **23** and, hence, more restricting on a garment sleeve surrounded thereby, as hereinafter explained. Suitably, the bands **22** and **24** may be from 2 to 3 times as thick as the main body of the glove (of which the intermediate band **23** is considered a part) and, therefore, may range from about 0.010 inch to about 0.030 inch or more in thickness, depending on the thickness of the main body of the glove.

The width of the thickened bands **22** and **24** may be similarly varied over a considerable range. Since the function of these bands is to more tightly encompass a garment sleeve than the intermediate unthickened band portion **23**, the most suitable widths for the thickened band portions are necessarily dependent in part on the thickness of those band portions, both in an absolute sense and relative to the thickness of the intermediate, unthickened band **23**, so that the combination of thickness and width of each thickened band **22** and **24** will be distinctively more resistant to stretching and more restrictive on a garment sleeve than the intermediate unthickened band **23**. Since it is easier to form only moderately thickened bands

22 and 24 of whatever width such thickness may require, these bands will generally be in the range of about three-eighths inch to three-quarters inch in width, the width preferably being toward the upper end of this range if the band thickness is near the lower end of the thickness range mentioned. Although excessive widths of the bands 22 and 24 may be objectionable for a variety of reasons, the principal objects of the invention are more dependent on the location and width of the intermediate, unthickened band 23.

Since it is desirable for the main body of a surgical glove to be as thin as possible while having the strength essential to resist failure in use, it is preferred that the thickness of the main body of the glove be approximately 0.005 inch. For a glove of that thickness, bands 22 and 24 of approximately 0.014 inch in thickness and approximately one-half inch in width have been found highly satisfactory for the purposes of the present invention. When the glove is constructed with these dimensions, the unthickened band 23 is preferably about 2 inches wide, but may suitably be anywhere in the range of about 1½ to 2½ inches in width.

It may often be easier to form a bead 21 at the open end of the glove in the construction shown in FIGS. 1 and 2 than to produce any other comparably neat and uniform edge configuration. Moreover, by rolling the bead 21 to the point where there is little or no reduction in material thickness between it and the thickened band 22, as shown in FIG. 2, maximum resistance to tearing of the glove while it is being donned by the surgeon is obtained. In this case, the bead 21 and thickened band portion 22 act together as a single thickened band for holding the cuff of the glove in place about the sleeve of a surgeon's gown as hereinafter explained. Such a construction is preferred. Alternatively, if desired, the bead 21 may be omitted, in which case the thickened band 22 may be terminated with a squared or rounded terminal edge, the optional squared edge being indicated by the dot-dash line 21″ in FIG. 2.

FIG. 3 illustrates a variant of the construction shown in FIGS. 1 and 2. In this embodiment of the invention, a modified lower forearm or cuff portion 18′ is provided in which the bead 21 is spaced from the thickened band portion 22 by an intervening cuff portion 25 that may be of essentially the same thickness as the unthickened band 23 between the thickened bands 22 and 24. This construction may be desired if, for any reason, a longer than normal glove is needed in order to pull the cuff portion of the glove higher up on the forearm further up over the gown sleeve. For this purpose, the unthickened additional cuff portion 25 between the bead 21 and thickened band 22 may be of any desired width. In other respects, the construction shown in FIG. 3 is essentially like that shown in FIGS. 1 and 2 insofar as the character and function of the thickened bands 22 and 24 are concerned.

FIG. 4 illustrates another variant of the construction shown in FIGS. 1 and 2. In this case, the bead 21, itself, constitutes one of the two thickened bands about the cuff portion 18″ of the glove and performs the function of the bead 21 and band 22 in the construction of FIGS. 1 and 2. In this case, the thickened, circumferential band 21 is separated from the thickened, circumferential band 24 by the same intermediate, unthickened, circumferential band 23 shown in each of the previously described embodiments of the invention. If desired, the bead 21 in the construction of FIG. 4 may be enlarged to provide greater resistance to stretching and a greater restricting effect on a gown sleeve so as to be comparable in its operation in this regard to the action of the combined bead 21 and thickened band 22 in the construction of FIGS. 1 and 2.

Turning now to the mode of operation of the glove construction of the present invention, FIG. 5 illustrates a surgeon's hand 30 and lower forearm 31 with the end of the sleeve 32 of a surgeon's gown about the lower forearm. As shown, the gown sleeve may include a stretchable cuff 33 that snugly surrounds the surgeon's arm at or adjacent his wrist 34. FIG. 6 shows the same hand, lower forearm, and gown sleeve with the glove of FIGS. 1 and 2 applied for utilizing the improved novel features of the invention.

As shown in FIG. 6, the thickened band 24 of the glove surrounds the cuff 33 of the gown sleeve, the thickened band 22 and adjacent bead 21 surround the gown sleeve well above the upper end of the cuff 33, and the unthickened band 23 of the glove cuff bulges outwardly to accommodate the bulkiness of a portion of the gown sleeve trapped between the thickened bands 22 and 24 immediately adjacent the cuff of the gown sleeve. The bulkiness of the gown sleeve in this region tends to form a bunched-up ring of gown sleeve material between the thickened bands 22 and 24 that resists working of the thickened band 22 and bead 21 downwardly on the surgeon's arm as his arm brushes against his side in the course of performing an operation. The gathering together and trapping of this ring of bulky gown material between the two thickened bands 22 and 24 is facilitated by the relative looseness of the unthickened intermediate band 23 and by a natural tendency of the tighter bands 22 and 24 to be positioned so as to leave some slacks in the intermediate band 23.

