# United States Patent [19]

**Nicholson**

[11] **3,889,594**

[45] **June 17, 1975**


[54] **HAND-HELD SELF-ADHESIVE-LABEL APPLICATORS**


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[73] Assignee: **Norprint Limited,** England



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[21] Appl. No.: **378,031**

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[52] **U.S. Cl.** ..... **101/111**

[51] **Int. Cl.** ..... **B41j 3/08**

[58] **Field of Search** ..... 101/19, 95, 99, 110, 111, 101/103, 288



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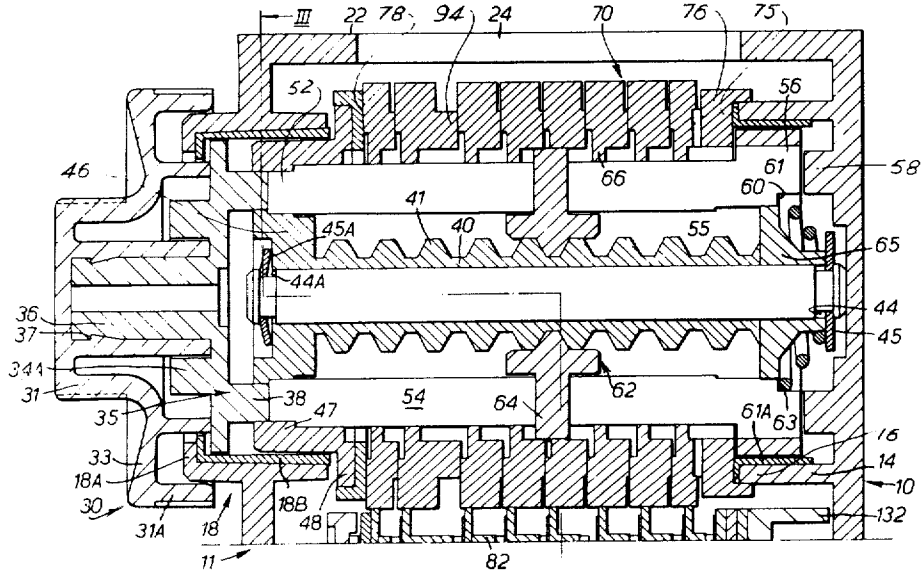
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*Assistant Examiner*—Edward M. Coven
*Attorney, Agent, or Firm*—McGlew and Tuttle



[57] **ABSTRACT**

An adjustable facet print mechanism includes a plurality of print-facet carrying bands, each having a plurality of print-facets, a corresponding plurality of first wheels arranged on a common axis, each wheel having an internal array of projections and carrying a series of characters corresponding to those of a related print band, a corresponding plurality of second wheels arranged on a common axis parallel to the axis of the first wheels and each serving in part to support one band, means serving additionally to support the bands and providing backing surfaces for the print-facets of the bands operative at any given time, means drivingly connecting corresponding first and second wheels, a threaded member rotatable on the common axis of the first wheels and lying within these wheels, a nut member carried by the threaded member and having an array of projections on its periphery, a rotatable spider member having a plurality of arms interdigitating with at least some of the projections of the nut member, means for preventing rotation of the spider member, and a single actuating member operative selectively to drive the threaded member, with the means for preventing rotation of the spider operative, whereby to move the nut member to a position whereat the projections thereof mesh with the internal projections of a selected first wheel and to drive the screwed member, with the means for preventing rotation of the spider inoperative, whereby to rotate the nut member and spider together to index the selected first wheel and associated print band to a required operative print facet.


