609/90

(12) UK Patent (19) GB (11) 2 164 387 (13) B

(54) Title of Invention

Method and apparatus for attaching piece goods to a slide fastener chain

(51) INT CL⁴; D05B 35/06

(21) Application No
8522039

(22) Date of filing
5 Sep 1985

(30) Priority data

(31) 650803

(32) 14 Sep 1984

(33) United States of America (US)

(43) Application published
19 Mar 1986

(45) Patent published
6 Jul 1988

(52) Domestic classification
(Edition J)
E2S ED
D1G AD

(56) Documents cited
None

(58) Field of search
E2S
D1G
Selected US specifications from IPC sub-classes A44B
D05B

(73) Proprietor(s)
Yoshida Kogyo K K

(Incorporated in Japan)

No 1 Kanda Izumi-cho
Chiyoda-ku
Tokyo
Japan

(72) Inventor(s)
Kazuo Miyakawa

(74) Agent and/or
Address for Service
Marks & Clerk
57-60 Lincoln's Inn Fields
London WC2A 3LS

FIG. 1

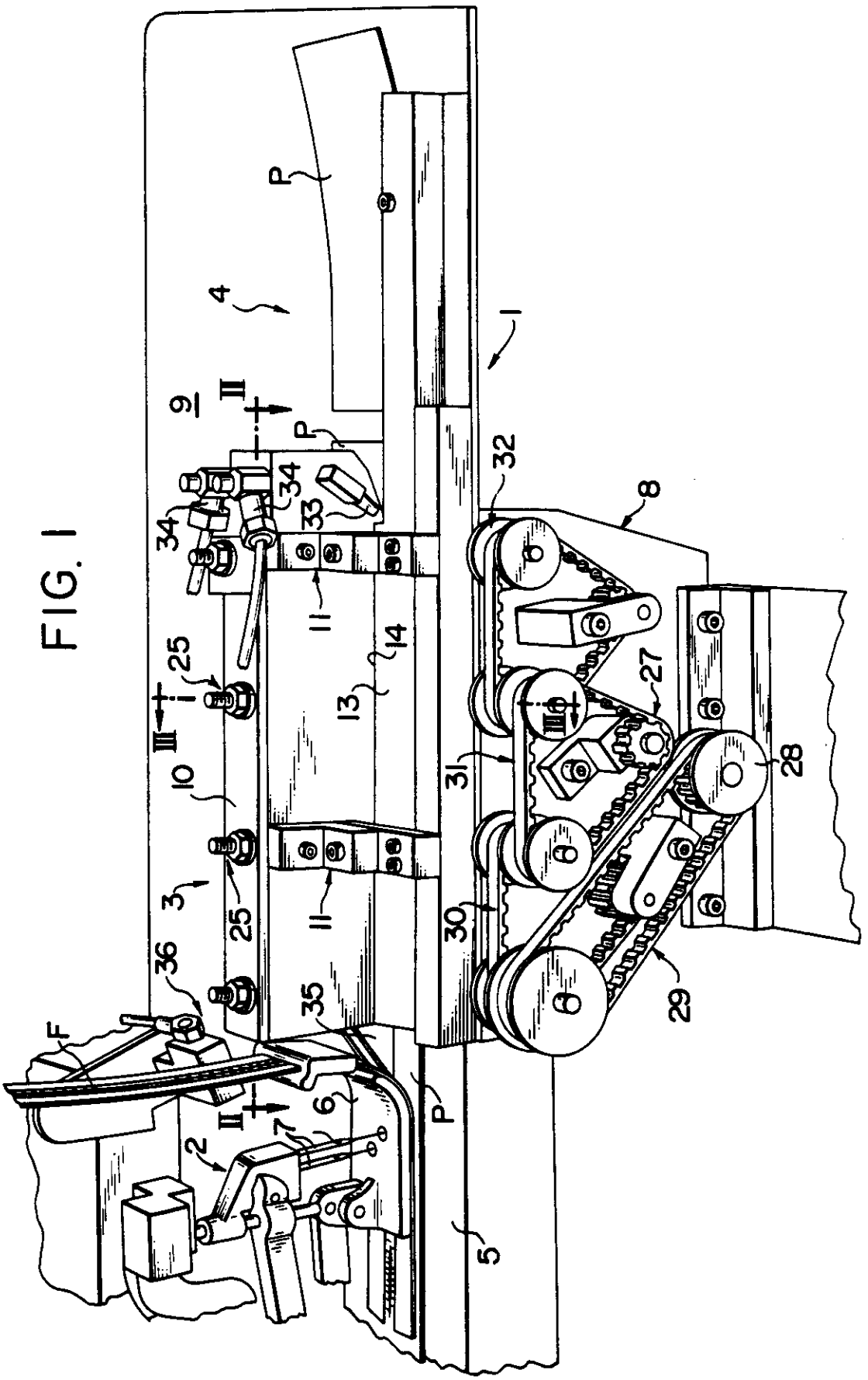

P
4
1
9
II
P
32
34
33
34
8
II
14
25
13
27
III
I
III
10
31
28
3
25
II
30
36
35
29
F
6
II
7
2
P
5

FIG.2

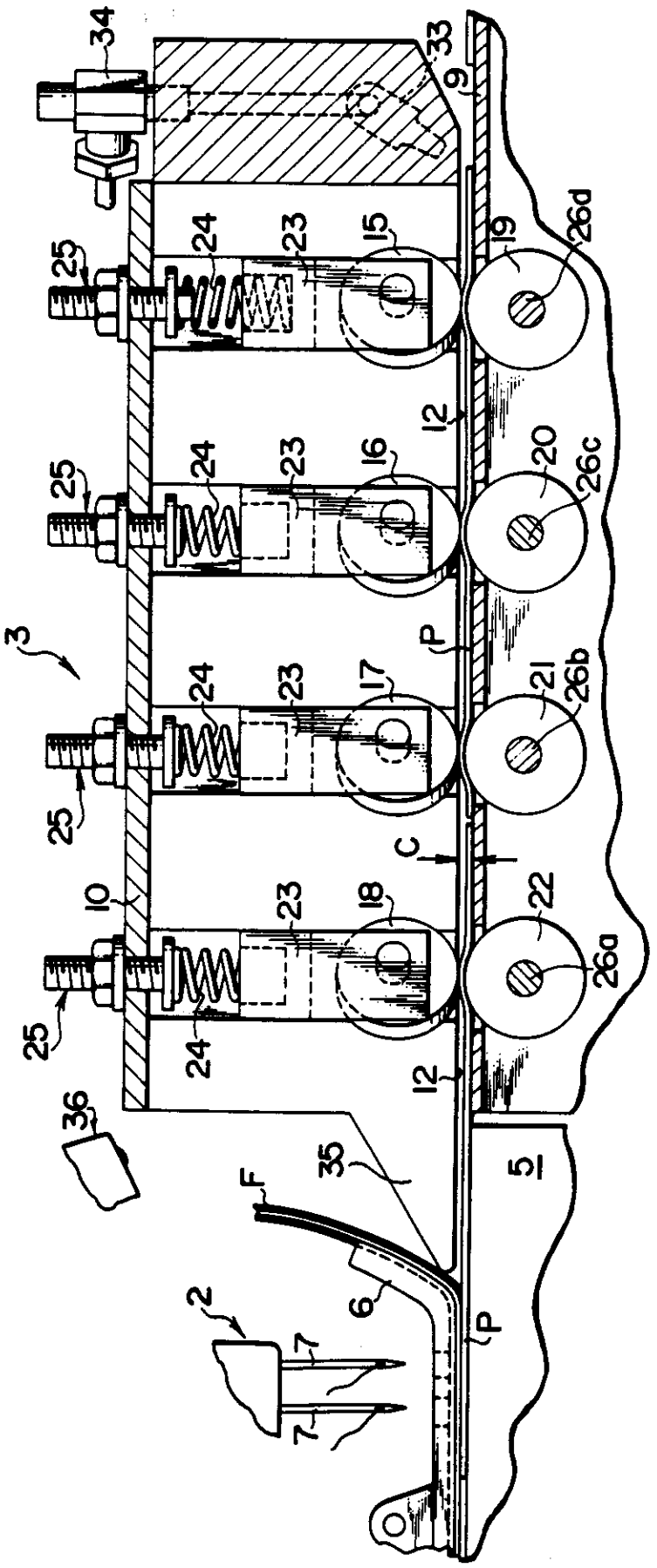

34
33
9
24
23
15
19
26d
25
12
16
20
26c
3
P
17
21
26b
C
10
18
22
26a
36
35
F
5
2
6
7

