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 INT CL⁵ **B65B 63/04, D06F 89/00 89/02**

(54) Apparatus for folding garments, especially smocks

(57) An apparatus for folding garments such as smocks has a pre-creasing member 29 for forming a crease along a line prior to folding about that line. The apparatus has longitudinal folding flaps 17, 18 and transverse folding flaps 19, 20 for a successive longitudinal and transverse folding of the garments. Elongated edge portions of the garment are folded in succession over a central portion by the longitudinal folding flaps 17, 18, thus forming an elongated folding tube. This tube puts up resistance to subsequent transverse folding by the transverse folding flaps 19, 20 which can lead to a "jumping up" of the ready-folded garment. To prevent "jumping up", at least one pre-creasing member, which is preferably a pre-creasing strip 29, is assigned to at least one longitudinal folding flap 17 and/or 18, so that the garment is provided with preliminary creases during longitudinal folding. The future transverse folds are thus pre-marked in the folding tube.

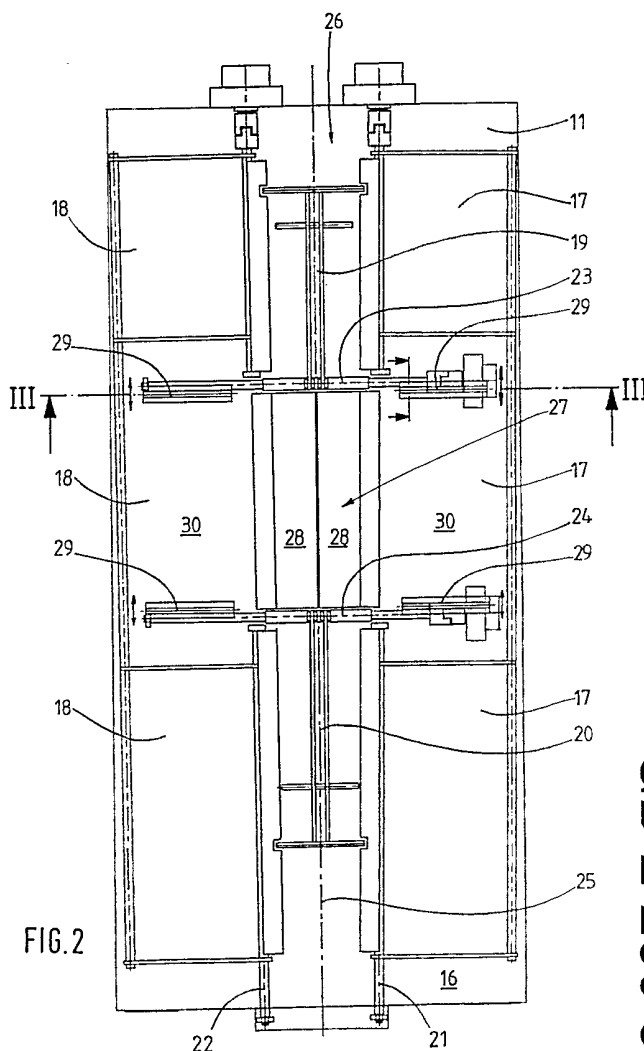
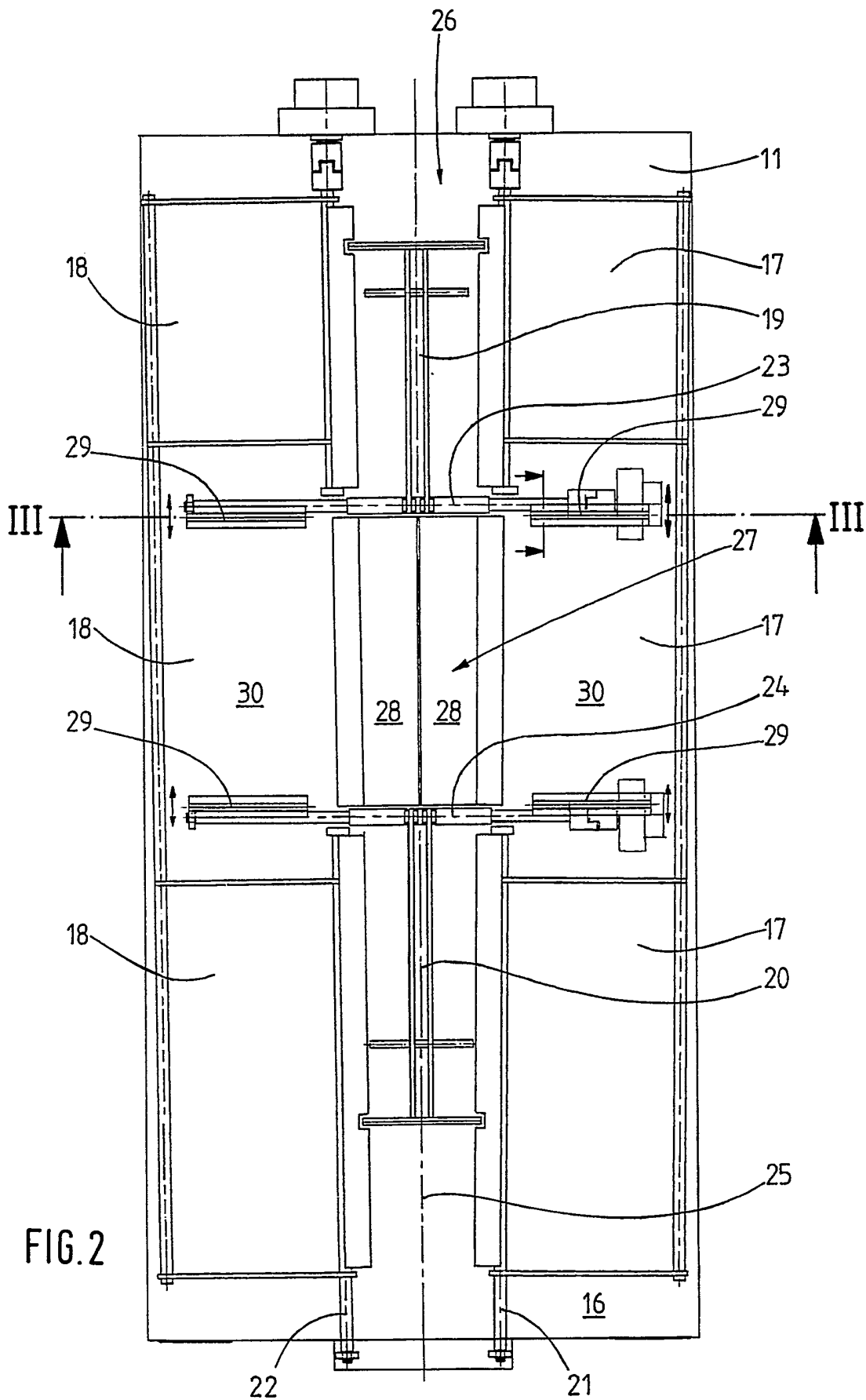


