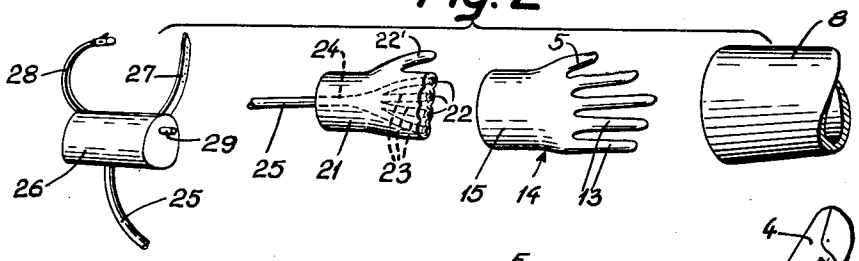
May 21, 1963 L. LANTEIGNE 3,090,049

ARTIFICIAL HAND

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Fig. 2



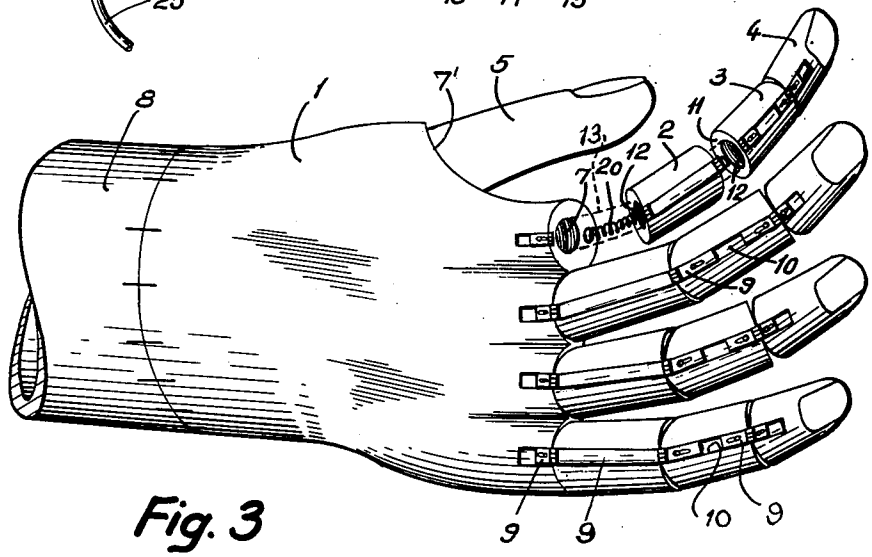


Fig. 3

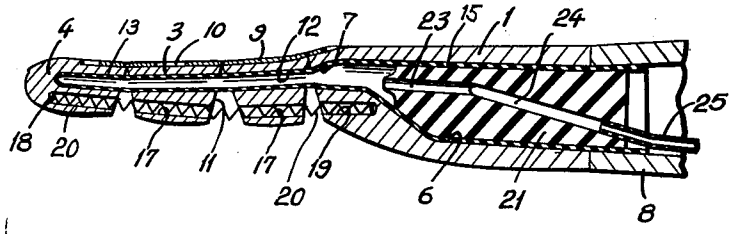


Fig. 4

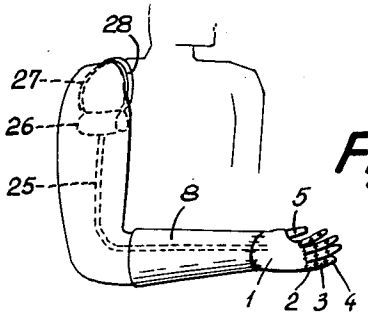


Fig. 1

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ARTIFICIAL HAND

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The present invention relates to an artificial hand which can be secured to the end of an artificial arm or directly to the amputated arm of the user and which has the external shape of a natural hand and in which the fingers are in a normally closed position and can open by simple pressure of the arm against the body.