FIG.3

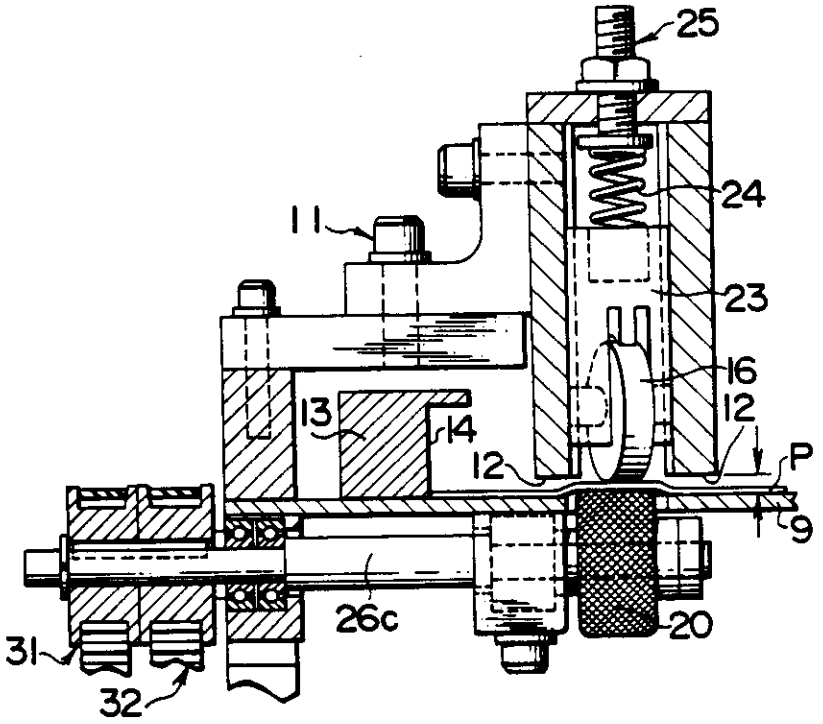

25
24
11
23
16
12
13
14
12
P
9
26c
20
31
32

FIG.4

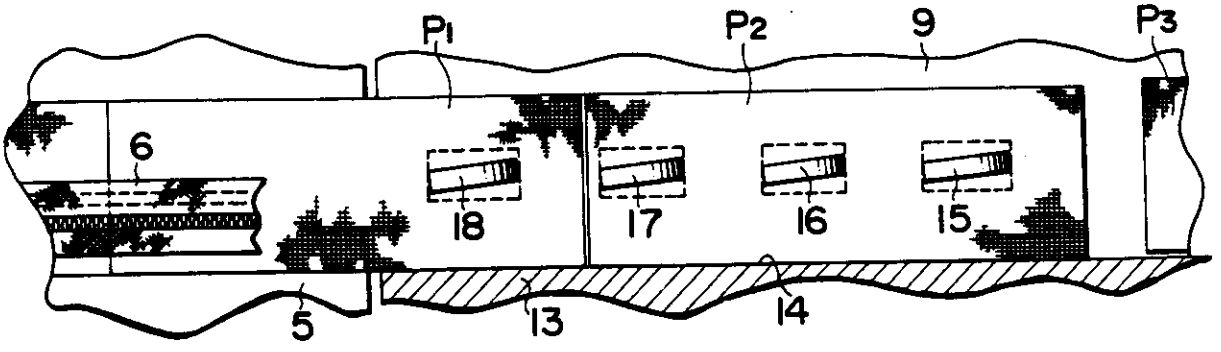

P1
P2
9
P3
6
18
17
16
15
5
13
14

FIG.5

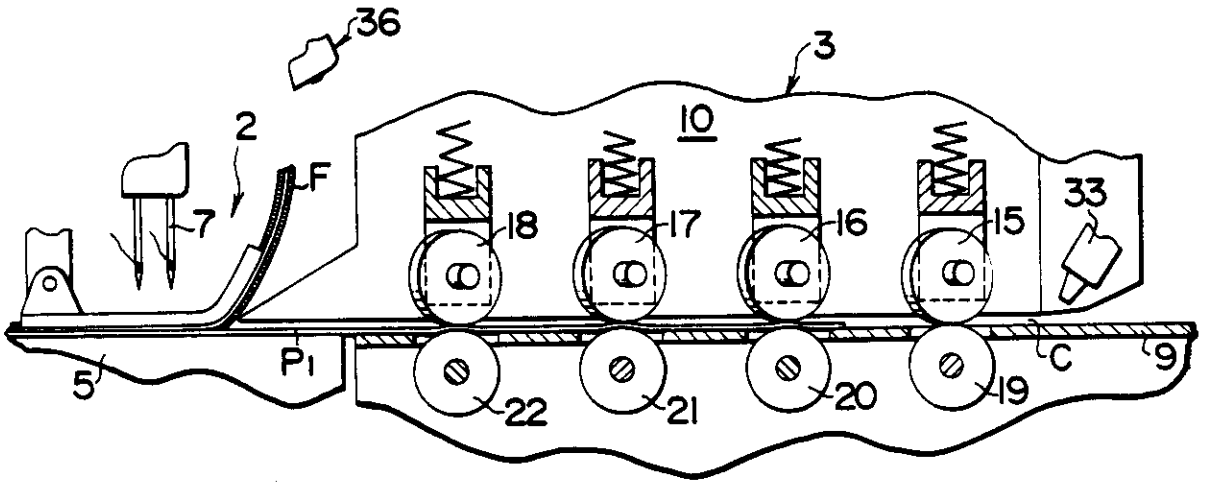