FIG. 2



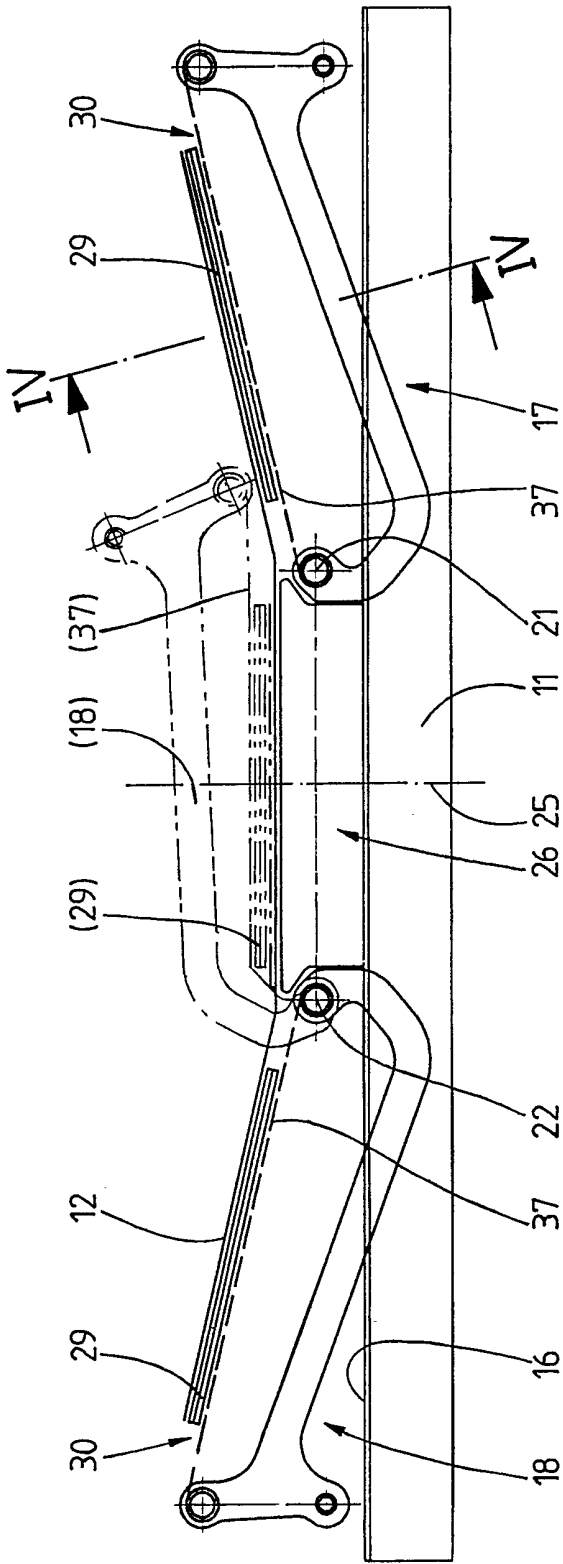


FIG. 3

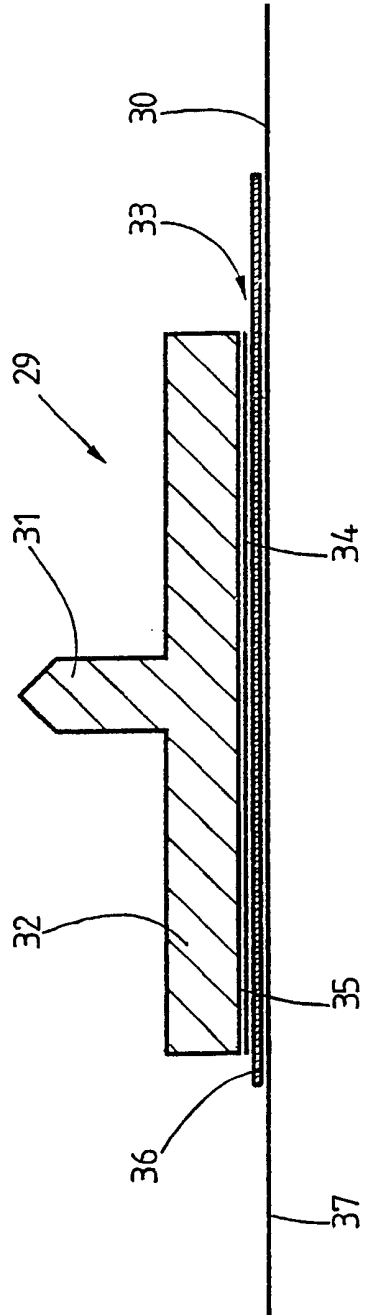


FIG. 4

1 Title: Apparatus for folding garments, especially smocks

DESCRIPTION:

5 The invention relates to an apparatus for folding garments, especially smocks, which has longitudinal and transverse folding flaps.

10 Apparatuses of this type are called "automatic folders" in the art and serve for folding garments such as, especially, smocks, hospital gowns or the like. These garments are folded by successive longitudinal and transverse folding.

15 An apparatus of this species is, for example, disclosed in German Patent 27 30 656. This apparatus has longitudinal and transverse folding flaps. Oppositely situated elongated edge portions of the garment are folded successively about a central portion by the longitudinal folding flaps (longitudinal folding). As a result, an elongated "folding tube" is formed. This tube is folded together one more time by the transverse folding flaps (transverse folding). It has turned out that because of the accumulation of material after the longitudinal folding, the garment resists the transverse folding so that the ready-folded garment tends to "jump up" at the transverse folds which renders the ready-folded garment relatively voluminous and may create problems during transport.

