1,016,993

PATENT SPECIFICATION

DRAWINGS ATTACHED

1,016,993

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Int. Cl.: —B 41 j

COMPLETE SPECIFICATION

Improvements relating to Typewriter Keyboards

We, INTERNATIONAL BUSINESS MACHINES CORPORATION, a Corporation organized and existing under the laws of the State of New York in the United States of America, of Armonk, New York 10504, United States of America (assignees of IBM DEUTSCHLAND INTERNATIONALE BURO-MASCHINEN GESELLSCHAFT M.B.H.,) do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a keyboard for typewriters or the like machines. Such keyboards have two collections of keys, to be operated by both hands of the operator. Alternatively the keyboard may have only one collection of keys to be operated by a single hand of the operator.

In the typewriter keyboards now in common use, the keys are arranged in horizontal rows extending in parallel to the platen, and the individual rows are arranged in steps ascending toward the platen. In this keyboard arrangement, the spaces between the key centres are approximately equal to the spaces between the fingers with the hand almost closed. The keys of the second row constitute the so-called basic keys on which the fingers rest when in their home position for typing. Considering a person sitting in front of such a keyboard in his natural position, as seen from the top, the forearms form an angle of approximately 60 degrees with the shoulders, i.e. form an angle of approximately 30 degrees with the axis of symmetry, the forearm extending horizontally and forming an angle of approximately 90 degrees with the upper arm. Due to the arrangement of the basic keys along a straight line, the hands have to be bent horizontally by approximately 30 degrees with respect to the forearm, which means a constant stress on the wrist. The average distance which a finger has to move during the typing operation is relatively large. The numerals are accommodated in the top row of keys. In order to reach these frequently needed keys, the fingers have to move through the longest distance, and the operator frequently interrupts his typing system and rhythm in order to operate these keys. Moreover, primarily because the keys are arranged approximately in a plane, both the fingers and the entire arm have to be moved in order to place the respective finger depressing a key always into a position vertically above such key. Otherwise the keys of the lower rows are depressed by the fingernails and the keys of the upper rows by the lower parts of the fingertips, that is, only part of the finger force being employed acts in the direction of the key movement, while the other part acting perpendicularly thereto merely increases the friction of the key guide. A close observation of the individual finger movements when using a key arrangement of the described type finally shows that, due to the longer distances through which they have to move, the thumb, the little finger and the index finger are strained substantially more than the middle and ring fingers.

It is an object of the present invention to provide a keyboard for typewriters or like machines in which the above disadvantages are mitigated.

According to the invention a keyboard for typewriters or like machines comprises at least one collection of keys, the contact faces of which are arranged so as to present a concave surface for the fingertips of the operator.

The expression "concave surface" is used in this Specification to describe a surface similar to the inside surface of an eggshell.

How the invention can be carried into effect is hereinafter particularly described

with reference to the accompanying drawings in which:—

Figure 1 is a top view of a keyboard embodying this invention;

Figure 2 is a vertical sectional view placed in parallel to the platen through the keyboard arrangement along the line A—A in Figure 1;

Figure 3 shows a vertical section through one of the two keyboard halves along the guide keys (second row of keys) corresponding to the sectional line B—B in Fig. 1;

Fig. 4a shows a vertical section extending in the direction toward the platen through the keyboard arrangement along the line C—C in Fig. 1 as seen toward the functional keys;

Fig. 4b is a schematic representation of the levels of the keys in the individual columns of character keys;

Fig. 5 is a lateral view of the keyboard arrangement with a person sitting in front of it;

Fig. 6 is a top view of the keyboard arrangement with a person sitting in front of it;

Fig. 7 represents the curves swept by the finger tips with the fingers bent;

Fig. 8 illustrates the arrangement of the character keys of the row of guide keys in a keyboard half in a schematic view; and

Fig. 9 shows a vertical projection of a keyboard half illustrating the arrangement of the columns of keys and rows of keys in accordance with the structure of the human hand.

In the drawing, the numeral 11 designates a table-like support (Figs. 5, 6) on which the typewriter, indicated by a platen 12, is placed. The machine operator 13 is sitting at the table 11 in a relaxed position corresponding to the natural physique. The forearms 14 of the operator do not extend horizontally but in a position sloping slightly downwardly. Correspondingly, the table 11 too is arranged to slope slightly downwardly from the operator's position. With the operator's body in this position, his forearms, as seen from the top, form an angle of approximately 60 degrees with his shoulders (Fig. 6), the forearms thus each forming an angle of approximately 30 degrees with the axis of symmetry 15.