**12 Claims, 20 Drawing Figures**



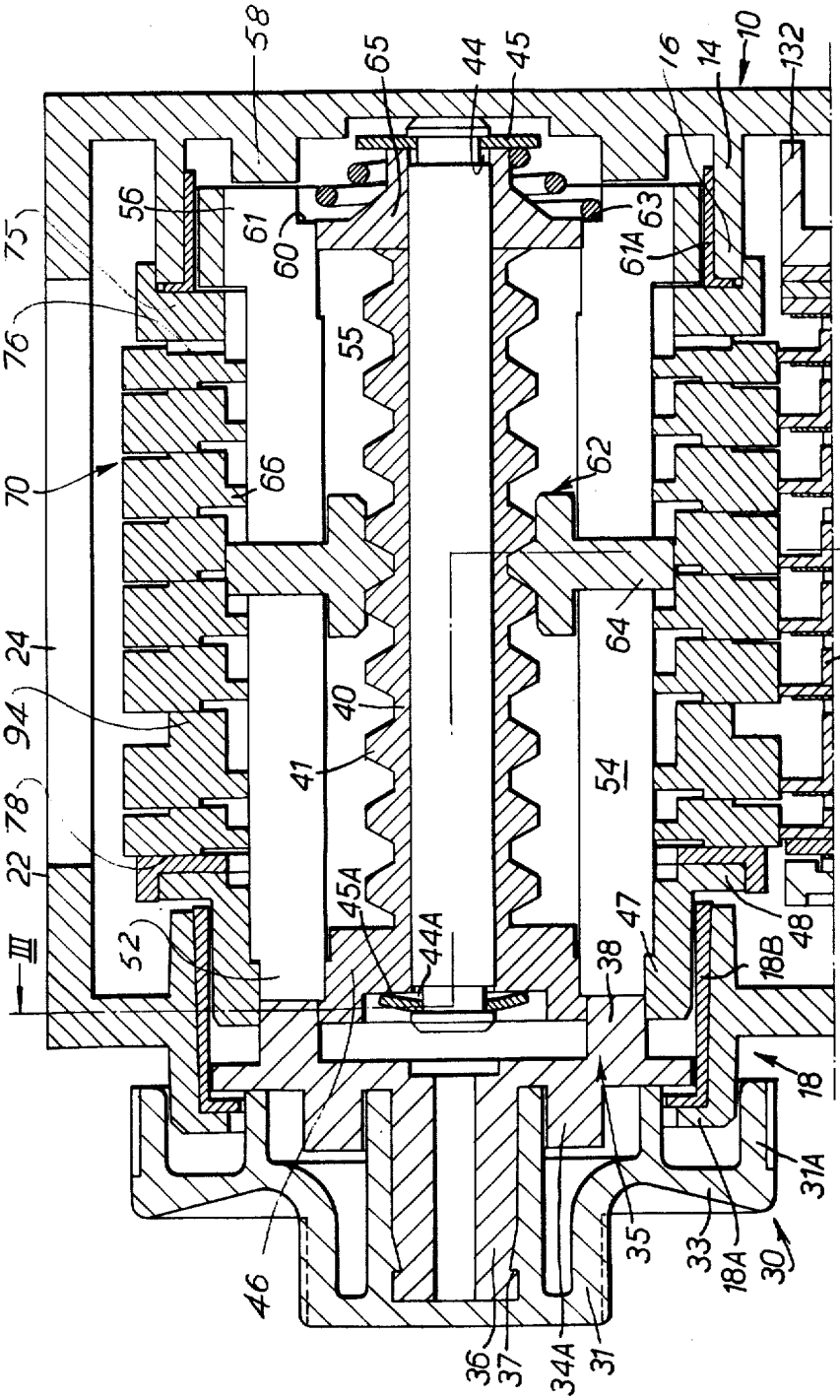

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FIG. 1A.

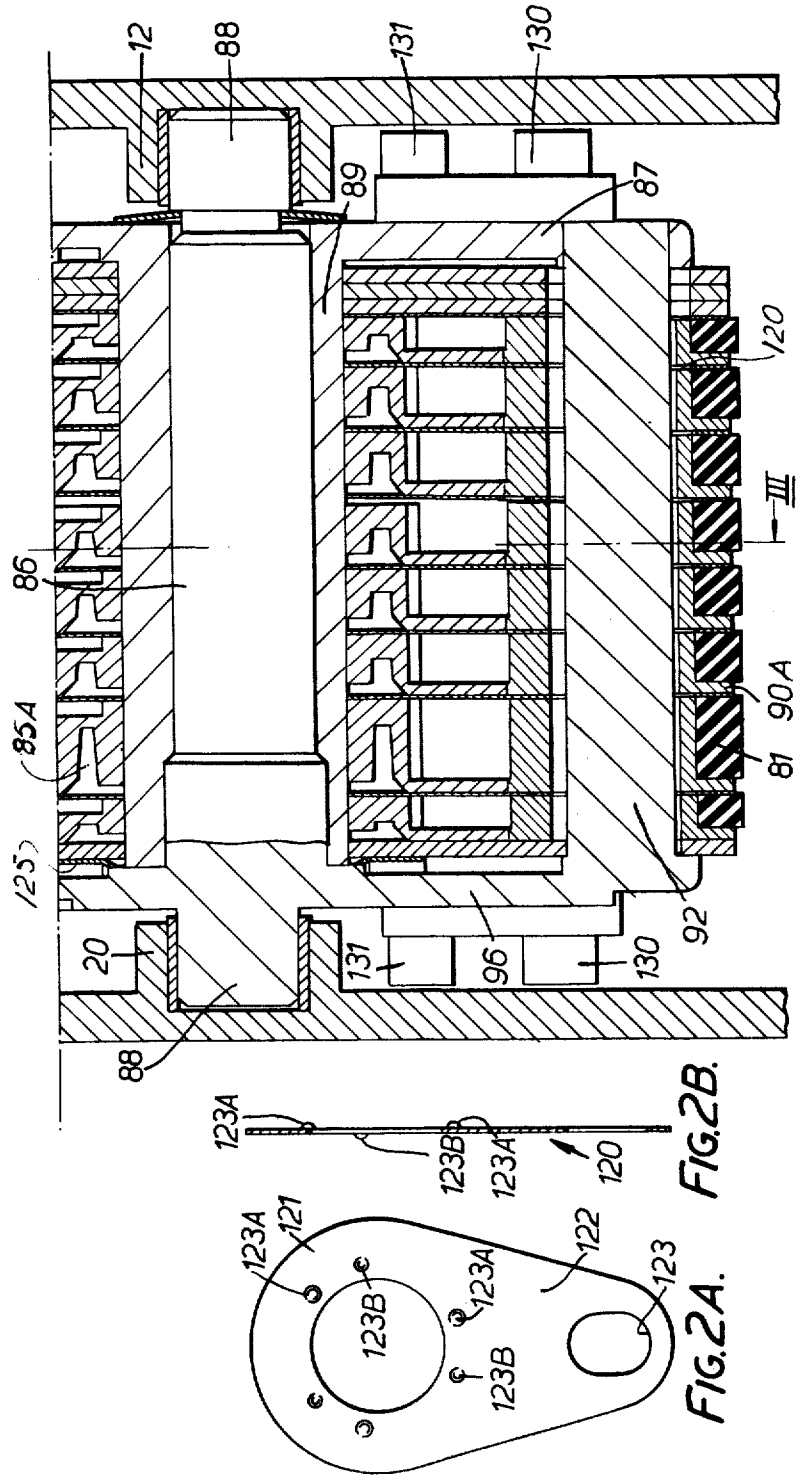



FIG. 1B.

FIG. 2B.

FIG. 2A.