36
3
10
2
F
7
18
17
16
15
33
P1
5
22
21
20
19
C
9

FIG.6

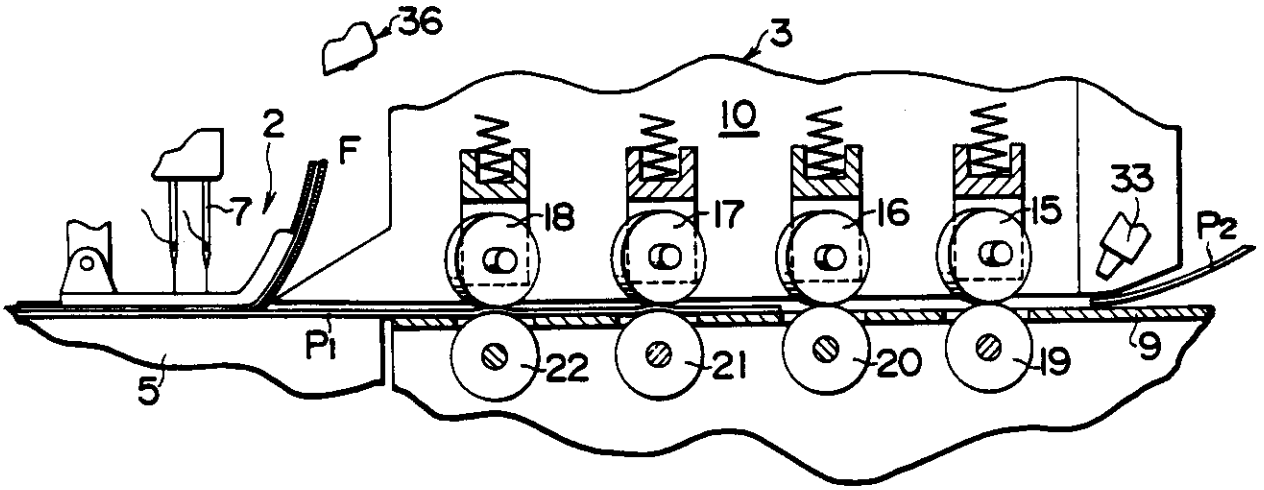

36
3
10
2
F
7
18
17
16
15
33
P2
P1
5
22
21
20
19
9

FIG.7

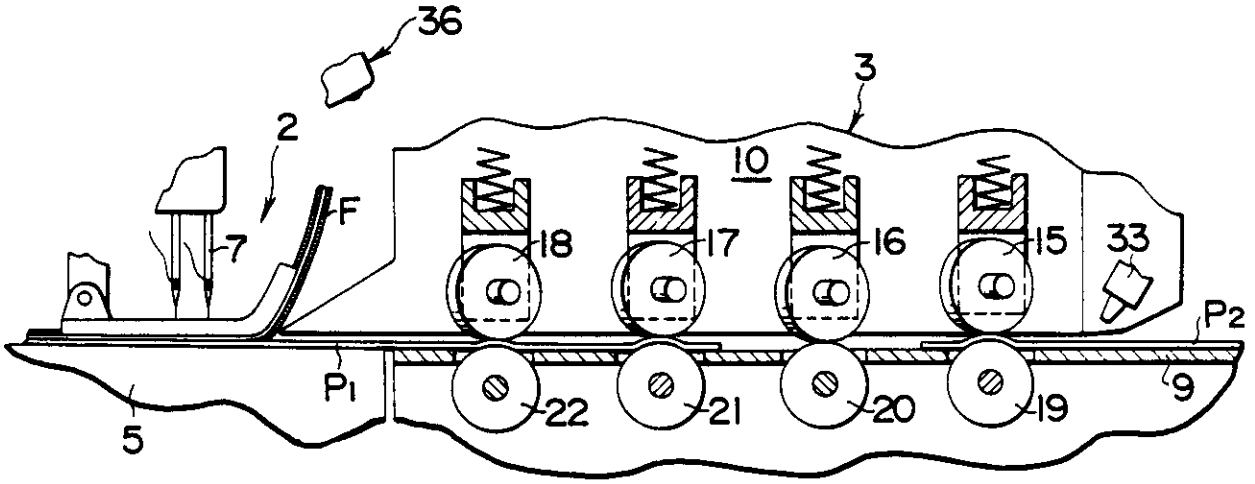

36
3
2
10
F
7
18
17
