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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US19/51983

A. CLASSIFICATION OF SUBJECT MATTER

IPC - B29C 33/30, 45/17, 45/73, 45/80 (2019.01)

CPC - B29C 33/30, 45/1756, 45/73, 45/80

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

See Search History document

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

See Search History document

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

See Search History document

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP 2013-095040 A (TOYOTA MOTOR) 20 May 2013; see machine translation	1-3, 8, 10, 12
X	US 5,314,327 A (STEIN W) 24 May 1994; figure 1; column 5, lines 5-15, 50-55	18
A	US 2018/0009146 A1 (CANON VIETNAM CO. LTD.) 11 January 2018; entire document	1-20
A	JP H04-110120 A (FANUC LTD) 10 April 1992; see machine translation	1-20
A	US 2016/0368194 A1 (FANUC CORPORATION) 22 December 2016; entire document	1-20

☐ Further documents are listed in the continuation of Box C.

☐ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"D" document cited by the applicant in the international application

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

01 March 2020 (01.03.2020)

Date of mailing of the international search report

12 MAR 2020

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US19/51983

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

-***-Continued Within the Next Supplemental Box-***-

1. ☒ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☒ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/US19/51983

-Continued from Box No. III Observations where unity of invention is lacking-

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I: Claims 1-10 and 12 are directed toward: an injection molding system comprising: a die detection unit.

Group II: Claim 11 is directed toward: an injection molding system comprising: a force detection sensor.

Group III: Claims 13-17 are directed toward: an injection molding system comprising: a first operation panel.

Group IV: Claims 18-20 are directed toward: a die for an injection molding system, including an injection molding apparatus configured to perform injection molding with the die and a conveyor apparatus configured to insert the die into the injection molding apparatus, the die comprising: a stationary part.

The inventions listed as Groups I-IV do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons:

The special technical features of Group I include: an injection molding system comprising: a die detection unit configured to detect the die conveyed by the conveyor apparatus; an actuator detection unit configured to detect a state of the actuator; and a controller configured to control the conveyor apparatus to, based on a detection result by the die detection unit and a detection result by the actuator detection unit, prohibit a conveying operation of the die, which are not present in Groups II-IV.

The special technical features of Group II include: an injection molding system comprising: a force detection sensor configured to detect a force applied to the actuator; and a controller configured to control the conveyor apparatus to prohibit a conveying operation of the die based on a detection result by the force detection sensor while the die is moved by the actuator, which are not present in Groups I and III-IV.

The special technical features of Group III include: an injection molding system comprising: a first operation panel configured to enable control of the injection molding apparatus; wherein the first operation panel and the second operation panel are located on a same side of the injection molding apparatus with respect to an injecting direction in which the injection molding apparatus injects a molding material to the die, and wherein the first operation panel and the second operation panel are located on the same side of the first conveyor apparatus with respect to a conveying direction in which the conveyor apparatus conveys the die, which are not present in Groups I-II and IV.

The special technical features of Group IV include: a die for an injection molding system, the die comprising: a stationary part; a movable part, wherein a cavity is formed between the stationary part and the movable part; and a rotating member attached to both the stationary part and the movable part, wherein the rotating member is configured to be rotated based on a movement of the die by the conveyor apparatus, which are not present in Groups I-III.

The common technical features of Groups I-IV are: an injection molding system comprising: an injection molding apparatus configured to perform injection molding with a die; a conveyor apparatus on one side of the injection molding apparatus and configured to insert the die into the injection molding apparatus, wherein the conveyor apparatus includes an actuator connectable to the die; and a controller configured to control the conveyor apparatus to, based on a detection result, prohibit a conveying operation of the die.

These common technical features are disclosed by JP 2013-095040 A (TOYOTA). Toyota discloses an injection molding system comprising: an injection molding apparatus (10; figure 1) configured to perform injection molding (paragraph [0029]) with a die (30); a conveyor apparatus (20a) on one side of the injection molding apparatus and configured to insert the die into the injection molding apparatus (mold 30 is conveyed and loaded into the molding machine body 10 by the carriage 20a; paragraph [0038]), wherein the conveyor apparatus includes an actuator connectable to the die (drive unit (actuator) of the carriage 20a for conveying the mold 30 into the molding machine body 10; paragraph [0037]); and a controller configured to control the conveyor apparatus to, based on a detection result, prohibit a conveying operation of the die (control unit 10 controls the carriage 20a to stop the movement of the carriage 20a upon the die detection sensor 50b sensing the correct position of the mold 30 between the platens 11 and 12; paragraphs [0034], [0043]).

Since the common technical features are previously disclosed by the Toyota reference, the common features are not special and so Groups I-IV lack unity.