The keys to be operated are accommodated on the table 11 in two keyboard halves or collections of keys 16 and 17, each of which is operated by one hand. The two keyboard halves are entirely separated from each other and from the machine and arranged on the table 11 to be freely movable, so that they may be adapted to each operator and displaced into the most convenient position, preferably the 30-degree inclination with respect to the axis of symmetry. In that position, the centre lines of the two keyboard halves (the angle bisectors between the two outer columns of keys) coincide with a straight line extending from the tip of the middle finger to the elbow.

The two keyboard halves are so designed that the keys mounted thereon are arranged in three-dimensionally curved areas. Those areas correspond to that area which is swept by the finger tips with the hand performing a grasping movement, especially by bending the fingers (Fig. 7).

First considering the character keys of the so-called guide key row forming the second row of keys, a vertical section through that row (Fig. 3) shows that the row of keys slopes outwardly with approximately a 30-degree inclination. This arrangement is based on the discovery that, while the operator occupies a relaxed position at the table, the hand does not lie in a horizontal position but is tilted outwardly under the indicated angle. Besides, this row of keys is arranged along an outwardly opening spiral curve on which the finger tips of an almost closed hand lie with the slightly bent fingers placed on the keys. Thus, the arrangement of the guide key row in a spiral curve in the vertical projection and in a sloping plane in the horizontal projection results in the spatial, spiral row of keys represented in Fig. 8. Curve 18 represents the local curve for the finger tips which are indicated by the circles 19. The dotted lines 20 indicate the direction of movement of the fingers when performing a bending movement.

In a configuration resembling that of the guide key rows, the character keys of the first, third and fourth key rows are also arranged in outwardly opening, spiral curves which, however, are not disposed in an outwardly sloping plane but in a manner to be described in detail below on a curved surface (Fig. 2).

The keys are also arranged in columns extending toward the platen. In accordance with the structure of the hand, the vertical projections of these columns lie on radially divergent straight lines the point of intersection of which is an imaginary point just behind the wrist bone (Fig. 9). In accordance with the differential flexibility of the individual fingers, the index finger has assigned thereto two columns of character keys, one column of character keys being respectively assigned to the middle and ring fingers, and one column of character keys and one to two columns of functional keys being assigned to the little finger.

The fields surrounding the key columns are rendered clearly distinguishable from the keyboard housing by different colours or by different coloured edges (drawn with heavy edge lines in Fig. 9). The individual columns of keys are respectively arranged

in a curve which initially slopes downwardly and then rises again in the direction toward the platen (compare also Fig. 7), the guide keys being respectively placed approximately on the deepest point of such curve. The levels of the five key columns including character keys 2, 3, 4, 5 and 6 respectively (as shown in Fig. 1) are schematically represented in Fig. 4b. In accordance with the general upward slope of the character keys, the key column including character key 6 occupies the highest and the key column including character key 2 occupies the deepest point.

The functional keys accommodated in the extreme outer key columns are also adapted to the bending movement of the fingers. They are arranged along the curve of the key columns, however ascending under an angle of approximately 45 degrees (Fig. 2, Fig. 4a). In this manner, there results for the overall key field a troughlike structure the surface of which is swept by the finger tips when the fingers are bent with the hand otherwise at rest. The operating directions of the individual keys respectively extend in the direction of the surface normal, the surfaces of the key caps respectively extending in the tangential plane of the two-dimensionally curved surface. Besides, according to common usage, the key caps are provided with small depressions.

In consideration of the natural position of the thumb, the keys 21, 22 to be operated by the thumb are mounted on the inner sides of the two keyboard halves 16, 17. Their direction of operation is adapted to the natural direction of the thumb movement (compare also Fig. 7). It extends approximately perpendicular to the direction of movement of the rest of the keys. The thumb key is designed as a functional key. The two thumb keys may be used for performing different functions. Thus, for example, one thumb key may be designed as the "space key", the other as the "line spacing key without carriage spacing".

Furthermore, the two keyboard halves are provided with rests 23, 24 for the heels of the hands, upon which the heels of the hands may be placed at least during the working breaks.