16
15
33
P2
P1
9
22
21
20
19
5

FIG.8

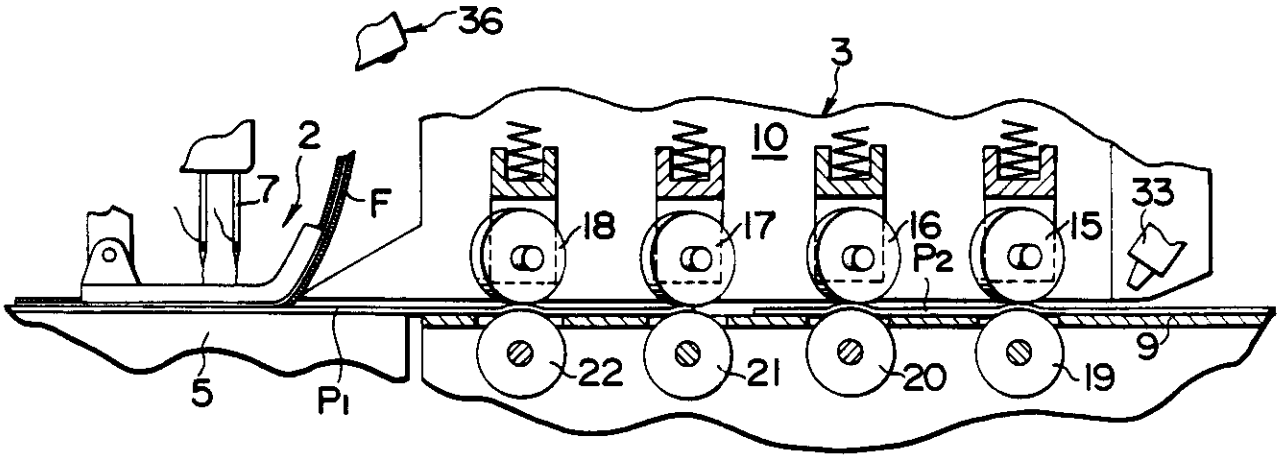

36
3
2
10
7
F
18
17
16
P2
15
33
9
22
21
20
19
5
P1

FIG.9

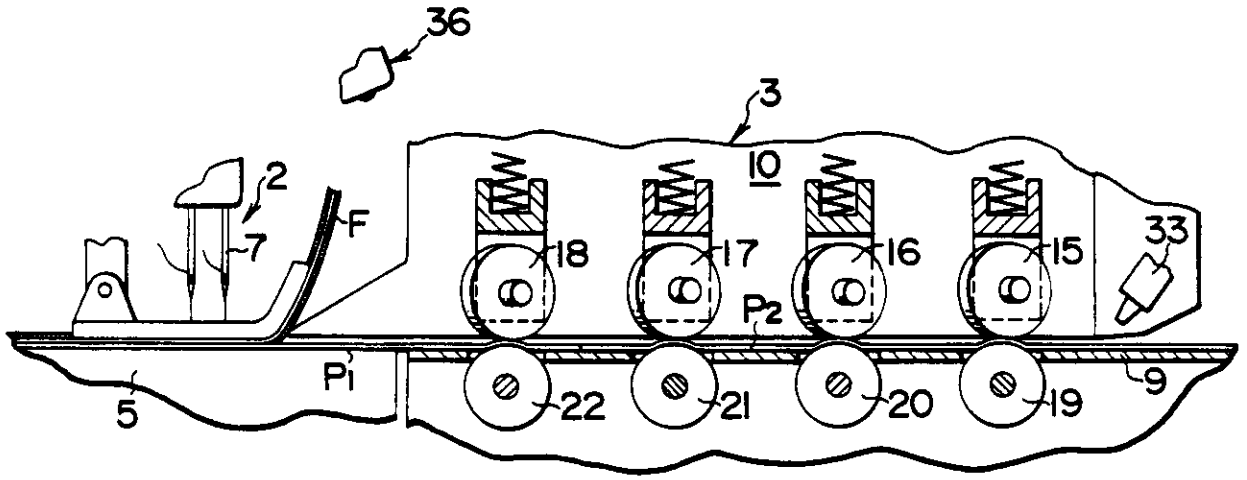
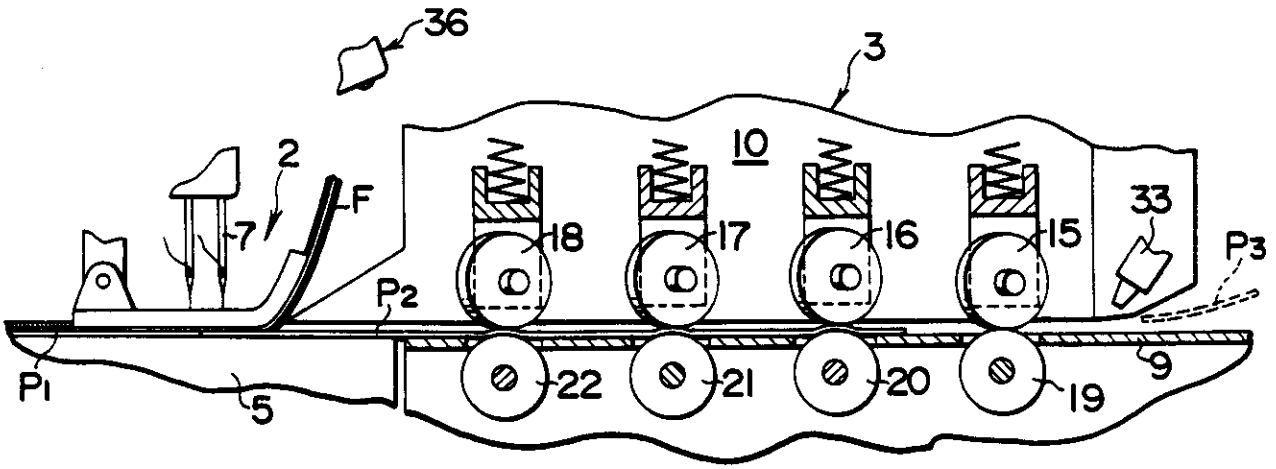