The main object of the present invention resides in the provision of an artificial hand of the character described which operates by pneumatic pressure and which is constituted by parts which can be easily disassembled for repairs, cleaning, and the like, and in which the number of constituting parts is a minimum whereby the artificial hand is relatively inexpensive to manufacture.

Another object of the present invention resides in the provision of an artificial hand of the character described which is easily operated and can take a firm grip.

The foregoing and other important objects of the present invention will become more apparent during the following disclosure and by referring to the drawing, in which:

FIGURE 1 is a schematic view of the artificial hand in accordance with the present invention fitted on the forearm of the user;

FIGURE 2 is an exploded perspective view of some of the parts forming the hand of the invention;

FIGURE 3 is a perspective view of the assembly of the rigid and articulated parts forming the artificial hand, one of the fingers being shown in exploded perspective view in order to see the internal structure; and

FIGURE 4 is a longitudinal section of one finger, of the metacarpal part and of the wrist part.

In the drawings, like reference characters indicate like elements throughout.

The artificial hand of the present invention consists in part of an assembly of rigid elements which are pivotally interconnected and made of plastic, aluminum or other materials normally used for the construction of artificial limbs. The assembly has the external shape of a natural hand and is adapted to be inserted in an external glove (not shown) which preferably has the feel and color of natural skin. The assembly of the pivoted rigid parts consists of a metacarpal element **1** and for each of the four fingers of rigid phalange members **2**, **3** and **4**. Metacarpal part **1** is hollow defining a cavity **6** which opens at the exterior for each of the four fingers, as shown at **7**, and also for the thumb at **7'**. Cavity **6** also opens at the big end of the metacarpal part **1** and this big end is rigidly secured to a sleeve element **8** of hollow construction and in which is inserted the amputated forearm of the user. The sleeve **8** can be replaced by an artificial arm which, in this case, would be secured above the elbow.

The phalanges **2**, **3** and **4** of each finger and the metacarpal **1** are pivotally interconnected by means of hinges **9**, the side edges of which are bevelled for slidable engagement with the longitudinal slots **10** of dovetailed cross-section, said slots **10** being made in the top portion of the phalanges **2**, **3** and **4** and also in the fore part of the metacarpal part **1**. Hinges **9** permit the pivotal movement of the phalanges **2**, **3** and **4** the ends of which are bevelled as indicated at **11**, in order to permit normal closing of the phalange members as natural fingers. The hinges **9** may move longitudinally within the slots **10** so as to close the fingers to a still greater degree. The

phalanges **2**, **3** and **4** are provided with bores or passages **12** which are in communication with each other and with the openings **7** of metacarpal part **1**. Bores **12** of terminal phalange members **4** are blind bores. The bores or passages **12** are disposed immediately underneath the hinges **9** and their internal surface is rough or ribbed as shown in FIGURE 3. The passages or bores **12** are adapted to receive the finger elements **13** of an internal glove **14** (see FIGURE 2) made of flexible and elastic material such as rubber, and capable of being inflated with air.

The metacarpal part **15** of glove **14** lines the internal surface of cavity **6** of rigid metacarpal part **1** whereas fingers **13** of glove **14** extend through openings **7** and line the bores **12** up to the bottom of the blind bore **12** of phalange **4**.

The glove **14** has also a hollow thumb part **5** which extends through thumb opening **7'** made in rigid metacarpal part **1**, as shown in FIGURE 3. The phalanges **2**, **3** and **4** are moreover provided with longitudinal bores **17** and **18** made underneath the passages **12** and opposite a blind bore **19** made in the outer end of the metacarpal part **1**. The bores **17**, **18** and **19** are adapted to receive a helical spring **20** which is secured within the bottom of blind bore **18** of phalange **4** and in the bottom of the blind bore **19** of the metacarpal part **1**. This coil spring is under tension and urges the phalanges in closed position.