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30 The invention is therefore based on the object to develop an apparatus of the aforementioned type in such a way that the garments can be folded together accurately.

35 To attain this object, the apparatus according to the invention is characterized in that at least one pre-creasing member is assigned to at least one longitudinal folding flap. As a result, the garment is already provided with preliminary creases when it is folded longitudinally. This pre-creasing is a pressing together of the folding tube

1 formed during the longitudinal folding in the region of the
transverse folds which are formed during the following
transverse folding. These transverse folds are, so to
speak, pre-marked or pre-folded in the folding tube. As a
5 result, distinct creases are formed in the region of the
transverse folds after the following transverse folding and
prevent the folded garment from jumping up and cause the
transversely folded portions of the garment to rest tightly
against one another. Besides, pre-creasing allows the gar-
10 ment to be folded to a low stacking height.

In a preferred apparatus, the pre-creasing members are dis-
posed adjustably on the longitudinal folding flaps. As a
result, the pre-creasing members can be positioned on the
15 longitudinal folding flaps in such a way that the garment
is pre-creased or pre-marked in a place which is most
favourable for the later transverse folding. Most important-
ly, it is possible to adjust the apparatus to different
materials and different thicknesses of material of the
20 garments, for example, on the one hand, smocks and, on the
other hand, hospital gowns.

Expediently, pre-creasing members are assigned to both
longitudinal folding flaps in such a way that they extend
25 the swivel axis of each transverse folding flap. In this
case, the apparatus comprises four pre-creasing members.
Every time a longitudinal folding flap pivots in order to
fold an elongated edge strip of a garment, the garment
which is to be folded is pre-creased or pre-marked. Some
30 layers of the garment are thus pre-creased several times,
namely, on the one hand, by the first longitudinal folding
flap and, on the other hand, by the second longitudinal
folding flap. It would, however, also be possible to assign
the pre-creasing members to one longitudinal folding flap
35 only, in particular to that longitudinal folding flap which
performs the last longitudinal folding. In this case, the
previously longitudinally folded portion of the garment is
pre-creased or pre-marked during the last longitudinal

1 folding.

5 In a preferred embodiment of the invention, the pre-creasing members are elongated pre-creasing strips. These strips are connected releasably to the respective longitudinal folding flap, preferably by a connecting means. Expediently, two-part fastening means such as Velcro (RTM) fasteners, snap fasteners, hook fasteners or the like are used. These fasteners permit a particularly easy and durable connection of the pre-creasing strips with the longitudinal folding flaps. Moreover, this connection can be released relatively easy when the pre-creasing strips must be adjusted.

15 Further features which are essential to the invention and relate in particular to the design of the pre-creasing strips and the connecting means are described in the dependent claims.

20 A preferred exemplary embodiment of the apparatus according to the invention will be described below in detail with reference to the drawings, in which:

25 Fig. 1 shows a schematic side view of the apparatus,

Fig. 2 shows a plan view of a work plate of the apparatus,

30 Fig. 3 shows an enlarged section III-III through the apparatus of Fig. 2, and

Fig. 4 shows an even further enlarged section IV-IV through a pre-creasing strip of Fig. 3.

35 The illustrated apparatus (automatic folder) serves for the automatic folding of preferably smocks. However, the apparatus may also serve for the automatic folding of other garments, for example hospital gowns.

1 The apparatus comprises a work plate 11 which is mounted
pivotably on a base frame 10 which is only sketchily illu-
strated in Fig. 1. Smocks 12 (or other garments), which are
sketchily illustrated in Fig. 3 only, are automatically
5 placeable on the work plate 11 by conveying means which are
known per se. The smocks 12 may (alternatively) also be
placed on the work plate 11 by hand.