36
3
10
2
7
F
18
17
16
15
33
P2
P1
5
22
21
20
19
9

FIG.10


36
3
10
2
7
F
18
17
16
15
33
P3
P2
P1
5
22
21
20
19
9

METHOD AND APPARATUS FOR ATTACHING PIECE GOODS TO A SLIDE FASTENER CHAIN

The present invention relates to the production of a continuous, contiguous series of individual piece goods to be sewn, particularly fly strips, in which the individual pieces can be intermittently and irregularly passed to a feed station for their delivery to a sewing machine. In particular, the invention concerns an arrangement for making a continuous, contiguous series of individual fly strips connected by a slide fastener chain in the manufacture of closures for fly openings.

U.S Patent 3, 750, 104 discloses a system for automatically attaching a plurality of fly strip pieces one after another to a continuous slide fastener chain. There, the fly strips are fed to an intermittently operable sewing machine one after another by means of feed rollers in timed relation to the intermittent operation of the sewing machine. A continuous length of fastener chain is continuously fed to the sewing machine for joining fastener chain to the fly strip pieces. This intermittent operation of the sewing machine is controlled by a photoelectric cell detector at the sewing station. The detector detects the completion of sewing of one fly strip when the trailing end of a sewn fly strip piece passes it to produce a "stop" signal not only to terminate the operation of the sewing machine but also to energize the

feed rollers. Subsequently, the detector detects the arrival of the next fly strip when the leading end of the next fly strip piece passes it to produce a "start" signal to initiate the operation of the sewing machine. Since the sewing operation is halted repeatedly with this system, there is considerable waste of sewing machine on-time and only a limited rate of production of the trouser closures can be achieved.

According to a first aspect of the present invention, there is provided a method of attaching successive piece goods to a continuous slide fastener chain whereby the piece goods are formed into a continuous series in end-to-end relation, comprising: sewing a preceding piece of the piece goods in a sewing machine with a leading end of said preceding piece sewn first and a trailing end of said preceding piece sewn last; continuously operating a drive means for driving a succeeding piece of the piece goods toward said sewing machine at a speed substantially faster than the rate of feed of said sewing machine until a leading end of said succeeding piece abuts the trailing end of said preceding piece as said preceding piece is being sewn; supporting said succeeding piece during said driving such that the leading end of said succeeding piece does not overlap or bunch at said preceding piece's trailing end upon abutting despite continuous operation of said drive means; and continuously delivering said slide fastener chain to said sewing machine for sewing onto said piece goods.

According to a second aspect of the present invention, there is provided an apparatus for automatically attaching successive piece goods to a continuous length slide fastener chain,

comprising a sewing machine, means for feeding said slide fastener chain to said sewing machine for sewing onto said piece goods, means for commencing sewing of a preceding piece of the piece goods in said sewing machine, a feed station upstream of said sewing machine for delivering a succeeding piece of the piece goods towards said sewing machine, said feed station having a continuously operating drive means for conducting said succeeding piece through said feed station at a speed substantially faster than the rate of feed of said sewing machine until a leading end of said succeeding piece abuts the trailing end of said preceding piece as said preceding piece is being sewn and having a guide means for guiding said succeeding piece through said feed station, and means for passing successive piece goods consecutively to said feed station, such that the leading end of said succeeding piece does not overlap or bunch at said preceding piece's trailing end upon abutting despite continuous operation of said drive means.

The piece goods are preferably fly strips, but the invention could also have similar application with other types of individual piecework to be sewn, individually or together with another piece such as a continuous length material. The benefits to sewing operation efficiency and improved production due to the invention are not limited to the preferred embodiment use with fly strips.

It is believed possible by means of the present invention to provide a unique and novel answer to the need for an automated system in the sewing art which can translate intermittent and irregularly delivered individual pieces into an aligned series arranged in end-to-end relation for high-speed passage through a sewing station without interruption of the sewing process.

A preferred embodiment of the invention addresses this need in an economical and efficient way and, by enabling the individual pieces to be successively supplied and acted upon by a sewing machine without interruption, increases sewing production rate.

It is further believed possible by means of the present invention to provide a significant advance and improvement in efficiency and economy over the prior art.

The invention will be described by way of example with reference to the accompanying drawings, wherein:-

Figure 1 is a side elevational view of a fly strip attaching assembly embodying the present invention;

Figure 2 is a cross-sectional view taken along the line II-II of Figure 1;

Figure 3 is a cross-sectional view taken along the line III-III of Figure 1;

Figure 4 is a schematic plan view of a succession of fly strips passing through the assembly of Figure 1; and

Figures 5-10 are partly schematic cross-sectional side elevational views of the sequential operation of the assembly of Figure 1.