WHAT WE CLAIM IS:—

1. A keyboard for typewriters or like machines comprising at least one collection of keys the contact faces of which are arranged so as to present a concave surface to the finger tips of the operator.

2. A keyboard according to claim 1, in which said surface is designed to be swept by the fingertips of an operator when the fingers are bent with the hand otherwise at rest.

3. A keyboard according to claim 1 or claim 2, including two collections of keys, the collections of keys being adjustable with respect to each other.

4. A keyboard according to any of the preceding claims, in which the line bisecting each collection of keys coincides with a line joining the middle finger and the elbow of an operator holding his arm in the natural position.

5. A keyboard according to any of the preceding claims, in which the keys of each collection are arranged in rows, each row of keys being arranged along an outwardly opening spiral curve.

6. A keyboard according to any of the preceding claims, in which the keys of each collection are arranged in columns and the keys of each column present a concave curve which, in a direction toward the platen, initially slopes downwardly and then ascends upwardly, the guide keys being preferably disposed near the deepest point of the curve.

7. A keyboard according to any of the preceding claims, including rests for the heels of the hands of the operator.

8. A keyboard as claimed in any one of the preceding claims, in which the keys are mounted on a table sloping downwardly away from the operator.

9. A keyboard for typewriters or like machines substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

M. J. W. ATCHLEY,
Chartered Patent Agent,
Agent for the Applicants.

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Published at The Patent Office, 25, Southampton Buildings, London, W.C.2, from which copies may be obtained.

FIG. 1.

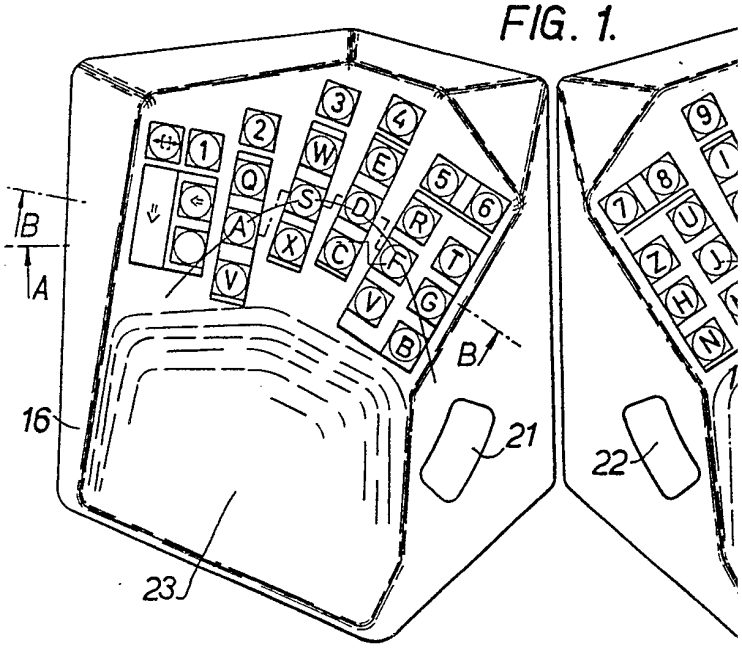


FIG. 2.

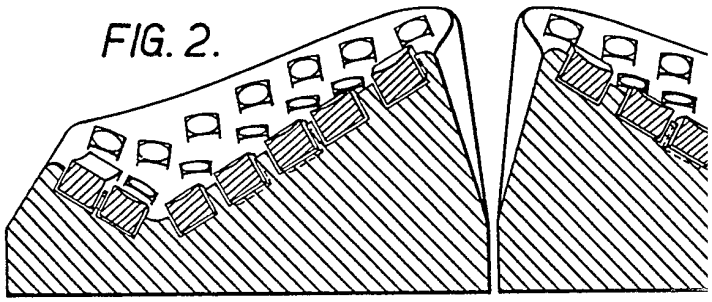
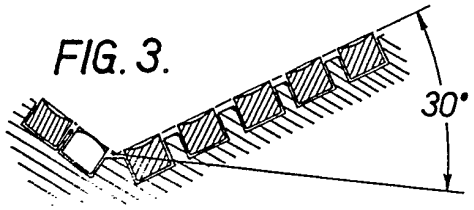


FIG. 3.