A metacarpal block **21** made of solid rubber or the like is inserted within the metacarpal part **15** of internal glove **14** so as to tightly fit cavity **6** of part **1**. Block **21** is provided at its outer end with four bosses **22**, slightly protruding within the four fingers **13** of the internal glove **14**. Block **21** has also a solid finger **22'** adapted to be fully inserted within the thumb **5** of internal glove **14**. A conduit system constituted by four branches **23** respectively opening at the outer end of bosses **22** and connected to a common duct **24**, is made within the mass of block **21**; the inner end duct **24** is connected to a flexible tube **25** which extends through the sleeve **8** to be connected to a flexible pouch **26**. The pouch **26** is preferably made of rubber and has an elongated shape adapted to be located under the arm pit of the user and maintained by straps **27** and **28** adapted to be interconnected over the user's shoulder, as shown in FIGURE 1. Pouch **26** is provided with a check valve **29** which permits entrance of air within the pouch when the latter is allowed to take its natural shape and which prevents escape of the air from the pouch otherwise than through tube **25** when the pouch is pressed against the body by the user's arm.

In the normal position of the artificial hand, the fingers are in a closed position under the action of springs **20**. When the user desires to open the hand, he has only to press his arm against his body thereby compressing the air within the pouch **26** which is fed to each one of the fingers **13** of the internal glove **14** and produces the straightening of the fingers **13** which in turn produce the opening movement of the phalange parts **2**, **3** and **4** against the action of springs **20**.

Because the hinges **9** may slide longitudinally within the slots **10**, metacarpal part **1** and phalange members **2**, **3** and **4** may take a slightly spaced apart position whereby the fingers are more flexible and can grasp objects of different sizes and also this permits a more pronounced closing of the fingers than that otherwise allowed by the bevelled ends **11** of the phalanges **2**, **3** and **4**.

While a preferred embodiment in accordance with the present invention has been illustrated and described, it is understood that various modifications may be resorted to without departing from the spirit and scope of the appended claims.

What I claim is:

1. An artificial hand comprising an assembly of rigid pivotally interconnected parts, having the external shape of a hand, these parts including a metacarpal part and phalanges pivotally interconnected to each other and to said metacarpal part, said metacarpal part having a cavity with end openings, and said phalanges having bores in communication with each other and with said openings, an internal flexible air pressure expansible glove-like element disposed within said cavity of said metacarpal part and having finger portions extending through said openings and within said bores of said phalanges, a metacarpal block inserted within the internal glove-like element to apply the latter against the surface of the cavity of said metacarpal part, said block having bosses entering within and sealing the finger portions of said internal glove-like element, a duct system within said block opening at each of said bosses and communicating with a common duct in said block, a compressible pouch adapted to be positioned under the armpit of the user in order to produce compressed air by pressing the arm against the body, a tube connecting said pouch to said common duct in order to feed the finger portions of said internal glove-like element with compressed air to cause straightening of said finger portions and consequently opening of said phalanges, and spring means interconnecting said phalanges and metacarpal part and urging the same into closed position, the adjacent ends of said phalanges and metacarpal part being bevelled to allow closing movement of said phalanges under the action of said spring.

2. An artificial hand as claimed in claim 1, wherein the pivotal connections of said phalanges between themselves and to said metacarpal part consist of hinges longitudinally slidable in slots made in the upper side of said phalanges and said metacarpal part.

3. An artificial hand as claimed in claim 1 wherein said spring means consist of coiled tension springs disposed within longitudinal bores made in said phalanges and in said metacarpal part and urging together said part and phalanges.

4. An artificial hand as claimed in claim 2 wherein said spring means consist for each finger of a coiled tension spring in aligned longitudinal bores made in said phalanges and in said metacarpal part under said passages.

References Cited in the file of this patent

UNITED STATES PATENTS

2,556,524	Drennon	June 12, 1951
2,659,896	Biasi	Nov. 24, 1953

FOREIGN PATENTS

303,587	Germany	Feb. 7, 1918
318,851	Germany	Feb. 16, 1920
1,008,691	France	Feb. 27, 1952