The preferred application of the present invention is the manufacture of closures for fly openings whereby a series of individual fly strip pieces joined together by a continuous length slide fastener chain is made at a high rate of production, not heretofore possible, using a continuously operating sewing machine.

Figure 1 shows an automated assembly 1 for attaching a succession of fly strip pieces P to a continuous slide fastener chain F continuously without interruption and in an efficient manner whereby the fly strips P are joined together by the fastener chain F in

abutting end-to-end relation. The assembly 1 generally comprises a sewing machine station 2, a feed station 3 for automatically delivering successive fly strip pieces continuously to the sewing machine, and a supply station area 4 where fly strip pieces are consecutively passed to the upstream end of the feed station 3 in what may be an intermittent and irregular fashion.

The sewing machine 2 may be a conventional type on the market. It includes a support table 5 for supporting thereover each successive fly strip P to be sewn, a pressure foot 6, a pair of needles 7 for sewing the fly strips P to the fastener chain F, and a typical feed dog device (not shown) for conducting piecework through the sewing machine operation. The fastener chain F is continuously supplied from a non-illustrated reel, supported on an upper portion of the sewing machine 2, to the sewing needles 7 through the space between the support table 5 and the pressure foot 6. The details of the sewing machine 2 itself are not pertinent here, and its detailed description is omitted for clarity.

The feed station 3 is mounted on a framework 8 having a support table surface 9 immediately upstream of the sewing machine 2 and will be described with reference to Figures 1-3. The successive fly strips P being delivered by the feed station 3 to the sewing machine pass over the table surface 9 beneath a housing

10 which extends longidudinally with the sewing machine operation and the flow path of the pieces P thereto.

The housing 10 is vertically upstanding from the table surfaces 9 and defines an interior containment space which opens downwardly facing the table surface. The housing 10 is suitably supported on bracket means 11 such that its rail-like lower edge wall surfaces 12 overlie the table surface 9 by a predetermined clearance space C. For reasons described later, this clearance space distance closely approximat es the thickness of the piece P passing through the feed station 3. For example, for a fly strip having a .8 mm thickness, the clearance space C is preferably about 1-1.2 mm. Also upstanding from the table surface 9 to one side of the housing 10 and extending along the clearance space C is a wall piece 13 having a guide edge surface 14. The guide edge 14 runs parallel to the housing substantially the full length of the housing and preferably an appreciable distance into the supply station area 4.

For conveying the successive fly pieces P through the feed station 3, the housing contains a series of idler support or guide rollers 15-18 which extend into the clearance space C from above and are respectively paired with driven rollers 19-22 extending into the clearance space from below through suitable openings in the table surface 9 to form consecutive

drive nips through which the fly strips P are conducted.

Each idler support roller is mounted for rotation at the lower end of axle support bars 23. The support bars 23 are mounted for slidable movement in vertically extending slots in the housing 10. Biasing means, shown here in the form of coil springs 24 having adjustability in the form of a thread bolt engagement 25 extending upward from the top wall of the housing 10, apply a light resilient downward bias on the support bars 23 and hence also the support rollers 15-18.

The driven rollers 19-22 are each disposed for rotation on ends of respective axles 26 a-d. The axles 26 a-d are suitably journaled in the framework 8 beneath the table surface 9 along parallel axes laterally perpendicular to the longitudinal extension of the housing 10 and the flow path of successive fly pieces P through the feed station 3. As shown in Figure 1, a rotary drive transmission system 27 is connected to the outer free ends of the driven roller axles 26 a-d to effect different speed rotation of the driven rollers 19-22 and continuous operation of the feed station's drive means (rollers 15-22). In illustration, a rotary motor (not shown) turns a drive wheel 28. The drive wheel 28 operates a first belt and pulley transmission 29 to turn axle 26a for rotating

driven roller 22. A second belt and pulley transmission 30 imparts relatively faster rotational speed to axle 26b turning driven roller 21. A third belt and pulley transmission 31 engages axle 26c to rotate roller 20 at a still faster speed; and a final belt and pulley transmission 32 imparts the relatively greatest rotational speed to axle 26d turning the upstream-most driven roller 29 in the feed station.

Thus, in accordance with the invention, the rotational speeds of the driven rollers 19-22 in the feed station 3 are progressively slower in each further downstream drive nip in the feed station; however, the rates of speed of all driven rollers are always greater than the rate of feed of the sewing machine 2. For example, the following speed rates have been found to afford effective operation of the assembly for handling the sewing of successive fly strip pieces P to a continuous fastener chain F: the driven roller 19 is at a highest rate of speed which is 40% faster than the rate of speed of the sewing machine feed and the driven rollers 20, 21, and 22 are at respective rates of speed 20%, 10%, and 5% faster than the sewing machine feed.

As shown in Figures 2-3, the axles for the idler support rollers 15-18 define parallel rotational axes for these rollers which are laterally angled offset from the rotational axes of the driven rollers 19-22. The downstream facing ends of the support rollers 15-18

are all directed partially sideways (relative to the driven roller dispositions) toward the guide edge 14 for, as further described below, effectively steering a common side edge of each successive fly strip piece P against and along the guide edge 14, relatively aligning succeeding and preceding pieces during conduction through the feed station 3 and at the sewing machine.

At the supply station area 4, individual pieces P are passed (preferably somewhat along the guide edge 14) into the clearance space C of the feed station 3 for initial conveying engagement with the upstream-most and highest speed drive nip formed by rollers 15 and 19. As the detailed discussion of the operation of the inventive assembly 1 set forth below discloses, regardless of the lengths of the pieces P (which could even vary) or the reasonable irregularity with which the pieces are supplied into the feed station 3, each successive piece entering the feed station is accelerated relative to the preceding piece being sewn in the sewing machine 2 such that each successive piece overtakes any spatial gap between its leading end and the trailing end of the preceding piece prior to completion of the sewing operation on the preceding piece. Passage of individual pieces P to the feed station 3 may be done manually, as illustrated here, or come from an automated conveyor arrangement.