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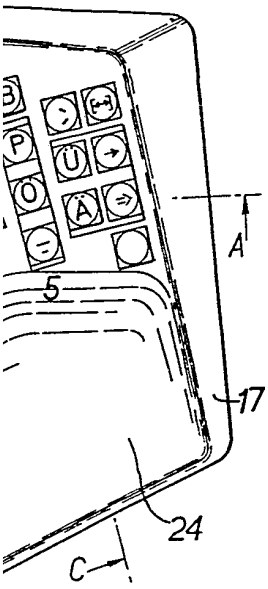
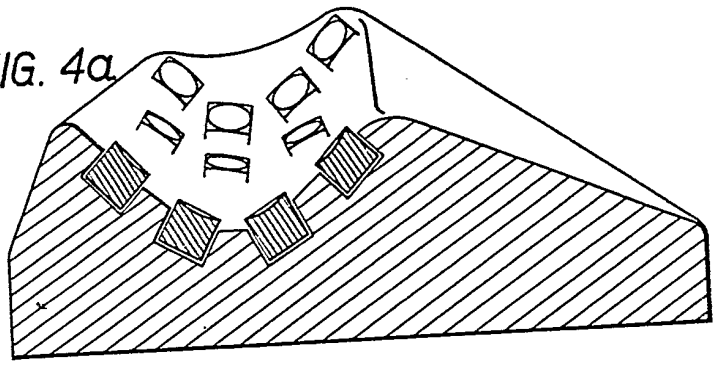
Sheet 1

FIG. 4a





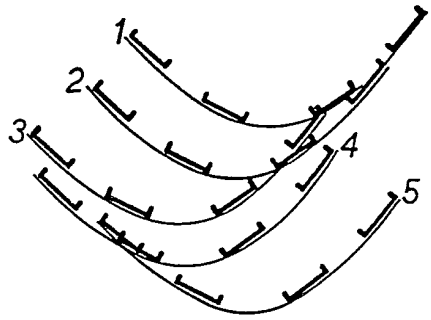


FIG. 4b.

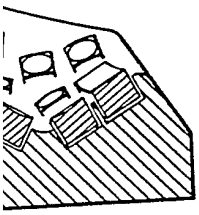


FIG. 5.

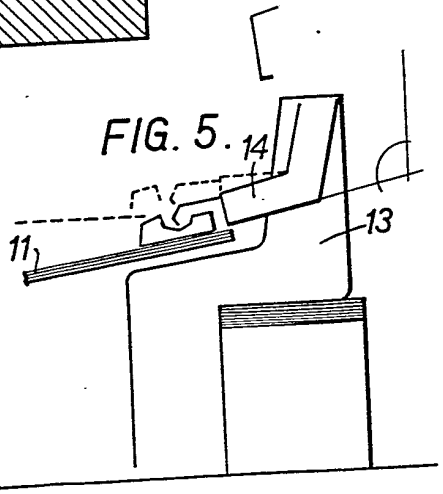
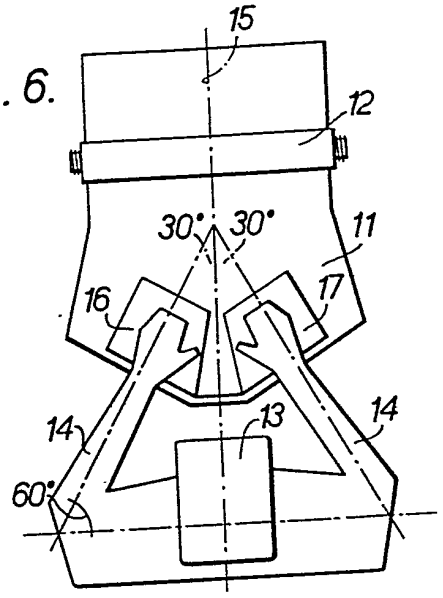


FIG. 6.



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Sheet 1

FIG. 1.