As can readily be seen from the foregoing and from FIG. 6, essentially the same function of holding the cuff end of the glove in place would be accomplished with the cuff portion of the glove extending further upwardly on the surgeon's arm so that the thickened bands 22 and 24 both embrace the gown sleeve above the cuff 33. Also, with an unthickened band portion 23 of sufficient width, and depending upon the length of the cuff 33 of the gown sleeve, the thickened band 24 of the glove cuff could surround the surgeon's arm immediately below the open end of the cuff while the upper thickened band 22 of the glove surrounds the gown sleeve far enough above the cuff to cause the same kind of bunching of bulky sleeve material adjacent the upper end of the cuff. Thus, the glove cuff construction of the present invention allows for considerable variation in the relationship between the circumferential bands 22 and 24 of the glove cuff and the lower end portion of the gown sleeve while functioning in essentially the same relationship therewith to more securely retain the cuff end of the glove in place about the end of the gown sleeve.

It should be evident from the foregoing and from the similarities of the structures of FIGS. 2, 3, and 4 that each of those constructions will similarly function to accomplish the principal object of the invention. In the case of the construction of FIG. 3, depending upon the width of the unthickened band 25 between the bead 21 and thickened band 22, this construction is capable of trapping two bunched-up rings of gown sleeve material, one between the bead 21 and thickened band 22 and the other between the two thickened bands 22 and 24. In this respect, the unthickened band 25 in FIG. 3 may function essentially the same as the unthickened band 23 in the construction of FIG. 4.

While several embodiments of the present invention have been disclosed for illustrative purposes to indicate how the glove cuff structure may be varied within the scope of the invention, it will be evident htat the invention is not limited to the particular embodiments illustrated and described. Also, while preferred dimensional relationships have been given for a specific glove construction and for such variants thereof as may most commonly be encountered, it will also be evident that such dimensional relationships are not sharply critical and may be varied considerably while achieving the described mode of operation and advantages of the invention.

What is claimed is:

1. A unitary, elastic, rubber-like glove adapted to snugly fit the wearer's hand, fingers, and thumb and having an open end cuff portion adapted to be pulled over the

wearer's hand,wrist, and lower forearm for receiving and surrounding the end portion of a garment sleeve, the improvement comprising spaced circumferential bands on said cuff portion and an intermediate section therebetween of substantially uniform thickness, the thickness of said bands being at least twice as great as the thickness of said intermediate section, said bands being substantially more resistant to stretching than said intermediate section, the spacing between said bands being at least about as great as the sum of the widths of said bands, said band providing spaced zones for snugly encircling a wearer's lower forearm and with a sleeve portion gathered and extending outward along said intermediate section for assisting in anchoring said cuff portion against movement toward said hand during use of said glove, said remaining portions of said glove being substantially more elastic than said bands and allowing normal hand and wrist movement without producing sufficient longitudinal force to pull said cuff portion of said sleeve portion.

2. In a glove of the type defined in claim 1, the improvement as defined therein in which the thickness of the material of said intermediate section is substantially the same as the thickness of the material beyond said circumferential bands away from said open end.

3. In a glove of the type defined in claim 1 and including a thickened bead about the open end of said cuff portion, the improvement as defined in claim 1 in which one of said circumferential bands includes said bead.

4. In a glove of the type defined in claim 1 and including a thickened bead about the open end of said cuff portion, the improvement as defined in claim 1 in which one of said circumferential bands includes said bead and an additional, thickened, circumferential zone contiguous therewith.

5. In a glove of the type defined in claim 1 and including a thickened bead about the open end of said cuff portion, the improvement as defined in claim 1 in which the one of said circumferential bands closest to said bead is spaced therefrom by a band of material substantially of the same thickness as the material of said intermediate section.

6. In a glove of the type defined in claim 1 and including a thickened bead about the open end of said cuff portion, the improvement as defined in claim 1 in which the one of said bands closest to said bead is spaced therefrom only by a circumferential zone of material substantially thicker than the material of said intermediate zone and beyond them away from said open end.

7. In a glove of the type defined in claim 1, the improvement as defined therein in which said spacing between said circumferential bands is in the range of about 1½ to 2½ inches.

8. In a glove of the type defined in claim 1, the improvement as defined therein in which at least one of said circumferential bands is of a width substantially greater than its thickness.

9. In a glove of the type defined in claim 1, the improvement as defined therein in which at least one of said circumferential bands is of a width substantially greater than its thickness and the other of said circumferential bands is a bead of generally circular cross section.

10. A unitary elastic, rubber-like glove as set forth in claim 1 wherein said bands have a thickness of about 0.014 inches, the remaining surfaces of said glove including said intermediate sections have a thickness of about 0.005 inch, the width of said intermediate section is about 1½ inches to 2½ inches, and the width of said bands is about ⅜ inches to ¾ inches.

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PO-1050
(5/69)

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,555,564 Dated January 19, 1971

Inventor(s) Earle Miskell and Lawrence Povlacs

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 2, line 44, delete the comma.

Column 3, line 43, change "potrion" to --portion--; and
line 44, change "refernece" to --reference--.

Column 4, line 34, change "Pat." to -- Pats. --.

Column 6, line 24, change "slacks" to --slack--; and
line 63, change "htat" to --that--.

Column 7, line 10, change "band" to --bands--; and
line 19, after "portion" [first occurrence] insert --off--.

Signed and sealed this 8th day of June 1971.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

WILLIAM E. SCHUYLER, JR
Commissioner of Patents