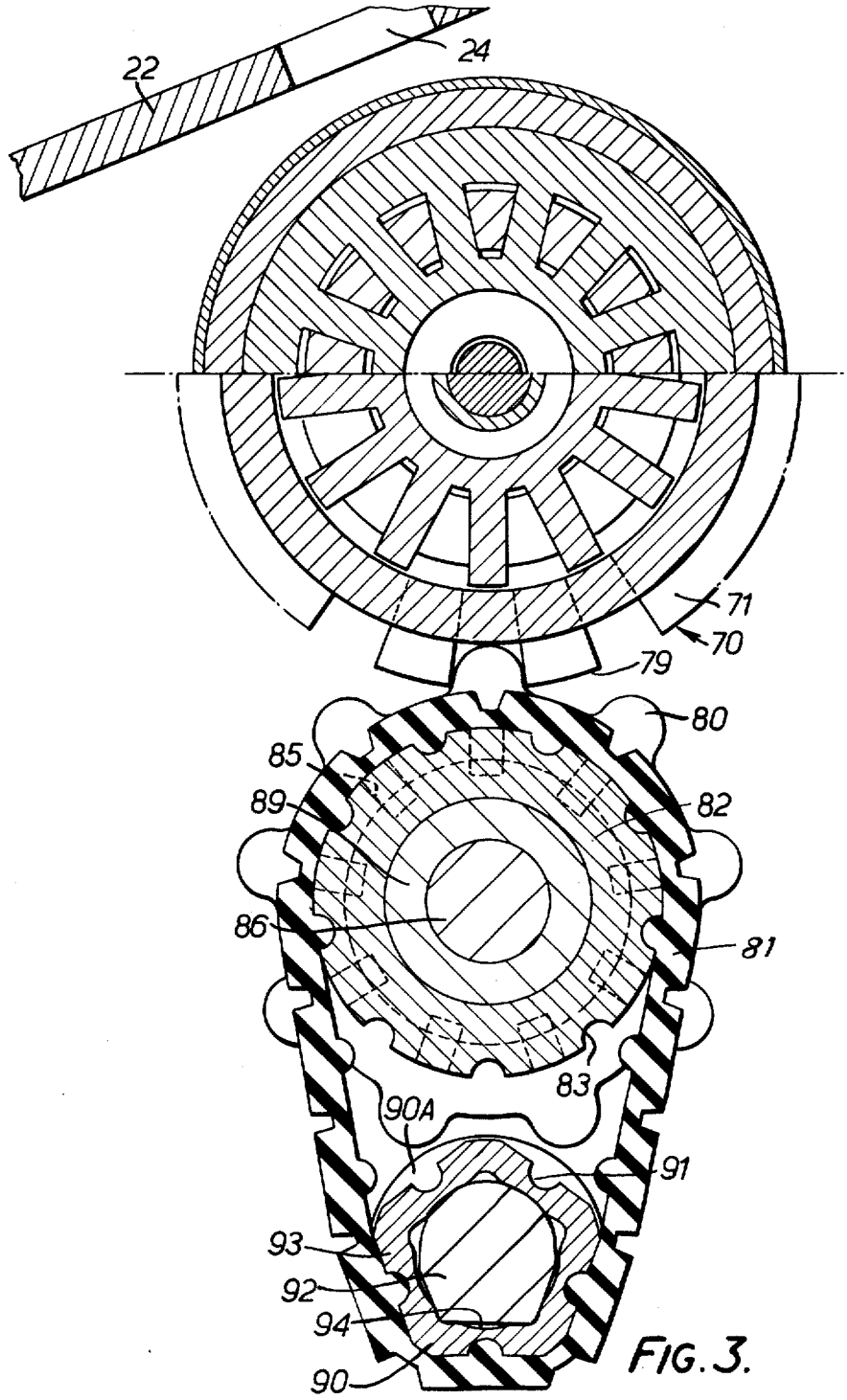



FIG. 3.

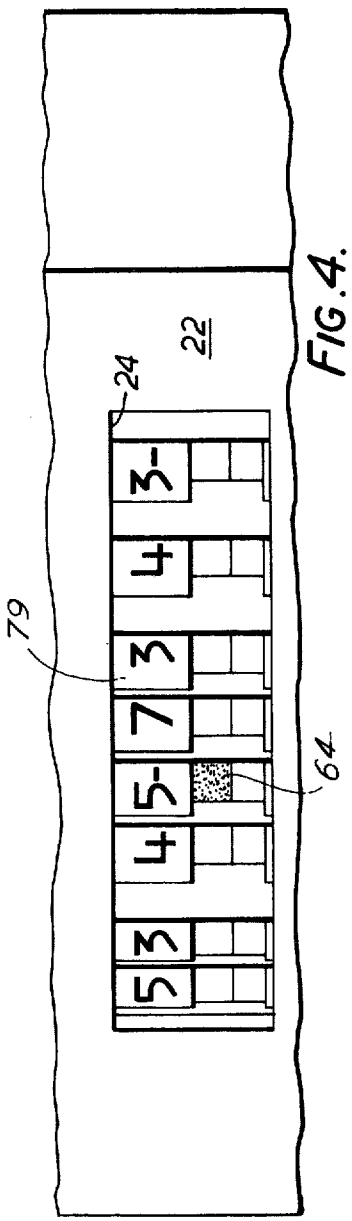



FIG. 4.

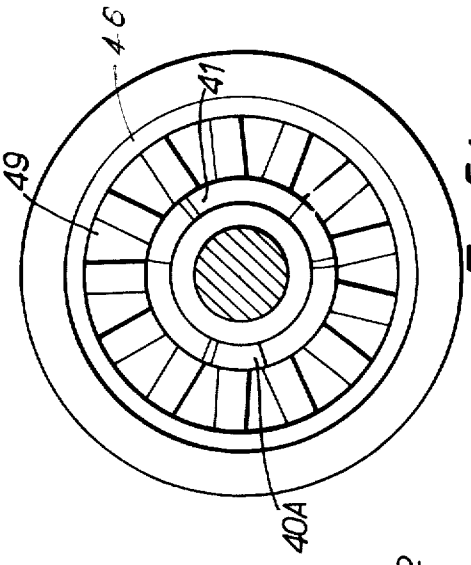



FIG. 5A.

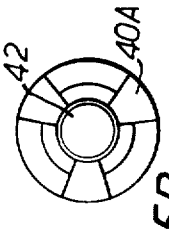



FIG. 5B.