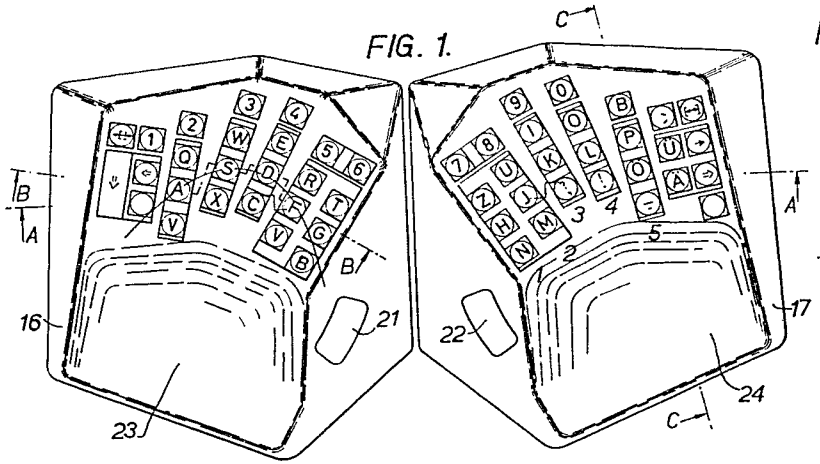
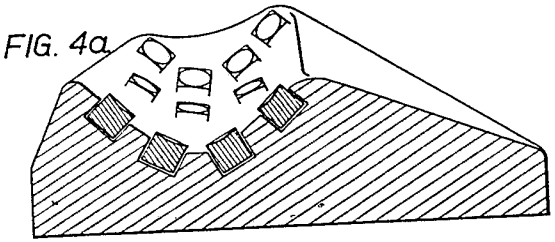


FIG. 4a.



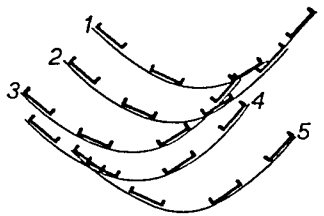


FIG. 4b.

FIG. 2.

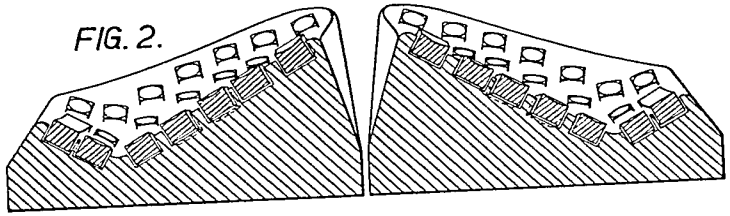


FIG. 6.

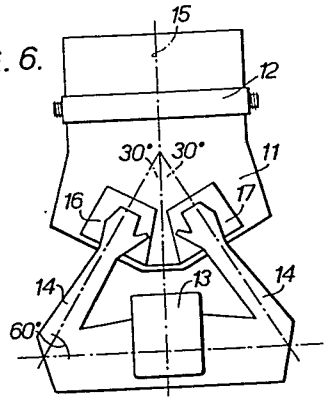


FIG. 5.

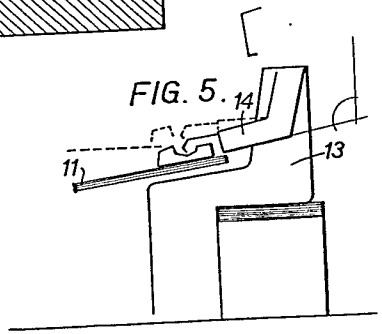
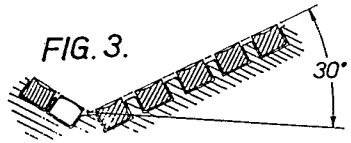


FIG. 3.



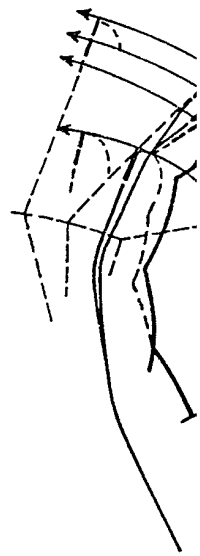
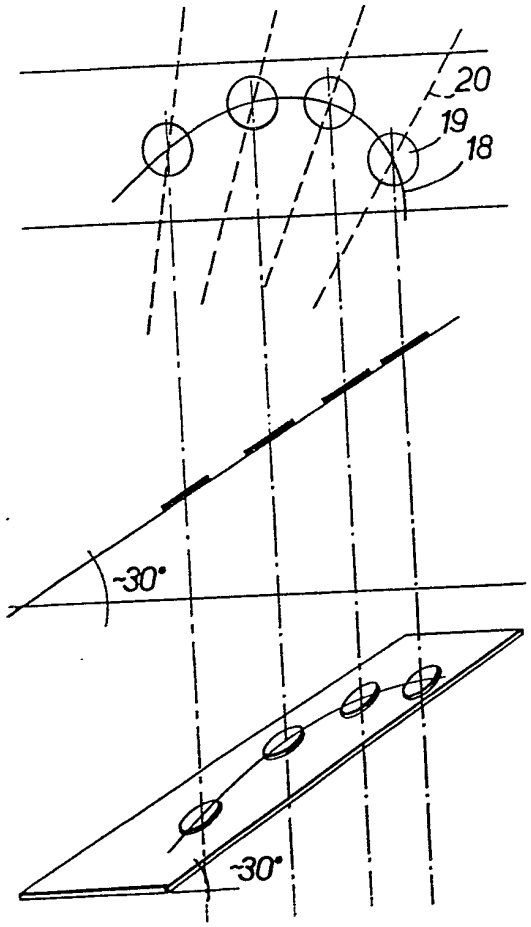