10 According to Fig. 2, the work plate 11 has a rectangular
surface area. As illustrated in Fig. 1, the entire work
plate 11 is pivotable from a transfer position of the
smocks 12 which is, in this case, inclined relative to the
vertical line by a parallel guide rod mechanism 13 in the
15 direction indicated by arrow 14 into an almost horizontal
folding and discharge position of the folded smocks 12.
Fig. 1 illustrates the inclined initial position of the
work plate 11, whereas the folding and discharge position
of the work plate 11 is indicated by dot-dash lines. A
20 discharge conveyor 15 for the discharge of folded smocks 12
is disposed below the work plate 11 which is pivoted
approximately into the horizontal line. Here, the discharge
conveyor 15 is a belt conveyor which rotates in an approxi-
mately horizontal plane. Further details of the apparatus,
25 especially of the parallel guide rod mechanism 13, are
disclosed in German Utility Model Application G 91 05 042
which is referred to in its entirety.

30 On the front side 16 of the work plate 11, which is
directed towards the smock 12, two elongated longitudinal
folding flaps 17 and 18 and two transverse folding flaps 19
and 20 are mounted to pivot about stationary axes of
rotation 21, 22 and 23, 24, respectively. The longitudinal
35 folding flaps 17 and 18 are assigned in spaced relationship
to opposite sides of the longitudinal mid-axis 25 of the
work plate 11. The axes of rotation 21 and 22 are located
on confronting (long) edges of the longitudinal folding
flaps 17 and 18. According to Fig. 2, the axes of rotation
21 and 22 extend slightly inclined in opposed directions,

1 i.e. conical relative to the longitudinal mid-axis 25. As a
result, an approximately trapezoidal central section 26 is
formed between the two longitudinal folding flaps 17 and 18
on the work plate 11.

5

According to Fig. 2, each longitudinal folding flap 17, 18
of the illustrated exemplary embodiment is formed from
several, in particular three parts. But the individual
parts of each longitudinal folding flap 17, 18 are
10 pivotable synchronously by a common drive. Alternatively,
the longitudinal folding flaps may also be formed from a
single piece.

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The longitudinal folding flaps 17, 18 are formed from rigid
frames or the like which are provided with a covering 37 of
a textile material (for example a nylon-polyamide fabric).

20

Oppositely situated elongated edge portions of the smock 12
are folded in succession by the two longitudinal folding
flaps 17 and 18 onto the central part of the smock 12 which
is located in the region of the central section 26 by means
of a successive pivoting of the longitudinal folding flaps
17 and 18 against the central section 26. After the longi-
tudinal folding, the smock 12 takes the form of a pre-
25 folded folding tube. In Fig. 3, the folding position of the
longitudinal folding flap 18 (located opposite the central
section 26) is indicated by dot-dash lines.

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The transverse folding flaps 19 and 20 which are smaller
than the longitudinal folding flaps 17 and 18 are located
in the region of the central section 26. According to
Fig. 2, the transverse folding flaps 19 and 20 are assigned
to opposite end portions of the central section 26. The
transverse folding flaps 19 and 20 are pivotable towards
35 the centre of the work plate 11 about the axes of rotation
23 and 24 which are disposed on the confronting ends of the
transverse folding flaps. The axes of rotation 23 and 24 of
the transverse folding flaps 19 and 20 extend in parallel

35

1 relative to one another which means they are directed trans-
verse relative to the longitudinal mid-axis 25 of the work
plate 11. Oppositely situated end portions of the folding
tube of the smock 12 formed by the longitudinal folding
5 flaps 17 and 18 are folded in succession against a central
portion of the smock 12 by the transverse folding flaps 19
and 20.

10 A closable orifice 27 is located on the central section 26
of the work plate 11, in particular between the transverse
folding flaps 19 and 20 and the longitudinal folding flaps
17 and 18. The orifice 27 can be closed by two pivoting
flaps 28 which are assigned to opposite sides of the longi-
tudinal mid-axis 25 of the work plate 11. These pivoting
15 flaps are mounted at their longitudinal edges which are
directed away from one another on the work plate 11 about
axes of rotation which are not shown in the Figures in
detail. The orifice 27 can be opened for a discharge of
folded smocks 12 onto the discharge conveyor 15 located
20 below the work plate 11 by means of an opposed pivoting of
the pivoting flaps 28 underneath the work plate 11.