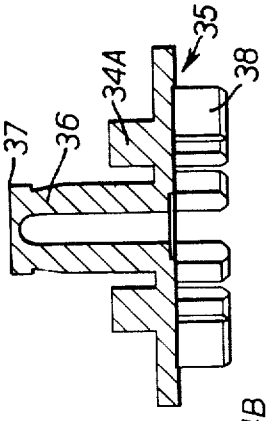



FIG. 6A.

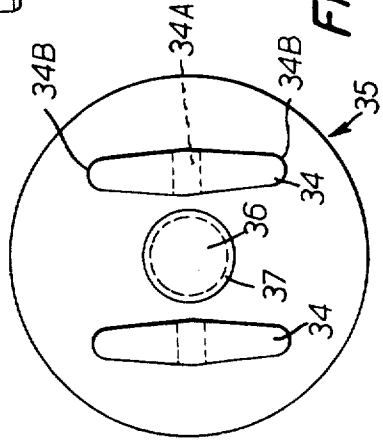



FIG. 6B.

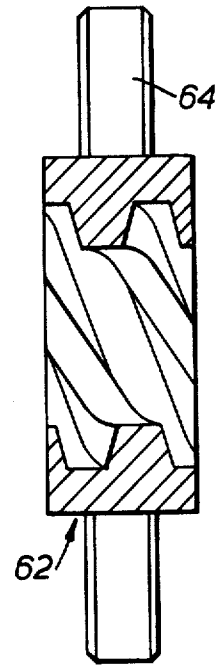



FIG. 7.

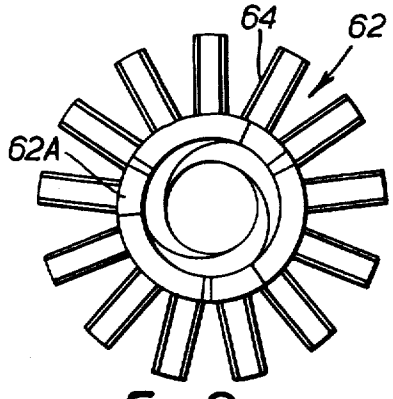



FIG. 8.

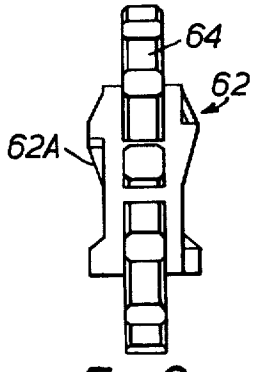



FIG. 9.

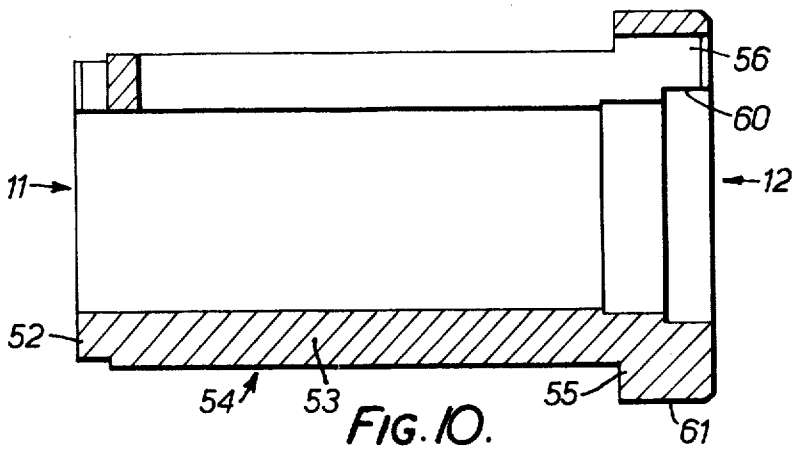



FIG. 10.

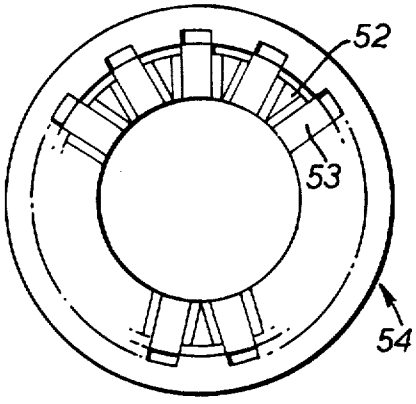



FIG. 11.

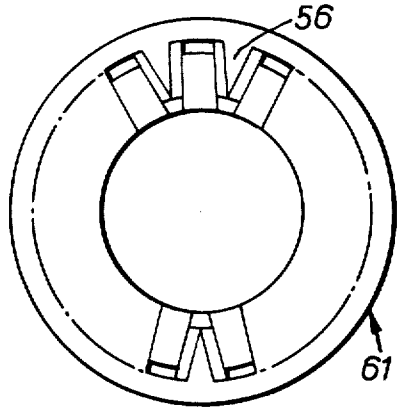



FIG. 12.

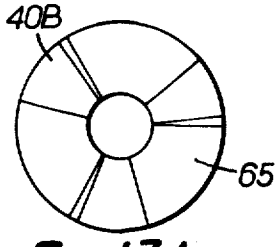



FIG. 13A.

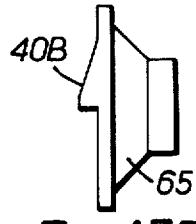



FIG. 13B.

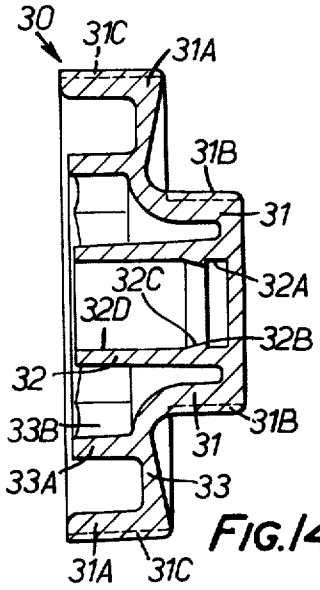



FIG. 14A.