FIG. 8.



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'IG. 7.

FIG. 9.

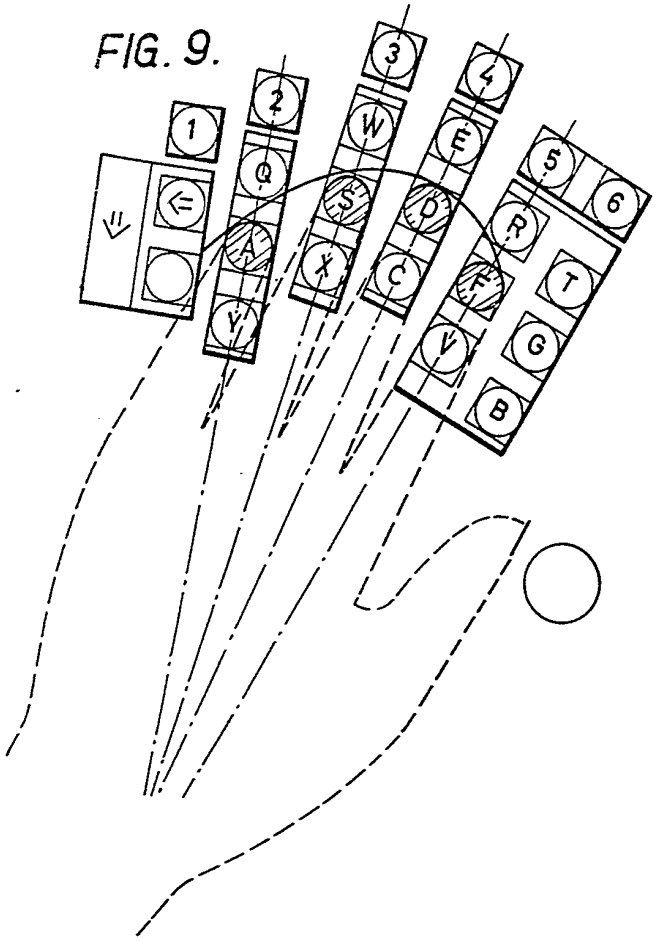

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FIG. 7.

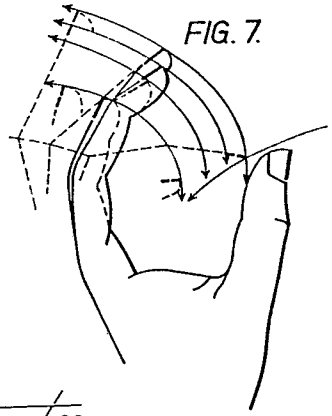

FIG. 8.

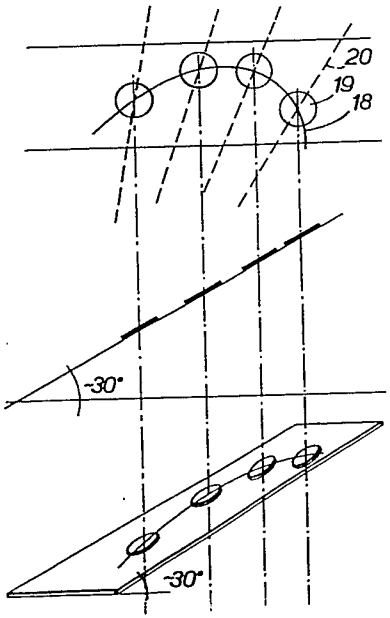

FIG. 9.