In accordance with the preferred embodiment, operation of the inventive assembly 1 is enhanced by the following features. At the upstream end of the housing 10, there is provided a pair of air jet nozzles 33 to which a continuous supply of pressurized air is supplied by suitable hose connections 34 for issuing a pressure angled downward and in the axial direction of movement of fly strip pieces P through the feed station 3. This enables holddown of the lead edge of each piece for easy entry into the clearance space C and assists movement of each piece into the feed station. At the downstream end of the housing 10, an axial extension 35 of the lower edge surfaces 12 is provided substantially right up to the pressure foot plate 6 in the sewing machine 2. There may also be provided a sensor system, indicated here by photodetector 36, immediately upstream of the sewing machine 2 to effect shut off of the sewing machine 2 operation should a spatial gap appear following the trailing end of a piece P being sewn (such as if supply of pieces to the feed station has been halted or unduly delayed) to conserve fastener chain F and sewing machine operation. A suitable start switch, such as a foot pedal, can be used to reactivate the sewing machine when renewed sewing operation is desired.

Operation of the automated assembly 1 is shown in sequence in Figures 5-10. As shown in Figure 5, the

sewing machine 2 is operating and sewing together the continuous length fastener chain F and the leading end of a fly strip piece P_1 being delivered from the feed station 3. As the fly strip piece is being sewn, its rate of movement is that of the rate of feed of the sewing machine. This is so, despite the fact that the driven rollers (20-22) of the drive nips in which the piece being sewn is still disposed have rates of speed greater than the feed of the sewing machine, since the upper and lower surfaces of the piece are closely confined in the clearance space C against bunching or furling by the guide surfaces 12 and 9 and the relatively weak biasing force on the support rollers (16-18) enables the driven rollers to slip easily beneath the piece in this situation.

Figure 6 illustrates a succeeding fly strip piece P_2 being passed into the upstream end of the feed station 3 for delivery to the sewing station 2. The pressure from the air jets 33 serve to hold the lead end of the succeeding piece P_2 down against the table surface 9 to facilitate its entry into the clearance space C. When the lead end of the succeeding piece P_2 reaches the drive nip formed by the support and driven paired rollers 15 and 19, furthest upstream in the feed station 3, the succeeding piece is positively engaged and most quickly accelerated toward the trailing end of the preceding piece P_1 being sewn, as shown in Figure 7.

The succeeding piece P_2 continues to be consecutively positively engaged in further downstream drive nips for conveyance toward the trailing end of the preceding piece P_1 (being sewn) at speeds designed to overtake the spatial gap between these successive piece ends, as shown in Figures 8 and 9, until the succeeding piece's lead end abuts the preceding piece's trailing end. Each time the succeeding piece's leading end reaches a further downstream drive nip prior to abutting with the trailing end of the preceding piece P_1, travel speed of the succeeding piece P_2 is relatively slowed to the lower rate of speed of that further downstream nip's driven roller. Bunching or furling of the upstream portions of the succeeding piece acted upon by the faster driven rollers is prevented again by the close confinement of piece in the clearance space C and the capability of the drive rollers to slip easily beneath the piece when its leading end travel rate has been relatively reduced.

As indicated in Figure 4, in addition to being indexed forwardly through the feed station 3 by the drive nips, the succeeding piece P_2 is also simultaneously steered laterally by the slant disposition of the idler support rollers so that a side edge of the piece is aligned for movement against and along the guide edge wall 14. Such alignment against the guide edge 14 has already occurred with the preceding piece

P_1 and occurs with each successive piece transported by the feed station 3 so that the continuous series of pieces placed in end-to-end relation by the assembly 1 are longitudinally aligned with one another for easier subsequent handling.

The leading end of the succeeding piece P_2 reaches the trailing end of the preceding piece P_1 prior to completion of the sewing operation on the preceding piece, as shown by Figure 9. As the succeeding piece P_2 abuts the preceding piece P_1 in end-to-end relation, the rate of travel of the succeeding piece matches that of the preceding piece being sewn at the rate of feed of the sewing machine and no bunching of or overlapping by the succeeding piece occurs. As the preceding piece P_1 is indexed forward by the sewing machine feed, the succeeding piece P_2 is also indexed forward by the drive nip engagement of this piece in the feed station 3 by virtue of the release of resistance against forward movement on the succeeding piece until abutment again. Eventually, as indicated by Figure 10, conveyance of the succeeding piece P_2 is taken up by the sewing machine feed just prior to completion of sewing of the preceding piece P_1. Thus, abutting end-to-end relation of the preceding and succeeding pieces is maintained through completion of the sewing of the preceding piece P_1, whereupon sewing of the leading end of the

succeeding piece P_2 commences and the operation repeats as a further succeeding piece P_3 is passed to the feed station 3 as indicated by Figure 10. Thus, a continuous, contiguous series of aligned fly strip pieces P joined together by continous fastener chain F is produced, regardless of reasonable irregularities with which consecutive fly strip pieces are passed to the feed station and unaffected by the length of the pieces.

Preferably in operation of the assembly 1, the drive for the driven rollers 19-22 in the feed station is always continously operating. The sewing machine 2 is also expected to be continuously operating, except if selectively controllably shut down for brief periods upon sensing the absense of an abutting succeeding piece at the end of the sewing operation on a preceding piece.

Reference is directed to our co-pending patent application No. 85 21199 (reference 230P50450) (Serial N°. 2.163.482).