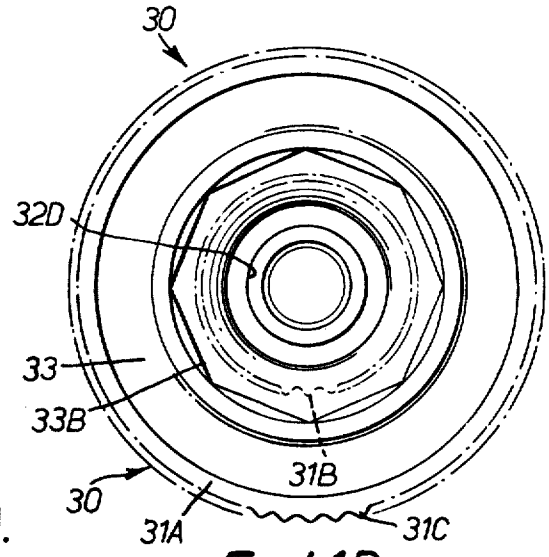



FIG. 14B.

# HAND-HELD SELF-ADHESIVE-LABEL APPLICATORS

## BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to adjustable-facet print mechanisms, for example for use in hand-held self-adhesive-label applicators.

2. Description of the Prior Art

Adjustable-facet print mechanisms have previously been proposed in which print bands can be adjusted manually to give a required print-out. Such mechanisms are commonly employed in date stamps, but such date stamps are rarely required to give a good print impression and furthermore, because the impression is changed only relatively infrequently, the fact that the users fingers may become soiled by ink from the print bands is of relatively little account.

More recently similar, but generally more elaborate, print mechanisms have been employed in marking devices for use in supermarkets and other stores and the requirements of use are far more onerous than in the case of data stamps. The print impression must be completely clear and, because the operator is likely to change the print-out fairly frequently, it is clearly desirable that direct manual contact with the print bands should be avoided. Again, it is important that the operator should know with absolute certainty the print-out after any re-setting operation and to avoid the risk of confusion it is not desirable to rely upon the negative impression which can be viewed by the user at the print-out position of the print-bands or wheels. It follows that the mechanism should include a clearly legible reproduction in positive characters of the print facets operative at any given time.

Furthermore it is a requirement of practice that changes of the print-out should require only a simple operation by the user and that the use of a multiplicity of different control members should be avoided. Again, the use of a number of control members is undesirable because the amount of space taken gives rise to difficulties in providing a compact mechanism.

It is therefore an object of the present invention to provide an adjustable-facet print mechanism which can adequately meet the demands of practice.

## SUMMARY OF THE INVENTION

According to the present invention there is provided, in an adjustable facet print mechanism, a plurality of print-facet carrying bands, each having a plurality of print-facets, a corresponding plurality of first wheels arranged on a common axis, each wheel having an internal array of projections and carrying a series of characters corresponding to those of a related print band, a corresponding plurality of second wheels arranged on a common axis parallel to the axis of the first wheels and each serving in part to support one band, means serving additionally to support the bands and providing backing surfaces for the print-facets of the bands operative at any given time, means drivingly connecting corresponding first and second wheels, a threaded member rotatable on the common axis of the first wheels and lying within these wheels, a nut member carried by the threaded member and having an array of projections on its periphery, a rotatable spider member having a plurality of arms interdigitating with at least some of the projections of the nut member, means for preventing rotation of the spider member, and a single actuating member operative selectively to drive the screwed member, with the means for preventing rotation of the spider operative, whereby to move the nut member to a position whereat the projections thereof mesh with the internal projections of a selected first wheel and to drive the screwed member, with the means for preventing rotation of the spider inoperative, whereby to rotate the nut member and spider together to index the selected first wheel and associated print band to a required operative print facet.



## BRIEF DESCRIPTION OF THE DRAWINGS

One embodiment of an adjustable-facet print mechanism in accordance with the present invention will now be described by way of example, with reference to the accompanying diagrammatic drawings, in which:

FIGS. **1A** and **1B** are together a longitudinal section of the embodiment in accordance with the invention;

FIG. **2A** is an end elevation showing part of the mechanism of FIG. **1** and FIG. **2B** is a side elevation of the same part;

FIG. **3** is a section on the line III—III of FIG. **1**;

FIG. **4** is a fragmentary plan view of a read-out facility of the mechanism;

FIGS. **5A** and **5B** are respectively a section of one part of a detail and an end elevation of the same detail;

FIG. **6A** is a longitudinal section of a clutch member of the lead screw assembly and FIG. **6B** is an end view of the clutch member;

FIG. **7** is a longitudinal section of a nut member which is engaged on the lead screw assembly;

FIG. **8** is an end view of the nut member of FIG. **7**;

FIG. **9** is a side elevation of the nut member of FIG. **7**;

FIG. **10** is a longitudinal section of a spider member forming a part of the mechanism;

FIG. **11** is an end elevation of the spider viewed in the direction of the arrow **11** of FIG. **10**;

FIG. **12** is an end elevation in the direction of the arrow **12** of FIG. **10**;

FIGS. **13A** and **13B** are respectively an end elevation and side elevation of a detail; and

FIGS. **14A** and **14B** are respectively a longitudinal section and an end elevation of a control knob of the mechanism.

Referring now to the drawings, and particularly to FIGS. **1A** and **1B**, an adjustable-facet print mechanism in accordance with the invention is intended for incorporation in a self-adhesive label applicator, for example as disclosed in our co-pending application Ser. No. 283,212 and comprises a framework or casing having end plates **10, 11** between which the working parts of the mechanism are assembled and secured. The end plate **10** has a plane external surface whilst its internal surface is formed with a relatively smaller annular boss **12** and a relatively larger annular boss **14,** the latter being stepped at its inner end **16.**

The end plate **11** has an external annular boss **18** coaxial with the boss **14** and a single internal annular boss **20** which is of the same size as and lies directly opposite and co-axial with the boss **12** of the end plate **10.** The end plates **10, 11** are joined by a peripheral structure indicated at **22** which has a transverse opening or slot **24** (see also FIGS. **3** and **4**) for a read-out facility to be described in detail hereinafter. The end plates **10, 11** and structure **22** will normally form parts of the exter-

nal casing of apparatus (not otherwise shown) with which the mechanism is associated.