25 According to the invention, pre-creasing or marking members
are assigned to the longitudinal folding flaps 17 and 18.
In the illustrated apparatus, these pre-creasing or marking
members are elongated pre-creasing strips 29. Several, in
particular two pre-creasing strips 29 are assigned to each
longitudinal folding flap 17 and 18. The pre-creasing
strips 29 are located approximately in the regions of the
30 axes of rotation 23 and 24 of the transverse folding flaps
19 and 20. According to Fig. 2, the pre-creasing strips are
assigned to opposite ends of the axes of rotation 23 and
24, in particular in such a way that the pre-creasing
strips 29 which extend transversely over the longitudinal
35 folding flaps 17 and 18 lie on (imaginary) extensions of
the axes of rotation 23 and 24. Accordingly, the pre-
creasing strips 29 extend substantially transverse to the
longitudinal mid-axis 25 of the work plate 11 in relation

1 to their direction of longitudinal extension.

5 The pre-creasing strips 29 project from the top side 30 of the longitudinal folding flaps 17 and 18 which faces the smock 12. For this purpose, the pre-creasing strips 29 have, according to Fig. 4, an approximately T-shaped profile. They have a creasing web 31 which extends transverse to the top side 30 of the longitudinal folding flaps 17 and 18 and a fastening web 32 which extends in parallel to the top side 30 of the longitudinal folding flaps 17 and 18. A free end of the creasing web 31 has a pointed design in order to intensify the creasing effect. The creasing web 31 and the fastening web 32 are connected to one another integrally and are preferably made of plastic or aluminium.

15 The pre-creasing strips 29 are connected releasably to the longitudinal folding flaps 17 and 18. Thus, the pre-creasing strips 29 can be shifted relative to the imaginary extension of the axes of rotation 23 and 24 of the transverse folding flaps 19 and 20. As a result, the smocks 12 which are to be folded can be provided with accurately positioned preliminary creases. It is also possible to attach the pre-creasing strips 29 to the longitudinal folding flaps 17 and 18 in such a way that they do not extend exactly perpendicular relative to the inclined axes of rotation 21 and 22 of the longitudinal folding flaps 17 and 18. When the longitudinal folding flaps 17 and 18 are folded on the central section 26, the pre-creasing strips 29, and especially their creasing webs 31, therefore reach a position extending transverse to the longitudinal mid-axis 25, that is to say they come to rest exactly above the axes of rotation 23 and 24 of the transverse folding flaps 19 and 20 or, if necessary, parallel thereto, in spite of the inclination of the axes of rotation 21 and 22 relative to the longitudinal mid-axis 25 of the work plate 11.

1 The pre-creasing strips 29 are connected releasably to the
longitudinal folding flaps 17 and 18 by readily releasable
connecting means. In the illustrated apparatus, these
connecting means are formed from Velcro^(RTM) fasteners 33 which
5 are known per se. One part of each Velcro^(RTM) fastener 33,
namely a clinging band 34, is connected, preferably by
adhesive bonding, to a bottom side 35 of the fastening web
32 of the respective pre-creasing strip 29, which bottom
side is directed towards the longitudinal folding flap 17
10 or 18. A second part of the Velcro^(RTM) fastener 33, namely a
fleece band 36, is connected tightly to the top side 30 of
the respective longitudinal folding flap 17 or 18. For this
purpose, the fleece band 36 is stitched on the covering 37.

15 As it is illustrated particularly in Fig. 4, the surface
area of the fleece band 36 is greater than the surface area
of the clinging band 34. As a result, the pre-creasing
strips 29 can be easily attached with the clinging band 34
to the longitudinal folding flaps 17 and 18 in different
20 positions in the region of the fleece band 36 which has a
greater, especially wider surface area. At the same time,
it is ensured that the entire surface of the clinging band
34 is covered by the fleece band 36.

25 During the longitudinal folding of the smock 12, transverse-
ly directed preliminary creases or impressions are applied
into the longitudinally folded folding tube by the pre-
creasing strips 29 which project from the top side 30 of
each longitudinal folding flap 17 and 18. An appropriate
30 positioning of the pre-creasing strips 29 on the longi-
tudinal folding flaps 17 and 18 allows the preliminary
creases or impressions to predetermine the transverse
folding lines formed during subsequent transverse folding.
As a result, transverse folding is not only easier and more
35 precise, but the smock 12 also reliably retains its fully
folded position after transverse folding. Moreover, the
height of the folded piece which is formed from the smock
12 is reduced because intensive durable transverse folding

1 lines, namely transverse creases, are formed by the pre-
creasing and the (second) creasing resulting from the sub-
sequent transverse folding.