CLAIMS:-

1. A method of attaching successive piece goods to a continuous slide fastener chain whereby the piece goods are formed into a continuous series in end-to-end relation, comprising:

(a) sewing a preceding piece of the piece goods in a sewing machine with a leading end of said preceding piece sewn first and trailing end of said preceding piece sewn last;

(b) continuously operating a drive means for driving a succeeding piece of the piece goods toward said sewing machine at a speed substantially faster than the rate of feed of said sewing machine until a leading end of said succeeding piece abuts the trailing end of said preceding piece as said preceding piece is being sewn;

(c) supporting said succeeding piece during said driving such that the leading end of said succeeding piece does not overlap or bunch at said preceding piece's trailing end upon abutting despite continuous operation of said drive means; and

(d) continuously delivering said slide fastener chain to said sewing machine for sewing onto said piece goods.

2. A method according to claim 1, further comprising: aligning said succeeding piece behind said preceding piece during said driving.

3. A method according to claim 1 or 2, further comprising: shutting off said sewing machine in response to detecting a spatial gap at said sewing machine following the trailing end of said succeeding piece being sewn in the otherwise continuous operation of said sewing machine.

4. A method according to claim 1, 2 or 3, wherein said driving is effected by a series of opposed driven roller and idle support roller pairs defining therebetween a nip relation through which each said succeeding piece consecutively passes and said support rollers are lightly biased against said respective drive rollers to permit slippage of driven roller engagement of said succeeding piece.

5. A method according to claim 4, wherein the rates of speed of said driven rollers are progressively slower in each further downstream nip, but always greater than the rate of feed of said sewing machine.

6. A method according to any preceding claim, wherein said succeeding piece is driven through a clearance space between opposed surfaces, said clearance space being sized to prevent bunching of said succeeding piece when it abuts the preceding piece's trailing end.

7. A method according to any preceding claim, wherein the piece goods are fly strips.

8. An apparatus for automatically attaching successive piece goods to a continuous length slide fastener chain, comprising a sewing machine, means for

feeding said slide fastener chain to said sewing machine for sewing onto said piece goods, means for commencing sewing of a preceding piece of the piece goods in said sewing machine, a feed station upstream of said sewing machine for delivering a succeeding piece of the piece goods towards said sewing machine, said feed station having a continuously operating drive means for conducting said succeeding piece through said feed station at a speed substantially faster than the rate of feed of said sewing machine until a leading end of said succeeding piece abuts the trailing end of said preceding piece as said preceding piece is being sewn and having a guide means for guiding said succeeding piece through said feed station, and means for passing successive piece goods consecutively to said feed station, such that the leading end of said succeeding piece does not overlap or bunch at said preceding piece's trailing end upon abutting despite continuous operation of said drive means.

9. An apparatus according to claim 8, further comprising means for shutting off said sewing machine in response to detecting a spatial gap at said sewing machine following the trailing end of said preceding piece being sewn.

10. An apparatus according to claim 8 or 9, wherein said drive means comprises a series of driven conveyor means for consecutively moving said succeeding piece

through said feed station, the rates of speed of said conveyor means being progressively slower at each further downstream conveyor means but always greater than the rate of feed of said sewing machine.

11. An apparatus according to claim 10, wherein the rate of speed of said upstream-most conveyor means is about 40% greater than the rate of feed of said sewing machine.

12. An apparatus according to claim 8, 9 or 10, wherein said guide means comprises an edge wall against and along which a common side of each succeeding piece is moved by said drive means for aligning said successive piece goods during conduction through said feed station.

13. An apparatus according to claim 12, wherein said guide means comprises a pair of opposed surfaces defining a clearance space therebetween through which said succeeding piece is conducted, said clearance space being sized to prevent bunching of said succeeding piece when it abuts the preceding piece's trailing end.

14. An apparatus according to any one of claims 8 to 13, wherein said drive means comprises a series of opposed driven roller and idle support roller pairs defining therebetween a nip relation through which each said succeeding piece consecutively passes and said support rollers being lightly biased against said respective

driven rollers to permit slippage of driven roller engagement of said succeeding piece.

15. An apparatus according to claim 14, wherein said support rollers are rotated about parallel axes angled offset relative to parallel rotational axes of said driven rollers and said guide means includes an edge wall adjacent said clearance space against and along which a common side of each succeeding piece is steered by said support rollers for aligning said successive pieces during conduction through said feed station.

16. A method of attaching successive piece goods such as fly strips to a continous slide fastener chain substantially as described with reference to and as illustrated in the accompanying drawings.

17. Apparatus substantially as described with reference to and as illustrated in the accompanying drawings.

REGISTER ENTRY FOR GB2164387

Form 1 Application No GB8522039.0 filing date 05.09.1985

Priority claimed:
14.09.1984 in United States of America - doc: 650803

Title METHOD AND APPARATUS FOR ATTACHING PIECE GOODS TO A SLIDE FASTENER CHAIN

Applicant/Proprietor
YOSHIDA KOGYO KK, Incorporated in Japan, No 1 Kanda Izumi-cho, Chiyoda-ku, Tokyo, Japan [ADP No. 00833988008]

Inventor
KAZUO MIYAKAWA, 3781 Apple Way, Marietta, Georgia, United States of America [ADP No. 03611563001]

Classified to
E2S D1G
D05B

Address for Service
MARKS & CLERK, 57-60 Lincoln's Inn Fields, London, WC2A 3LS, United Kingdom [ADP No. 00000018001]

Publication No GB2164387 dated 19.03.1986

Examination requested 19.06.1986

Patent Granted with effect from 06.07.1988 (Section 25(1)) with title METHOD AND APPARATUS FOR ATTACHING PIECE GOODS TO A SLIDE FASTENER CHAIN

**** END OF REGISTER ENTRY ****

RENEWAL DETAILS

PUBLICATION NUMBER	GB2164387

PROPRIETOR(S)

Yoshida Kogyo KK, Incorporated in Japan, No 1 Kanda Izumi-cho, Chiyoda-ku, Tokyo, Japan

DATE GRANTED	06.07.1988
DATE NEXT RENEWAL DUE	05.09.1990
DATE NOT IN FORCE	
DATE OF LAST RENEWAL	29.08.1989
YEAR OF LAST RENEWAL	05
STATUS	PATENT IN FORCE