The boss **18** of the end plate **11** is partially covered by a control knob **30** (see FIGS. **1** and **14A**, **14B**) which is of stepped cylindrical form including a smaller diameter portion **31** and a larger diameter portion **31A**, both portions having fine teeth **31B** and **31C** respectively on their peripheries to provide a good grip. A sleeve **32** integral with the portion **31** extends coaxially within both portions **31** and **31A**, but stops slightly short of the end plane of the portion **31A**. The internal surface of the sleeve includes a plain cylindrical portion **32A**, a step **32B**, a frusto-conical portion **32C**, and a further plain cylindrical portion **32D**. The purpose of these portions of the internal surface of the sleeve **32** will appear hereinafter. The knob portions **31** and **31A** are interconnected by a generally annular portion **33** and this carries an integral annular flange **33A** the internal surface **33B** of which is octagonal. The flange **33A** lies intermediate the portion **31A** and the sleeve **32**.

The octagonal surface **33B** of the flange **33A** is arranged to engage at the corners of the octagon with a pair of elongate projections **34** (FIGS. **6A** and **6B**) forming parts of a clutch member **35**. Each projection **34** extends parallel to the disc-like base of the clutch member **35** and is connected thereto by a stem **34A**. As will be apparent from FIG. **6B** each of the elongate members **34** has a rounded tip **34B** and this facilitates overriding of the octagonal inner surface **33B** of the flange **33A** when the torque imposed is excessive, the members **34** flexing under such conditions. The disc-like base of the clutch **35** carries an axial spigot **36** having an annular flange **37** at its free end and this engages within the sleeve **32** of the knob **30**. The step **32B** of the sleeve serves to retain the flange **37** of the spigot **36**. The clutch member **35** also carries on its main disc-like base an array of thirteen equally-spaced chamfered dogs or teeth **38** which lie on the opposite side of the base to the elongate projections shown in FIG. **6B**. Each of the dogs or teeth is of sector section.

The periphery of the disc-like base of the clutch member **35** is substantially in contact with a bush **18B** (FIG. **1A**) within a flange **18A** of the boss **18**.

The clutch member **35**, as can be seen from FIG. **1A** is juxtaposed to a shaft **40A** which carries a lead screw **40** having an external screw-thread with a three-start acme thread **41** of coarse pitch along the major part of its length and, at the end of the shaft **40A** remote from the clutch member **35**, there is an annular groove **44** arranged to carry a retaining circlip or washer **45**. A similar groove **44A** and spring washer **45A** is provided adjacent clutch member **35**. To ensure correct assembly one thread is of greater width than the other two and the nut member shown in FIGS. **1**, **7**, **8** and **9** is formed with female threads of complementary form. A flange **46** extends radially from the lead screw **40** and carries at its outer periphery an integral sleeve **47** extending co-axially and inwardly and this sleeve, in turn, carries a further radially-extending flange **48** which lies radially outwardly of one end of the screw thread **41**.

Recesses **40** (FIG. **5A**) in the end flange **46** serve to engage the dogs **38** of the clutch member **35** and also dogs **52** of a skeleton sleeve or spider **54** (see FIGS. **1**, **10** and **11**) which extends co-axially with the lead screw **40**. The individual members **53** (thirteen in number) of this spider **54** are clearly shown in FIGS. **10** and **11**, and the end portions thereof remote from the dogs **52** together carry a flange-like member **55** lying radially outwardly of the end of the lead screw **40** remote from clutch member. The member **55** has an array of dogs **56** arranged to engage corresponding dogs **58** fast with the inner surface of the end plate **10**. The flange **55** also has an annular recess **60** which accommodates one end of a spiral spring **63** the other, smaller, end of which abuts the washer **45** engaged on the reduced diameter portion **42** of the lead screw **40**. Finally, the flange **55** includes a cylindrical co-axial surface **61** and this provides support for the spider **54** by being a sliding fit in a bush **61A** mounted within the boss **14** of the end plate **10**.

The screw-threaded portion of the lead screw **40** carries a nut member **62** (see FIGS. **1**, **7**, **8** and **9**) which is guided along the individual legs of the spider **54** by an array of teeth or dogs **64** which also serve to engage corresponding internal teeth **66** of a selected one of a plurality of read-out wheels **70** (first wheels) which are held between the flange **48** of the lead screw **40** and the stepped end portion **16** of the boss **14** of the end plate **10**. The regularly-spaced internal teeth **66** of each read-out wheel **70** serve to support the wheel on the spider **54** and each wheel has an axially-extending integral ring **74** axially locating on the immediately adjacent read-out wheel **70** or the face **78** of the flange **48** in the case of the end one of the wheels, the axial extent of the rings **74** being such that a gap is left between each of the read-out wheels **70**. An end face **76** of the other end wheel **70** is engaged by a ring **75** abutting the bush **61A** carried within the boss **14**.

To prevent the nut **62** from jamming at the ends of its travel along the thread **41**, stop surfaces **62A** (FIGS. **8** and **9**) are formed at each end of each thread helix of the nut member and these stop surfaces co-act with corresponding stop surfaces (not shown) at the flange end of the thread **41** and stop surfaces **40B** on a spacer or collar **65** (FIGS. **1A**, **13A** and **13B**). The collar **65** lies between the washer **45** and the step in the lead screw **40** and serves primarily as a spacer.