5 The pre-creasing strips 29 according to the invention can
also be used in apparatuses having longitudinal folding
flaps which are pivotable about parallel swivel axes and in
apparatuses with other relative arrangements of the folding
10 flaps. The invention is therefore not restricted to the
aforedescribed apparatus (automatic folder).

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CLAIMS

5 1. Apparatus for folding garments, especially smocks, which has longitudinal and transverse folding flaps, characterized in that at least one pre-creasing member (pre-creasing strip 29) is assigned to at least one longitudinal folding flap (17 or 18).

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2. Apparatus according to claim 1, wherein the pre-creasing member or the pre-creasing members is/are disposed adjustably on the longitudinal folding flap (17 or 18) or the longitudinal folding flaps (17, 18).

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3. Apparatus according to claim 1 or 2, wherein a pre-creasing member is disposed approximately in the region of oppositely situated extensions of an axis of rotation (23, 24) of each transverse folding flap (19, 20).

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4. Apparatus according to one or more of claims 1 to 3, wherein the pre-creasing members are elongated pre-creasing strips (29) which are disposed, with respect to their longitudinal direction, on the longitudinal folding flaps (17, 18) approximately transverse relative to a longitudinal mid-axis (25) of a work plate (11) which is provided with the longitudinal folding flaps (17, 18) and the transverse folding flaps (19, 20).

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5. Apparatus according to claim 4, wherein the elongated pre-creasing strips (29) are provided with a creasing web (31) which is directed approximately transverse relative to the plane of the longitudinal folding flaps (17, 18) and which projects relative to a top side (30) of the longitudinal folding flaps (17, 18).

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6. Apparatus according to claim 4 or 5, wherein the pre-creasing strips (29) are connected releasably to the longitudinal folding flaps (17, 18), especially by a preferably two-part connecting means located between the

1 pre-creasing strips (29) and the longitudinal folding flaps
(17, 18).

5 7. Apparatus according to one or more of claims 4 to 6,
wherein the pre-creasing strips (29) have a fastening web
(32) which extends transverse to the creasing web (31).

10 8. Apparatus according to claim 6 or 7, wherein one
part of the connecting means is disposed on the fastening
web (32) of the pre-creasing strips (39) and another
(second) part of the connecting means is attached to the
respective longitudinal folding flap (17, 18).

15 9. Apparatus according to claim 7, wherein the parts of
the connecting means which are assigned to the longitudinal
folding flaps (17, 18) have a greater surface area than the
parts of the connecting means which are assigned to the
fastening webs (32), in such a way that the parts of the
connecting means which are assigned to the longitudinal
20 folding flaps (17, 18) extend approximately over the entire
region of adjustment of the pre-creasing strips (29) on the
longitudinal folding flaps (17, 18).

25 10. Apparatus according to one or more of claims 6 to 9,
wherein the connecting means are ^(RTM)Velcro fasteners (33), and
wherein a part of this fastener, preferably a clinging band
(34), is adhesively bonded to a bottom side (35) of the
respective fastening web (32) and a second part of the
30 ^(RTM)Velcro fastener (33), preferably a fleece band (36), is
stitched on a covering (37) of the longitudinal folding
flaps (17, 18).

35 11. Apparatus for folding garments, substantially as de-
scribed herein with reference to the drawings.

**Patents Act 1977
Examiner's report to the Comptroller under
Section 17 (The Search Report)**

Application number

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Relevant Technical fields

- (i) UK CI (Edition K) A3V B8C (CF10)
- (ii) Int CI (Edition 5) B65B 63/04
D06F 89/00 89/02

Search Examiner

D J MARSH

Databases (see over)

- (i) UK Patent Office
- (ii)

Date of Search

17 NOVEMBER 1992

Documents considered relevant following a search in respect of claims 1 TO 11

| Category (see over) | Identity of document and relevant passages | Relevant to claim(s) |
|------------------------|--|-------------------------|
| A | GB 2218680 A (DUCKER ENGINEERING) | |
| A | GB 2024142 A (IROPA) | |



| Category | Identity of document and relevant passages | Relevant to claim(s). |
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