As will be apparent from FIG. **3**, the read-out wheels **70** are deeply crenellated to form a plurality of individual teeth **71** with the read-out facets **79** at the outer periphery of each tooth. It will be apparent from FIG. **1** that the ratio of the axial thickness of the read-out wheels **70** is **3**: **4**: **6** and the same ratio applies to the print bands and print wheels to be described in detail hereinafter. The combination of wheels can be varied to accommodate print bands **81** of corresponding widths which incorporate different characters. This facility is of particular importance where letters other than latin and numerals other than arabic are to be used.

The teeth **71** of each wheel **70** are in constant mesh with thin, lobe-shaped, projections **80** provided on the periphery of the corresponding one of a plurality of print-band carrier wheels **82** (second wheels), the print bands **81** engaging on a peripheral part of each carrier wheel below the radial level of the projections **80**. Each carrier wheel has a plurality of peripheral notches **83** spaced by a distance equal to the spacing of the character-carrying segments of the print bands. A corresponding number of radially-extending grooves **85** of semi-circular section is provided on one side face of each wheel. A continuous annular groove **85A** (FIG. **1B**) is provided on the other side face of each wheel. The

print band carrier wheels **82** are rotatably mounted on a shaft **86** through the intermediary of a sleeve **89**, the shaft being journalled by portions **88** in the bosses **12**, 20 of the end plates **10**, **11** respectively. The shaft and sleeve have complementary tapers to assist moulding. The facility of providing a bearing relationship between the boss **20** and the portions **88** assists assembly. This is further assisted by two spigots (not shown) at the ends of the sleeve remote from a plate-like member **87** carrying the sleeve and complementary apertures (not shown) in a plate member.

The number of and thickness of the print-band carrier wheels **82** corresponds with the number and thickness of read-out wheels **70**, and these print-band carrier wheels are spaced by thin plate or shim members **120** (spacers) which extend to and engage over a fixed bar **92** which carries further carrier wheels **90**, (third wheels - see FIG. **3**) each print band **81** being trained around a corresponding wheel **90** and spaced from the adjacent print bands by portions of the members **120**. The bar **92** has a lower flat surface, two inclined surfaces extending upwardly away from the flat surface at the same angles as the corresponding sides of a pentagon, two vertical, parallel opposite sides and a semi-circular upper surface interconnecting the parallel opposite sides. The bar **92** carries the wheels **90** which are of generally pentagonal form, each face of the pentagon having a recess **91** of semi-circular form in each, otherwise plane face. Each wheel **90** includes an integral generally annular flange **90A** and a generally pentagonal aperture **93** which co-operates with the bar **92** and has a shallow recess **94** in each side. As any given wheel **90** rotates on the bar **92** resistance is generated by the shape of the bar and the aperture **93**, but when the generally plane faces correspond, an essentially flat support is given to the operative print facet of the corresponding print band **81**. For comparatively wide print bands **81**, it is preferable to reduce the width of the pentagonal surface of the corresponding wheel **90** since otherwise the stiffness of the band makes turning difficult. The non-pentagonal portion is made cylindrical.

Each spacer **120** as shown in FIGS. **2A** and **2B** comprises a generally plane annular portion **121** and, as shown, a depending portion **122** having an elongate aperture **123** is arranged to receive the bar **92**. The portion **121** receives the sleeve **89** in the aperture thereof. Upstanding dimples **123A**, **123B** are provided on respective faces by pressing to provide the spacing and biasing function of the member **20**. When assembled the dimples **123A** of each spacer **120** engage in the groove **87** of an adjacent wheel **82** and the dimples **123B** provide indexing stops in conjunction with the radial grooves **85** in the other adjacent wheel. A spring **125** at one end of the stack of wheels serves to bias them against the dimples of the interposed spacers.

The operation will now be described primarily with reference to FIGS. **1** and **3**. At any given time the position of the nut member **62** along the length of the lead screw **40** is readily apparent by inspection through the slot **24** (FIGS. **3** and **4**) because it is made of a color which contrasts with the color of at least the spider **54** and lead screw **40**. Assuming that the nut member **62** is at the desired position it is merely necessary to rotate the knob **30** which serves to index the corresponding read-out wheel **70** and print band carrier wheels **82** and **90** until the desired new character on the read-out wheel is indicated at the slot **24**. Rotation of the knob **30** causes the dogs **38** of the clutch member **35** engaged in the corresponding recesses in flange **46** of the lead screw **40** to drive the lead screw and, at the same time, the dogs **52** of the spider **54** in engagement in the opposite ends of the same recesses of the flange **46** drive the spider **54** which rotates the nut **62** which in turn, through its teeth **64**, rotates the engaged print-out wheel **70**. The lobe-shaped projections **80** of the corresponding print band carrier wheel **82** are rotated by engagement with the teeth **71** of the corresponding read-out wheel **70** and the print band **81** indexes between the positions determined both by the dimples **123B** engaging the successive radial grooves **85** and by the interaction of the bar **92** and the apertures **93** of the wheels **90**. The position of the nut member **62** is checked by inspection through the slot **24**.

If it is desired to change the operative character on one of the other print bands, the knob **30** is depressed and the dogs **38** of the clutch member **35** serve to drive the dogs **52** of the spider **54** substantially out of engagement with the recesses in the flange **46** of the lead screw and the dogs **56** at the other end of the spider into engagement with the fixed dogs **58**. Rotation of the spider **54** is then effectively prevented and rotation of the knob **30** serves only to drive the lead screw **40** and, because of the screw-threaded meshing engagement of the nut member **62** with the thread **41**, of the lead screw, the nut member **62** tracks until it lies opposite the read-out wheel **70** which is to be adjusted. When the nut member is correctly positioned its surface becomes visible through the slot **24**. Subsequently, when inwards pressure is released, the knob **30** is moved outwardly under the action of the spring **63** so that the dogs **56** and **58** disengage and the dogs **62** re-engage in the recesses **49** of the flange **46**. The rotation of the selected read-out wheel and corresponding print band can then proceed as hereinbefore described.

The shape (see FIGS. **10** and **11**) of the dogs **52** of the spider is such that, when substantially disengaged, the dogs click over the edges of the recesses of the flange **46** under the action of the spring **63** and with the assistance of the profiled teeth **52** and recesses in the flange **46** with chamfered edges. The pitch of the thread **41** is so selected that the nut member **62** moves over a distance equal to the spacing between two of the narrowest print bands **81** and hence read-out wheels **70** for three clicks, a distance equal to the next wider print band for four clicks and a distance equal to the widest print band for six clicks.

It will be apparent from FIG. **1B** that the shaft **86** is eccentric in relation to the sleeve **89**. This arrangement facilitates mounting of the print bands **81** on the wheels **82** and **90**, since the bands can be assembled loose and subsequently tightened.

I claim:

**1.** In an adjustable facet print mechanism, a plurality of print-facet carrying bands, each said band having a plurality of print-facets, selected ones of which are operative at any given time; a plurality of first wheels arranged on a common axis, each wheel having an internal array of projections and carrying a series of characters each corresponding to a respective print-facet of a related print band and providing an indication by display of the character corresponding to the then operative print-facet of said related print band; a plurality of second wheels arranged on a common axis parallel to the axis of the first wheels and each serving in part to

support a respective print band; means supporting said bands at a position spaced from said second wheels and providing backing surfaces for the print-facets of the bands operative at any given time; means drivingly connecting corresponding first and second wheels; a screw-threaded member rotatable on a common axis of said first wheels and lying within said first wheels; stationary means rotatably supporting said screw-threaded member; a nut member carried by the screw-threaded member and having an array of projections on its periphery; a rotatable spider member coaxial with said screw-threaded member and having a plurality of arms extending axially of said screw-threaded member and interdigitating with at least some of said projections of said nut member; means operable to prevent rotation of said spider member; and a single rotatable actuating member, movable axially of said screw-threaded member over a distance substantially less than the axial length of said plurality of first wheels, operative selectively, in a first axial position, to drive said screw-threaded member with the means operable to prevent rotation of said spider member operative, whereby to move said nut member to a position whereat the projections thereof mesh with the internal projections of a selected first wheel and, in a second axial position, to drive said screw-threaded member with the means operable to prevent rotation of said spider inoperative, whereby to rotate said nut member and spider together to index the selected first wheel and associated print band to bring a required print facet to an operative position.

**2.** A print mechanism according to claim **1,** wherein the means serving to support said bands at a position spaced from said second wheels comprises a plurality of third wheels arranged on a common axis parallel to the axis of said first wheels, each said third wheel having a polygonal periphery, the flats of which serve as said backing surfaces.

**3.** A print mechanism according to claim **2,** wherein each said print band has a plurality of regularly-spaced internal projections and wherein each said second wheel has complementary spaced recesses engageable by the internal projections of the associated print band.

**4.** A print mechanism according to claim **2,** wherein each said print band has a plurality of regularly-spaced internal projections and each said third wheel has corresponding recesses each disposed at mid-length of a flat of the wheel.

**5.** A print mechanism according to claim **1,** wherein said means operable to prevent rotation of said spider member comprises a first array of dog members on said stationary means; a second array of dog members on said spider member and rotatable therewith; said first and second arrays of dog members being selectively interengageable to prevent rotation of said spider member.

**6.** A print mechanism according to claim **5,** in which said stationary means comprises a casing carrying said first array of dog members; said spider member being movable axially to effect engagement and disengagement of said first and second arrays of dog members.

**7.** A print mechanism according to claim **6,** comprising clutch means controlled by said single actuating member, and serving to couple said screw-threaded member to the actuating member and to effect engagement of said first and second arrays of dog members.

**8.** A print mechanism according to claim **7,** comprising

spring means biasing said arrays of dog members to a disengaged relation.

**9.** A print mechanism according to claim **7,** comprising

overload means interposed between the actuating member and the clutch means.

**10.** A print mechanism according to claim **7,** wherein said clutch means comprises means defining an internal polygonal surface with an even number of flat sides; said actuating member comprising a knob carrying two elongate members, each of limited flexibility, extending transversely to the axis of rotation thereof and engaging parts of the polygonal surface, the length of each said elongate member being greater than the distance across the flat sides of the polygonal member but less than the distance between opposite corners thereof; said elongate members engaging the polygonal surface at their ends whereby to transmit rotation until, under overload conditions, the members flex to an effective length equal to the distance across the flat sides and thus slip relative to those flat sides and transmit zero torque.

**11.** A print mechanism according to claim **7,** wherein said clutch means comprises a disc having a plurality of apertures corresponding to the number of arms of said spider member, said disc being rigid with said screw threaded member and each aperture receiving an end portion of one arm of said spider member; and further comprising a clutch member carrying a plurality of teeth corresponding to the apertures of said disc and each partially engageable in a corresponding one of the said apertures; said second array of dog members being remote from said disc; axial movement of said single actuating member serving to engage ends of the teeth of said clutch member with ends of the arms of said spider member and thereby to engage said second array of dog members, carried by said spider member, with said first array of dog members carried by said casing.

**12.** A print mechanism according to claim **1,** comprising shim members, one shim member being interposed between each pair of adjacent second wheels, and each shim member having regularly-spaced projections on opposite faces thereof; each of said second wheels having a plurality of regularly-spaced recesses on one face thereof and an annular groove on the other face thereof; the projections on one face of each shim member engaging in the annular groove of one adjacent second wheel and the projections on the other face of each shim member engaging in the recesses of the other adjacent second wheel; the projections on said one face of each shim member engaging in the corresponding annular groove of an adjacent second wheel serving to align the second wheels and shim members, and the projections on the other face of each shim member engaging in said recesses of an adjacent second wheel serving both to align the second wheels and shim members and angularly to locate the second wheels and their corresponding print bands.

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